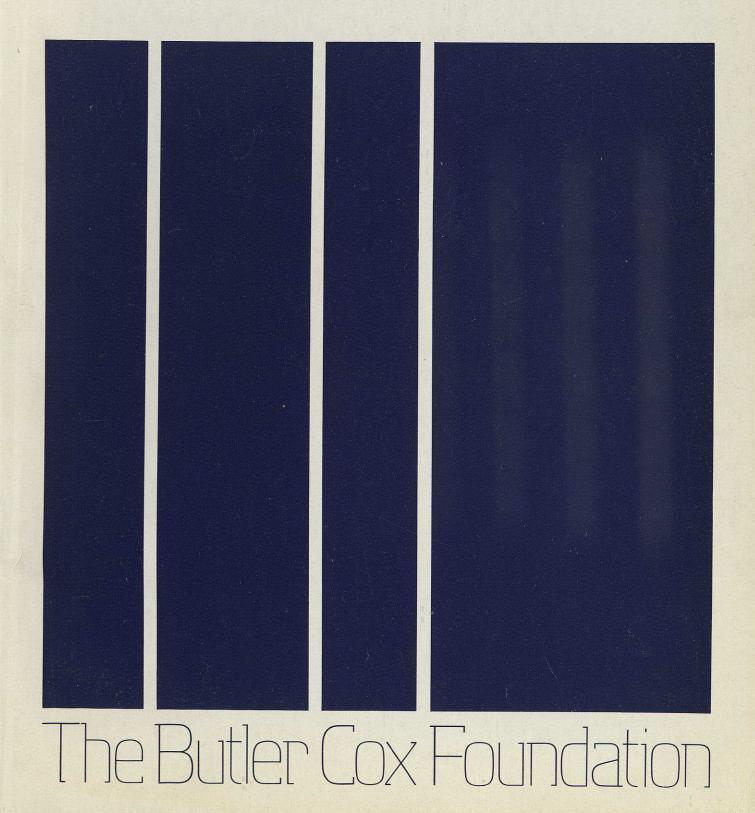
Report Series Electronic Mail No 17

February 1980



Abstract

Report Series No 17

Electronic Mail

by David Flint February 1980

Electronic mail is concerned with the use of terminals, telecommunications and computerbased facilities to enable individuals to send and receive messages. In particular, electronic mail can provide an additional and much needed alternative service to both the telephone and the internal and the public postal systems.

The aim of electronic mail is to provide a fast message delivery service, without interrupting the recipient of the message in the way that the telephone does. Electronic mail is not a new concept, and both facsimile and telex systems, which are forms of electronic mail, have existed for many years. Facsimile and telex are, however, limited both in their facilities and in their availability and, in addition, their use is normally restricted to specialised individuals and groups.

The changing economics of computer technology and the increasingly widespread use of terminal equipment present the opportunity to introduce electronic mail services into the office. During the 1980s, electronic mail could offer many office workers a genuine alternative choice of communications medium to supplement the post and the telephone.

The potential impact of electronic mail on business communication methods places it right at the heart of office automation, and for this reason this report concentrates on the practical aspects of intra-company electronic mail. It describes user experience to date both in the US and in Europe, and it also describes the features and the facilities of electronic mail systems. The report also discusses the likely trends in electronic mail products and technology and the main regulatory influences that affect the development of electronic mail systems. The report concludes with suggestions as to how those organisations that wish to introduce electronic mail might best go about it.

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The Foundation collects its information through its office in London and also through its associated offices in Europe and the US. It transmits its findings to its members in three main ways:

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

The Foundation is controlled by a Management Board whose members include representatives from the Foundation member organisations. The responsibilities of the Management Board include selecting topics for research and approving the Foundation's annual report and accounts, which show how the subscribed research funds have been employed. **Report Series No 17**

ELECTRONIC MAIL by David Flint February 1980

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CHAPTER 1

INTRODUCTION

DEFINITION OF ELECTRONIC MAIL

Before the electric telegraph was invented in the 19th century, business communications were based either on face-to-face meetings or on the physical movement of a message. Both of these forms of communication are still used today, but they have been supplemented by electronic forms of communication such as the telephone system, the telex system, facsimile transmission, and data transmission to and from a computer and between computers. To that extent, electronic mail in its widest sense has existed for many years.

The modern electronic mail systems that are now being developed and introduced have received considerable attention both from experts in industry and from the technical press, and this attention has generated considerable confusion about what electronic mail is and what it involves. Most people believe it to be an alternative to conventional, existing systems that uses electronic transmission and storage in the interests of speed, flexibility, and economy.

We define electronic mail as a facility that permits two or more people to converse with one another, where the messages are transmitted electronically between the users, and where the messages may be permanently recorded for future reference. This definition requires that users have access to some form of terminal equipment, and that there is a communications network able to link the terminals together. It also requires that the system itself provides a means of storing and retrieving information.

Facsimile transmission and the public telex system can both be regarded as forerunners of true electronic mail. However, the telex system lacks many of the features of the electronic message systems that are being developed and used today. In particular, the new systems are capable of distributing messages directly between the originator and the recipient. They also incorporate sophisticated store-and-forward and filing capabilities, including an electronic mailbox, where messages addressed to a particular user of an electronic mail system are stored. The user is able to retrieve messages from his mailbox as and when he wishes.

As terminal devices become increasingly widespread, electronic mail has the potential to become a highly convenient communications medium for many types of message, including some messages that might otherwise be carried by the public mail, by telex systems or by conventional data processing systems.

Electronic mail also has the potential to displace some traffic from the telephone, which is the medium that individuals use most of all in communicating remotely with one another. Some proponents of electronic mail would even claim that it can eliminate the need for some meetings, though this is more a question of predicting behaviour and social needs rather than a question of technology.

However, if electronic mail is to become a widespread and highly convenient means of communication which fills the gap between the telephone and the postal system then each person who uses electronic mail will ideally need to have his own terminal on his desk or at worst will need to be able to have access to a nearby terminal. The potential impact of electronic mail on business communication methods places it right at the heart of office automation. We expect that many organisations will wish to use electronic mail as a means of gaining a foothold for tomorrow's office technology, and for this reason we examine electronic mail in some detail in this report.

SCOPE OF THIS REPORT

This report concentrates on the practical aspects of electronic mail, and it does not address the overall question of office automation. We shall be considering the broader technical, political and organisational issues of office automation in Foundation Report No. 19: Office Systems Strategy.

The introduction of electronic mail systems that use a low-cost delivery system, such as videotex, could have a significant impact on domestic communications as well as on business communications, but in this report, we concentrate on the latter. There is nonetheless a close relationship between domestic communications and business communications, because a mass residential market could eventually reduce the cost of the terminals that are used in business applications, and this would significantly affect the cost of introducing a business electronic mail system. Also, domestic electronic mail terminals would make it possible for more people to work from home, and this facility would (potentially) cut the need for some business travel.

We concentrate in the report on intra-company rather than on inter-company communications. Intra-company communication presents fewer technical, legal and organisational problems, and in most commercial organisations it also dominates the flow of documents. Also, most experience of electronic mail so far has been gained in organisations that have installed intracompany communication systems.

PURPOSE OF THE REPORT

The purpose of the report is to explain where the opportunities for electronic mail lie, to describe how existing electronic mail systems work, and to suggest how those organisations that wish to experiment with electronic mail might best go about it. We use the term "experiment" advisedly because we believe that, as with many office automation applications, it will often be difficult for an organisation to produce a well reasoned and sound justification for installing an electronic mail system.

An organisation that undertook an experimental project would be likely to gain two advantages. First, it would obtain experience of using electronic mail and would learn from this some of the benefits and pitfalls. Second, it would be likely to gain enough information from the experiment to be able to assess with some confidence the justification for installing an electronic mail system and also the benefits it would be likely to derive from such a system.

The report goes on in chapter 2 to review in more detail what electronic mail has to offer. Chapter 3 then describes user experience to date, bearing in mind that electronic mail is still in its formative stages in the US and is only at its early beginnings in Europe.

Chapter 4 describes the features and facilities of electronic mail systems, and chapter 5 discusses the likely trends in electronic mail products and technology. Chapter 6 discusses those main regulatory influences that affect the development of an electronic mail system. Chapter 7 brings all the above considerations together and suggests the way in which organisations should make a start on electronic mail.

CHAPTER 2

THE NEED FOR ELECTRONIC MAIL

Foundation Report No. 4: Trends in Office Automation Technologies, put forward the basic case for office automation. In particular, it drew attention to the growing proportion of total labour costs for which office staff account. It also drew attention to the low investment that organisations have made in equipment and services to support office workers. The report also highlighted that the more costly categories of staff (namely, managers and specialists) represent a growing proportion of the office population.

Electronic mail services promise to contribute improvements in the productivity of office staff. In particular, electronic mail has the potential to make some aspects of business communication more effective. In the first part of this chapter we discuss briefly the presently under-supported office communication requirements and we outline the benefits that electronic mail might seek to deliver.

As well as contributing improvements in the productivity of office staff electronic mail can also make another contribution to a business. Indeed, in the short run, that contribution may prove to be easier to justify and, as a result, it may represent the dominant use that organisations make of electronic mail. In many businesses, particularly those that deal with consumer products and services, there is a major requirement for a message facility that can be used (for example) to handle customers' orders and to process reservations. For many of those businesses, and particularly those businesses where it is not necessary or possible to process information automatically, electronic mail may well provide the best method for meeting the requirement. We describe this type of application on pages 6 and 7.

SHORTCOMINGS IN EXISTING BUSINESS COMMUNICATION

Figure 1 is derived from the results of a study at a corporate headquarters that houses 1,700 employees. In the three categories of workers shown there (principals, secretaries and clerks) between 57% and 89% of the total number of activities are related to creating documents, distributing and receiving documents, and conducting telephone communications. Clearly, a number of discrete products and services (such as electronic PABX and word processing) are addressing this whole field, principally by reducing or eliminating the shortcomings of the existing facilities. However, given the dominance of communication-oriented tasks in the overall pattern of office activity it is probable that a new type of service such as electronic mail will have a considerable impact on almost all categories of office staff. Existing office communications facilities have two particular shortcomings that are not too likely to be improved in either the near term or the medium term. These shortcomings are the delays that occur in the transmission of messages and the losses that result from "friction" in communication systems. These losses fall into two categories — messages that are lost because they are not sent because of frustration with the communication system, and time that is wasted when individuals endeavour to communicate either by telephone or by memo or letter.

The time taken to deliver messages

Leaving aside those written messages that are delivered by hand (and this method is normally

possible only within a building) the present means of communication are limited to the following:

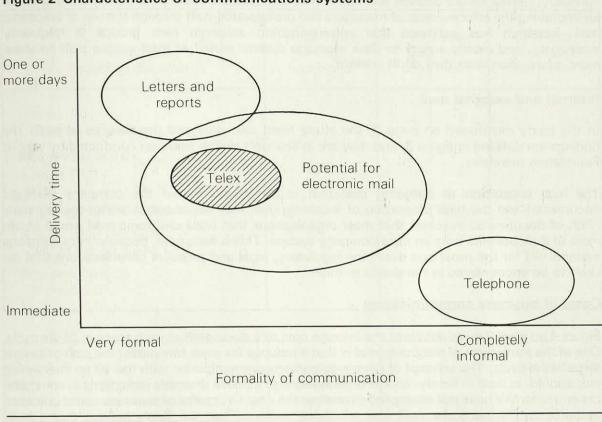
- Telephone messages, which can be sent only in real time.
- Telex.
- Postal communications, which both in internal systems and external systems typically have a delivery cycle of at least a day.

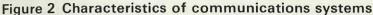
Figure 1 An analysis of office staff activities

		Principals	Secretaries	Clerks
		Percenta	ge of time	
Paper-based communication				
Filling out forms Writing Typing Paper and mail handling Checking documents Reading Copying Filing Searching for, or returning information		- 16 - 4 2 7 1 2 10	4 37 12 4 2 6 5 3	8 7 8 5 10 3 4 6
Giving or receiving dictation		3	6	-
	Total	45	79	61
Telephone communication		12	10	9
Total paper- and telephone- related communication		57	89	70
Other activities				
Calculating Conferring with secretary or principal Attending meetings Planning and scheduling Travelling Other	Total	7 2 12 4 6 12 43	- 4 - 3 2 2 11	10 2 1 1 16 30
Number of personnel		329	123	115

(Source: IBM Systems Journal)

Existing communications systems can be characterised in terms of the formality and the immediacy of communication. As figure 2 shows, there is at present a wide gap between the highly-formal, non-interactive medium of the letter and the informal, interactive medium of the telephone. This is a gap that electronic mail is designed to fill. Telex partially fills the gap, but its technical limitations and (in most organisations) its remoteness, limit its use.





Clearly, the telephone has several virtues, and in particular it has the advantages of speed and the facility for interaction. At present, however, it is used mostly for those messages that need to be delivered faster than the postal service, irrespective of whether interaction is either necessary or desirable. Consequently, the telephone is the cause of interruption to the recipient's work, and this interruption could be avoided if a fast, non-interactive communication medium were available.

By contrast, many postal services — both internal and external — are in decline. Deliveries of the public mail service are tending to be made less frequently, and delivery times generally are tending to lengthen and to become more erratic. Consequently, those who use the service now have to allow for longer delays than was formerly the case, and overall, the general result is that business activities are slowed down.

Losses through "friction" in the communication system

A number of studies have shown that a very high proportion of telephone calls (60% to 75%) fail to locate the required person. This suggests that the average office worker who makes his

own telephone calls "wastes" about 1½ hours a week, although the use of more sophisticated PABX facilities could help reduce the size of this problem.

The problem is not only one of wasted time. Sometimes messages are lost altogether and so, for example, sales staff may fail to contact a potential customer and as a result they delay or even lose a sale.

Similarly, there are losses in the text communication system. For many office workers there is at present no real substitute for the conventional procedures of creating and mailing documents. Inevitably, messages are delayed and sometimes are not sent at all. As a result, there is scope for improving the effectiveness of managers and professional staff through the use of electronic mail. Research has indicated that communication amongst peer groups is frequently inadequate, and clearly a desk-to-desk message system would at least enable staff to share more information than they do at present.

Internal and external mail

In the study mentioned on page 3, the study team also analysed the sources of mail. The findings are detailed in figure 3, and they are in line with similar research conducted by various Foundation members.

The high proportion of outgoing mail that is distributed within the company (81% of documents) and the high proportion of incoming mail that is generated within the company (75% of documents) indicates that most organisations that used electronic mail would obtain most of their benefits from an intra-company system. This is fortunate, because intra-company systems will for the most part avoid the regulatory, legal and protocol considerations that are likely to be encountered in the public domain.

Costs of business communication

Figure 4 on page 8 gives details of the average cost of a document at each stage in its life cycle. One of the attractions of electronic mail is that it reduces (or even eliminates) the cost of several steps in the cycle. The concept of person-to-person communication with few or no intervening steps could, at least in theory, enable organisations to achieve dramatic reductions in communication costs. We have not attempted to analyse the cost structures of business communication systems, and in particular mail and telephone systems, but we firmly believe that a large proportion of the total costs are fixed. (In the case of the public services this is true in the longer run only — because consumers are charged on a transaction basis.) This indicates that any claims for significant cost reduction, particularly in the case of internal mail and telephone systems, need to be carefully examined. Cost reductions are likely to be achieved only when new facilities are sufficiently widespread and sufficiently used to enable real reductions to be made in other facilities.

ELECTRONIC MAIL AND DATA PROCESSING

Up to now, the following two types of message traffic have been considered to be within the domain of data processing:

1. The distribution of periodic reports that have been prepared by batch processing systems. (Sales and accounting statistics are examples of this type of traffic.)

2. The collection of such information as timesheets and customers' orders.

Electronic mail may be particularly appropriate for handling the second of those two types of

transaction. As the structure of the message decreases and as the degree of human intervention required to process it increases, electronic mail will tend to become a more attractive solution than data processing. In chapter 7 (on page 40), we list several examples of the applications which could fall into this category.

Figure 3 Sources of mail

Copies of outgoing documents	First two sources combined	First three sources combined	First four sources combined
24% to own department's files 19% routed within department	43%		there is a number of a number of the second
24% to other headquarters' departments		67%	
14% to other locations within the company			81%
19% sent outside the company			

Incoming letters and memos	First two sources combined	First three sources combined	First four sources combined
3% from within same department			
14% from other headquarters' departments	17%	a birth anti-	
58% from other locations within the company		75%	
25% from outside the company			100%

(Source: IBM Systems Journal)

Figure 4 Life cycle costs of a document

	Percentage of total cost
Creation	28
Capture	14
Keying	13
Expansion	10
Distribution	19
Storage and retrieval	15
Disposal	1
	100

(Source: Exxon Corporation)

CHAPTER 3

USERS' EXPERIENCE AND ATTITUDES

We now turn from the theoretical opportunities that electronic mail promises to the reality of what has been achieved by the pioneer users of electronic mail. Much of the experience to date has been gained in the United States. There, a more competitive and more mature telecommunications market, a declining postal service, and the need to cope with several time zones in different parts of the country have encouraged the development of both equipment and services.

We also review the experience and the attitudes of organisations in Europe, where some significant pointers are already emerging.

EXPERIENCE IN THE UNITED STATES

Our research shows that most of the US companies that are successfully using electronic mail have the following common characteristics:

- They operate in many countries and, perhaps more important, in many time zones.
- They make substantial use of on-line computing, so that they already use many terminals in many different places.
- They did not carry out a formal cost-justification of the electronic mail system. (It was based on a mainframe and on a communication system that had been justified either for their other functions or for the purpose of a deliberate experiment.)

But some companies that do not have those common characteristics have also achieved success. Almost 40% of companies in the US already make some use of electronic mail, at least in a broad sense, and another 20% plan to introduce an electronic mail system within the next few years. Our research found, for example, a nationwide organisation of florists, a real estate company, and an administrative branch of the US Army, all of whom were obtaining benefits from electronic mail. However, in each of those cases the benefits typically took the form of more efficient communications, and the systems had been cost-justified on that basis, rather than on the basis of the more efficient use of staff members' time.

The electronic mail market in the US involves both common carriers (such as RCA, Tymnet and Telenet) and suppliers of in-house systems (such as Comet supplied by Computer Corporation of America). A list of the most significant electronic mail services is given in figure 5.

Electronic mail systems have developed in the US because of the need to manage corporations that are geographically dispersed. Experience shows, however, that the most striking advantages of electronic mail result more from increasing the efficiency of office staff, than from improving communications *per se*.

It is possible to identify several different approaches to providing electronic mail services, and

Figure 5 Some electronic mail services in the US

Vendor	Service	Notes
Public services		
Tymnet	On-Tyme	Text message system derived from a timesharing system.
Telenet	Hermes	Text message service.
RCA	Q-Fax	Facsimile link between twelve countries including con- version between incompatible formats.
Graphnet	Faxgram	Facsimile alternative to the telegram. Messages may be filed and delivered by the telephone, or by telex or by facsimile machine.
ISI	IS1	Text message service.
Tymnet	Augment	Text message service and systems for shared working on structured text documents.
ITT	Faxpak	Facsimile service supporting a variety of otherwise incompatible machines.
In-house systems	Salmady or share	
Computer Corporation of America	Comet	Sophisticated text message system, including filing and retrieval.
Wiltek	edmon - De to	Text message service based on an intelligent secretarial terminal with local storage.

these can be classified by the position of the intelligence that controls the system. The intelligence can be located in:

- A mainframe computer, which is also used for data processing applications.

- A bureau computer which is used to provide electronic mail facilities to several user organisations.
- An in-house computer which is dedicated to providing electronic mail facilities.
- The electronic mail terminals.
- A value-added network. (This is a variant of the bureau service.)

All these different approaches to electronic mail systems have already been pioneered in the United States, and we describe some examples below.

1. The mainframe approach

Many large companies have developed their electronic mail system either on their own mainframe or on a timesharing service.

Hewlett-Packard, for example, have for some years run a worldwide communications system called COMSYS. The system is based on Amdahl mainframes in Palo Alto, and the general structure of COMSYS is shown schematically in figure 6. With the exception of the link from Palo Alto to Geneva all links use dial-up lines. At pre-determined times of the day the COMSYS central site polls the regional computers to accept data that is waiting to be transmitted and to pass on data of its own. Similarly, the regional computers poll the local machines. Most of the data that is transferred is structured data (such as payroll, sales orders and routine commercial transactions), but 15% of the data consists of administrative messages.

Messages may be entered through any terminal that is connected to either a local or a regional computer, and they are delivered to the local computer that the addressee uses. Mail is delivered within one day, and there is no priority system. At present, all mail has to be routed through the mainframe for switching, but the enhancements that are now being developed will permit both the regional and the local computers to carry out the switching themselves.

Messages typically occupy fewer than 20 lines, but COMSYS also carries very long documents which are prepared using simple word processing features.

Hewlett-Packard say the main benefits of COMSYS are:

- The certainty that messages will be delivered overnight.
- The removal of time zone problems.
- The reduction of telex and TWX traffic.

They also believe that the rate of increase in voice traffic has been reduced during a period when the company has grown rapidly. Electronic mail has already become an integrated and highly valued part of corporate communications in Hewlett-Packard.

IBM's General Systems Division provides another example of an electronic mail system that is based on a mainframe computer. Every notification of a product change (and there are very many of these) has to be sent to 16,000 people worldwide. A recently-introduced system distributes these from an S/370 mainframe to a number of Series 1 minis, and thence to 6670 information distributors in branches. The system gives a much faster service than the postal system the division used previously.

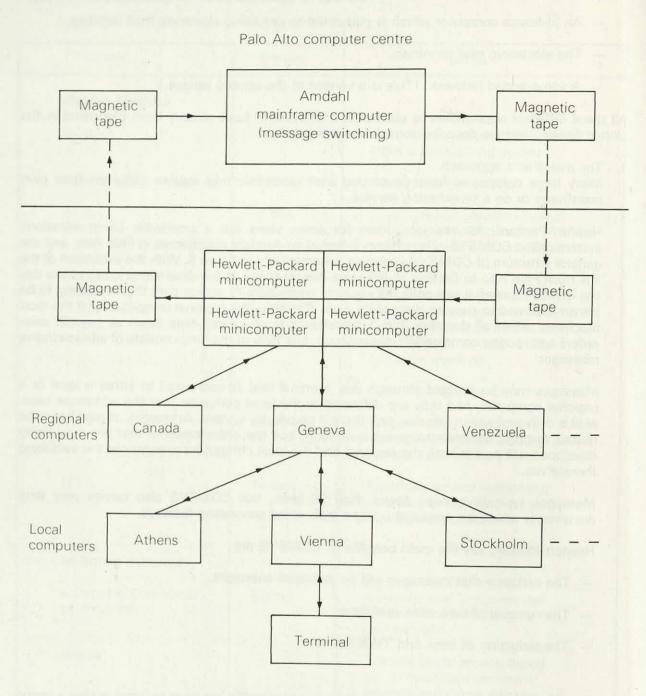


Figure 6 The Hewlett-Packard corporate communications system (COMSYS)

Mainframe manufacturers can be expected to provide electronic mail software to run on their computers. For example, from October 1980, IBM will offer a system of this kind both on 370 mainframes and 370-compatible mainframes. The system, which is called DISOSS, provides for documents to be filed, to be retrieved by name, author, keywords, etc., and then to be sent to other users. The initial version runs on 3730 workstations (which require SNA), and it limits the distribution of documents to workstations attached to a single main-

frame. Burroughs and Univac (and, no doubt, other mainframe vendors) will offer similar systems on their machines.

Systems based on mainframes can meet most of the requirements of an electronic mail system. However, an electronic mail system that is based on a mainframe operating system has the following limitations:

- It is difficult to give the system an active role in delivering mail, and this makes it unsuitable for handling urgent messages.
- It is not always possible to provide the integrity, the security and the reliability that a communications system needs.
- It is complicated to link mainframes that use different operating systems. A company that uses a variety of operating systems on various computers will need to effect such links before the users of all the different computers can use a corporate electronic mail service.
- Approach based on bureau services and dedicated computers Electronic mail systems based on dedicated computers can be run either on an in-house machine or on a bureau machine that provides electronic mail facilities to several different organisations.

An organisation that buys a dedicated system is likely to purchase it from an outside vendor who has expended considerable effort and time developing his product. Such a system is better equipped to overcome the limitations of integrity, security and reliability that are inherent in the mainframe approach.

Electronic mail systems that use dedicated processors also have some disadvantages. For example, if the electronic mail system and the data processing computer are supplied by different vendors, it will be difficult to link the message system with transaction processing and other kinds of computing. However, this problem may be alleviated by using either an intelligent terminal or an intelligent network.

Suppliers of electronic mail systems will probably add transaction processing capabilities to their systems in the near future. They will then be well placed to provide fully distributed systems because they will have already taken into account the requirements of reliability and addressing when designing the electronic mail system.

The most widely used dedicated processor system to date is Comet, provided by Computer Corporation of America (CCA). Comet is available on a bureau basis from CCA, but the software (which had been written for DEC PDP11 equipment) is also available as a package for installation in-house. CCA, in advocating electronic mail, stress improved productivity rather than cost displacement, although they believe that electronic mail can reduce telephone costs. They also believe that electronic mail may be a possible catalyst for the application of data processing to managerial problems.

Comet provides only for intra-company mail (CCA do not wish to register as a common carrier). Comet enables users to create messages that they can then distribute to others, and to read and manage their own mailbox files.

CCA's Comet bureau service was launched in March 1978, and it now has more than 50 user organisations. There are between 800 and 900 subscriber terminals connected by Telenet, Tymnet, dial-up and leased lines. CCA plan to provide telex and TWX interfaces during 1980.

Several different types of asynchronous terminals are used to connect to Comet, including the word processing systems of Vydec, DEC and Wang. The basic subscription charge is \$60 per month per subscriber, in addition to terminal rental charges and common carrier charges. One user calculates that the average cost per message is \$1.50.

Typically, an organisation that uses CCA's bureau service will start with between 10 and 20 terminals. As the organisation increases its use of the service, it will increase the number of its terminals to somewhere between 100 and 125, and at that stage will consider installing a privately-operated Comet system. The Comet software is available for purchase for \$40,000 plus a monthly maintenance charge of \$425.

Three Comet users' experiences are given below.

Example 1

CCA uses Comet internally, and each member of the 110 staff concerned has a mailbox. The internal use of Comet has grown rapidly, and all internal company announcements, except those where the company has a legal obligation to issue a printed notice, are now made via the system.

Administrative and social messages are also transmitted by Comet. These include announcements of job appointments, advertisements of internal jobs and announcements of social functions. This wide variety of use means that each employee has several reasons to check his mailbox regularly. However, there is a tendency to swamp the system with messages, and so a filtering process is necessary. CCA propose to do this by routeing all social messages via the personnel department, who will maintain a list of each employee's interests, and will ensure that only messages of potential interest are broadcast to that employee. However, CCA intend this to be a short-term solution only. In the longer term, the profiles should actually be held within Comet.

CCA employees log on to Comet on average twice a day, and each session lasts on average six minutes. The way in which different people use Comet's facilities vary considerably. For example, less than half the employees have ever used the retrieval command, and many never use the filing system.

Example 2

Digital Equipment Corporation (DEC) has performed a large pilot trial. DEC provided 750 staff of various grades (but predominantly managers) with Comet terminals. Their subsequent use of the system was then monitored by the use of questionnaires. DEC believes that Comet has produced a productivity improvement of at least 5%, and possibly as much as 15%. Telephone calls have been reduced by 10% to 15%, and although meetings are held as frequently as before they are now of shorter duration and more effective in their results. DEC see the following as the main advantages of the pilot system:

- Compared with the mail system, messages are delivered faster, iess formally and without the need for support staff.
- Compared with telephone communication, messages do not require synchronous connection. They may be stored, sent to several addresses, forwarded and so on, and they are concise.
- Comet messages may be dealt with very much more quickly than either telephone messages or written messages. One manager estimated that he could easily deal with between 30 and 50 messages per hour. Corresponding figures for telephone messages

might be only about six per hour. This factor therefore contributes directly to improving the productivity of the manager.

- Computer conferencing also arises directly out of exchanges of messages. The advantages of computer conferencing (which CCA use) is that each contribution can be based on more careful thought than usually is given during a telephone conversation or during a meeting.
- Intermediate steps in the distribution cycle are eliminated. This is partly because electronic mail messages do not require the same standard of spelling and grammar as typed memoranda (which although not logical, is a common feature of electronic mail messages).

DEC has now decided to standardise on their own, internally developed system. DEC now have 1,800 staff who use the electronic mail system as well as the internal telex system.

Example 3

A commercial real estate company uses Comet to distribute three lists of properties to ten offices at widely dispersed locations. Previously the lists were distributed by facsimile, and it took a whole day to prepare and transmit each day's lists. Because of the delay in distributing the daily lists the company had had to resort to a lottery to determine the position each office would occupy on the distribution list. Electronic mail gave immediate benefits. The lists, which previously were typed in the ordinary way, are now typed into Comet, and the lists are now sent simultaneously to the ten offices. The company has obtained a direct cost saving of approximately \$6,000 per annum.

3. Approach based on the use of intelligent terminals

Intelligent terminals, which are essentially communicating word processors, can be linked to create an electronic mail system. Two significant examples are the Lexar managerial work-station, which uses dial-up lines, and the Alto workstation developed at Xerox's Palo Alto research centre. Both systems are essentially text based, but the Alto terminal also permits diagrams to be built up on the screen and to be stored in a coded form.

The Lexar terminal has been developed by Citibank, and it is intended that it should be used by corporate executives. Both the executive and his secretary have a screen and a keyboard, and each of them can perform word processing, interactive computing, etc. On command, the system will dial a remote computer and complete the log-in procedure for that system.

The logic for the electronic mail system is provided within the local Lexar terminal. To deliver a message to another terminal it dials the remote user, checks that it is connected to the right workstation, and sends the document, which may be of any length.

An illuminated lamp indicates that a document has been received, and the executive or his secretary can then inspect it. The originator may mark a document "confidential", and if a document is so marked the recipient's secretary will not be able to read it, though she will know that it has arrived. Normally, the recipient of a document can edit it, although the sender can prevent this happening by marking the transmitted document "unchangeable".

Received documents can be read from a remote location by dialling in with a suitable terminal.

The local processor provides diary functions (it can, for example interrogate the diaries of other executives to find a mutually convenient meeting time) and a personal telephone directory, etc. Notable features include the A4 screen (which can be swivelled through 90° to view 132-column accounting reports) and the cluster of function keys.

Citibank now has 120 terminals installed. We expect that the Lexar system will become commercially available in the US within the next year.

An alternative approach using intelligent terminals is to link a number of word processing systems to form a local network. The Wang Inter-System Exchange (WISE) connects (by the use of a high-speed coaxial cable) up to four systems in a single building. This network permits the word processing systems (each of which may have up to 18 keystations) to share files and printers and also to exchange messages.

Intelligent typewriters, such as the IBM model 50 and QYX, are much cheaper than communicating word processors, but they can nevertheless offer many of the same functions. When the cost of intelligent typewriters falls towards that of the commonly used electric typewriters, businesses will acquire them in preference and in large numbers. This move will then greatly increase the number of potential electronic mail terminals in offices.

4. Approach based on network services

Tymnet Inc. operates throughout both the US and much of Europe a value-added network that provides access to timesharing bureaux and other computer-based services. Tymnet also offer a message service, which is called On-Tyme, via the network, although, for regulatory reasons, this service is not available in Europe.

On-Tyme is used mainly for sending very short administrative messages, although the service is used also for sending long messages. An originator of a brief message may well type it and send it himself, but he will probably use his secretary to prepare and send a lengthy message.

One organisation that uses On-Tyme estimates that well over 50% of its administrative messages are now sent via On-Tyme. But the percentage is substantially higher for those messages that are sent to the field offices around the world. Most messages that are not sent by On-Tyme are messages that are sent within the same building.

An example of a long message that travels by On-Tyme is a draft contract that has to be reviewed by several people around the world. Almost certainly this worldwide review would not be possible without the use of electronic mail.

EXPERIENCE IN EUROPE

We recently conducted a postal survey of large users of computers in Europe. We sent questionnaires to nearly 900 firms and about 30% of them responded. Our respondents came from eleven countries altogether, and they represented a wide variety of sizes and sectors of industry.

The clearest point that emerged from our survey was that European experience of using electronic mail is limited. Only 16% of those who responded to our questionnaire were using electronic mail in its broadest sense, and many of the systems concerned did not provide person-to-person communication.

The most advanced systems (based on dedicated computers) that are actually available in Europe are based on telex switching. They provide store-and-forward switching, a full character set, and short-term storage and addressing to individuals, rather than to machines. However, the companies concerned expect that these systems will be used mainly by specialist operators.

One example is Arbat's Contact-11, which may be accessed by either a telex machine, a VDU, a printing terminal or a communicating word processor. It may also be addressed via a public data network such as the British Post Office's PSS service.

Our survey showed that although their experience with electronic mail systems is limited, European companies have significant experience with the basic technologies. Figure 7 shows the proportions of respondent companies that we predict will be using the various technologies in 1981, and the proportionate increase between 1975 and 1981.

Figure 7 E	uropean	experience	of	modern	communications systems
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System	Percentage penetration (1981)	Percentage increase in penetration (1975 to 1981)	Percentage of users of the system who use it for electronic mail (1979)
R.	here and a start	and all the second	and distant of the state of the
Stand-alone word processor	67	380	4
Private voice or			Arridozguireno
data network	47	90	11
Analogue facsimile	41	165	14
Telex switch	29	160	11
Computer-based message system (CBMS)	24	270	24
Electronic PABX	20	760	4
Communicating word processor	17	5,250	24
Videotex	16		2
Digital facsimile	14	610	20
Optical character recognition (OCR)	13	200	10
Teletex	1	-	

Several sophisticated electronic communications systems are already in use in Europe including the following:

- The BBC External Service has an electronic news distribution service that provides infor-

mation to the news units of the various overseas broadcasting services. News items are received from correspondents, news agencies, etc., and are input by BBC staff. They are then retrieved by journalists using keyword searching techniques.

- A large newspaper group transmits copy and pictures between its London and its Manchester offices to support the assembling and the printing of its London, Northern and Scottish editions. When union negotiations are complete this system will be replaced by a high-definition facsimile system from which printing plates will be made directly.
- A major airline uses a mixture of facsimile, telex switching and private circuits to send urgent messages around the world.

Each of these systems was justified on the basis of the operational requirements of the business.

A more ambitious scheme is being implemented by Telefon AB LM Ericson. This company is replacing its internal telex system with 300 Rank Xerox communicating word processors that will provide electronic document distribution throughout Scandinavia.

ATTITUDES IN EUROPE

Our respondents generally had a positive attitude to both electronic mail and office automation. For example, 61% reported that they had either a task force or a steering committee that has responsibility for office automation. Only 16% of the companies claimed to be using electronic mail at present, but 23% said they intended to introduce it within two years, and a further 17% said they were planning to introduce it in more than two years' time.

Respondents, when asked about the expected advantages of electronic mail, stressed the potential it offered for improving business communications. They considered that potential cost savings were less important. The possible advantages, in order of priority were:

- Improved staff efficiency.
- Faster and more reliable communications.
- Improvements in document creation, filing, retrieval and distribution.
- Savings in office labour costs.
- Savings in postal and telecommunications costs (including the costs of internal mail).
- More comprehensive direct links with external organisations.

Although most respondents had no direct experience of electronic mail there was little difference in attitudes between those who had and those who had not used an electronic mail system.

Of those who had plans for an electronic mail system, 40% had decided on the design, and of those respondents:

- 73% were using a design they had created themselves.
- 16% were using a privately-supplied system.

- 11% were intending to use a publicly-supplied system such as teletex or videotex.

Two-thirds of the respondents who described their designs indicated that they had a fairly simple system.

A small number of respondents indicated that they use, or intend to use, a wide variety of technologies for electronic mail. For example, 20% of respondents named four or more kinds of technology (including private networks, electronic PABXs, facsimile, word processors, telex, teletex, OCR, videotex, and computer-based message systems) that either were, or would be, included in their electronic mail systems.

The respondents saw many difficulties that are delaying progress towards electronic mail, and their views are summarised in figure 8. It appears that respondents view an electronic mail system as "just another computer system", rather than as an important step towards office automation. This view seems to conflict with the views they had on what benefits are most significant.

Figure 8 Factors that inhibit the use of electronic mail

Very important factors

Inability to cost-justify an electronic mail system High development costs High cost of private networks Lack of communications standards PTT monopoly and attitudes

Important factors

User acceptance PTT delays in providing services and equipment Uncertainty about future public services

Significant factors

High cost of public services Privacy and security Limited public communication services User education and training Risks of being a pioneer

Unimportant factors

Social and industrial problems

It was notable, though perhaps predictable, that cost-justification should appear less of a problem to those who are using an electronic mail system (39% rated it important) than to respondents in general (57%). Experienced users were also less concerned about the lack of communications standards and the high cost of public services.

Respondents in the UK were particularly concerned about cost-justification, PTT delays, and the lack of standards. Those in Germany and Switzerland were largely unconcerned about those matters. Social and industrial problems were regarded as being important by respondents in France and Belgium, but again were regarded as being unimportant by respondents in Germany and Switzerland.

CHAPTER 4

REQUIREMENTS FOR ELECTRONIC MAIL SYSTEMS

In this chapter we discuss the features of an electronic mail system, based on the systems we described in chapter 3.

In discussing the requirements for electronic mail systems, we distinguish between those features that are essential and those that either are useful but not essential, or else are valuable in special circumstances. A company will often find it best to start with an electronic mail system that includes only the essential features, and then to enhance the facilities as the use of the system increases.

Most electronic mail systems that are currently in use or else are contemplated will be used by different kinds of people. Although the systems will benefit all users (just as the telephone does) different features will produce greater or lesser benefits to different people according to the type of work they do and the use they make of the systems.

We first discuss the requirements in relation to the three processes of creating, delivering, and receiving messages. We then consider the requirements of interfacing electronic mail with other systems, and finally we consider the management requirements of an electronic mail system.

CREATING MESSAGES

1. Preparing messages

An electronic mail system should permit messages to be prepared either on the electronic mail terminal or on a separate machine (such as a word processor). Ideally, managers should be able to prepare short messages, and secretaries should be able to input lengthy documents. Specialist staff should be able to create lengthy documents over a period of time, and then to send those documents to others for comment.

It may be possible to create some standard messages by filling in details on a blank form displayed on the screen. The Prestel response page (illustrated in figure 9) is an example of a pre-formatted message of this type. Pre-formatted messages are of greatest value when the standard form includes the rules for validating the data entered on it and also the standard routeing of the message. Thus, an expense claim will usually be sent to the author's manager, and then will either be returned to the individual or be sent to the accounts department for payment. Both the Comet system and the Xerox Alto system support facilities of this kind.

Electronic mail systems need to take account of the varying levels of users' skills. ITT's 6400 ADX telex switch, for example, permits experienced operators to input messages as they would with a PTT telex machine. Inexperienced operators can build up messages interactively.

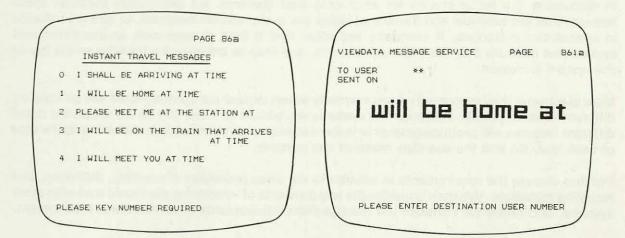
If long documents are to be carried on an electronic mail system, good word processing facilities will be required, either as part of the electronic mail system or in a word processor linked to the system. Most long documents have a logical structure (for example, chapters,

sections, paragraphs, sentences and words). The electronic mail system should be able to recognise this structure, and it should also be able to support progressive, top-down development of the document, partial retrieval and selective scanning.

2. Addressing messages

The electronic mail system should allow the sender to transmit messages to all those people with whom he has regular dealings. The initial use of an electronic mail system may well be restricted to intra-company traffic. However, our European survey and evidence from the USA both indicate that electronic mail will also be used for external communications.

Figure 9 Example of the use of a pre-formatted Prestel message



Note: The user responds to the message in the left-hand picture above by keying in the number 1. This causes the right-hand picture to be displayed. The user then keys in the destination user number (e.g. 12345) and then his own estimated time of arrival (e.g. 1450).

Telephone and telex communications are normally based on addressing a line, rather than addressing a particular extension or individual. However, most business communications are addressed to one (or more) individual people. The message sender needs to confirm that he is corresponding with the required person or machine. Telex provides an answer-back code to confirm that contact has been made with the correct machine, and telephone conversations typically begin with a conventional exchange through which both parties identify each other.

An electronic mail system should provide the facility to address an individual rather than a location, so that an addressee who has access to a suitable terminal can collect his mail when he is away from his normal place of work. Some systems may also need to provide the facility of addressing a location.

A directory or a directory enquiry facility will probably be needed to supplement the addressing mechanism. This may be provided either by means of a printed directory, or by a telephone service, or through the electronic mail system itself.

It should be possible to specify the addressee in a compact form, similar to the form

generally used on an internal memo. Desirably the system should assist in identifying misspelt names, and the way the Comet system does this is illustrated in figure 10.

Figure 10 Comet spelling aid

Command: COMPOSE Janet Oliver To: Janet Oliver is not a valid COMET name. Do you wish to see the 2 similar names? (Y or N): Y Fred Oliver Jane Oliver Corrected name: Jane Oliver

Note: Italics indicates text typed by user.

The system should allow messages to be addressed to several people, and it should provide for lists of addressees to be defined and used. It should also make it possible to send messages to people who are not active users of the electronic mail system.

It may be desirable to address messages to a process, such as a project control system. Used in conjunction with pre-formatted forms this facility will permit the electronic mail system to be interfaced with teleprocessing systems.

3. Convenience of use

The electronic mail terminal must be easy to use. It should not only be well designed in itself, but it should fit naturally into the existing habits and practices of the staff. It follows that the most appropriate device differs in different cases.

Many professional staff and specialist staff are familiar with computer terminals and may be willing to make extensive use of them. Where this is so, it will be appropriate to make the electronic mail system available to them through their existing terminals. Many secretaries are now used to working with word processors and intelligent typewriters, and these devices should therefore form the normal method in which secretaries use an electronic mail system.

It should be possible to use the electronic mail system at any time and without giving prior notice. It should not be necessary to wait until the addressee either is in his office or takes some action to receive a message. Ideally, the terminal should be located no further away from the user than his telephone is. In practice, the high cost of most of the possible types of terminal makes it impractical to meet this requirement, but it is important that every user should be able to have easy access to a terminal. Also, a terminal should not be so heavily utilised by other users that a particular user cannot usually have access to it when he wants to.

4. Identification of the message originator

With a telephone call, the caller's identity is known by his voice. On a letter or a memo, the identity of the writer is usually indicated by his typed name and/or his signature. Electronic mail systems should also provide some trustworthy form of identification of the sender, even though this facility will be necessary for only a minority of business communications. In a facsimile system, authentication can be given by the originator's signature, and in a system that is based on coded text, passwords and ciphers may be used. In the future, machine-readable credit cards and signature recognition devices will be used in those applications where a high degree of confidence is necessary (for example, in some financial transactions).

DELIVERING MESSAGES

1. Control of delivery

When a person uses the telephone, he knows or he can establish who he is speaking to, and so he can ensure that he conveys his message to the correct person. This does not apply with mail, and so the postal authorities have developed special services (such as registered letters and recorded delivery) so that, when necessary, proof of delivery can be established. Electronic mail systems will need equivalent features, such as the automatic notification of delivery and delivery enquiry facilities.

There is sometimes also a need for electronic mail systems to ensure that a message will be delivered at or after a specified time.

2. Reliability of delivery

Reliability is especially important in an electronic mail system. Such a system will be an alternative to telex and the telephone, and so it is with these systems, rather than with timesharing and transaction processing computers that electronic mail will, and should, be compared.

Faults should, of course, be kept to a minimum. When they do occur they should not result in the delivery of corrupt messages without, at least, some accompanying warning being given. A temporary loss of service is preferable to a system that accepts messages but fails to deliver them. Frequently, it is essential that, from the moment a message is accepted, the electronic mail system should take absolute responsibility for delivering the message. For the purposes of recovery and integrity the electronic mail should be treated as a valuable transaction.

3. Active and passive systems

A passive system is one in which mail is held in the system in a mailbox until the addressee is ready to inspect it. Systems based on timesharing computers are usually passive. Advantages of the passive approach include the following:

- The recipient is not interrupted to take the messages.
- The message is not considered to be delivered merely because it has been printed out somewhere; the addressee must actively seek out the message.
- The recipient can inspect his mailbox by using any electronic mail terminal.

However, the passive approach has the following disadvantages:

- Urgent deliveries cannot be made.
- Mail may be overlooked especially by an infrequent user of the system.
- Mail can be sent only to committed users of the system.

We believe that, in some circumstances, an electronic mail system needs to be active and to take positive action to deliver messages. Examples are:

- Urgent mail should be delivered to the addressee or, if his location is unknown, to someone whose job it is to find him. This person may be his secretary, or a messenger or a colleague.
- Messages for people who do not use the system should be printed either in a mailroom or at a place near to their secretaries, so that they can be delivered by hand. (If the message is confidential, all that needs to be delivered by hand is a notification that the message has arrived.)
- The addressee should be informed if mail is uncollected for an excessive period.

In the On-Tyme electronic mail system, for example, each user chooses one of the following three levels of service:

- 1. Messages are held passively.
- 2. "Rush" messages are delivered by dialout, but On-Tyme is otherwise passive.

3. "Rush" messages are delivered by dialout, and other messages are delivered by dialout at pre-selected times.

4. Priority of delivery

Although speed of delivery is a valuable feature of electronic mail systems, not all messages are urgent. Consequently, multiple priority levels are desirable, so as to avoid the unnecessary interruption of the recipient's work, and so as to make better use of the switching system. Existing electronic mail systems often provide only one level of priority, but at least the following three levels are useful:

- Urgent.
- Standard.
- Overnight.

To ensure that an urgent message is actually delivered, the system will need to provide "active" delivery facilities.

For non-urgent messages, a delivery time of up to several hours will generally be appropriate, and overnight delivery will permit spare transmission capacity to be used outside normal hours. Where the system provider charges users for the service, there should be a premium for urgent service and a reduction for overnight service.

In systems that have multiple priority levels and several means of delivery, the originator of a message may need to enquire of the system how long it will take to deliver a message to a particular person at a stated level of priority.

RECEIVING MESSAGES

The convenience features discussed above apply also to the recipient. We now discuss further features which are important to the recipient.

1. Scanning messages

Several messages may be waiting for a user, and if the messages have already been printed out the user can scan through them to find out which of them are important and urgent. When the messages are held in an electronic mailbox, the user needs to have the means to inspect a list of the messages that have been received and are waiting. The list should show the originator, the time and the date of despatch, the priority, and the subject. The recipient should then be able to choose the sequence in which he will deal with them.

2. Disposing of messages

Some messages need to be read and noted, and some require further action. Some may even be discarded unread. With many messages, the appropriate response will be to send a message in reply. The following functions are needed to deal with received messages:

- File. With this function, the message is stored until further notice. Because a message
 may deal with more than one subject, it should be possible to store copies in several files
 or with several keywords.
- Discard. With this function, the message is deleted. Because people make errors, the message should not actually be deleted immediately, but it should be removed from the user's mailbox.
- Answer. With this function, a message is sent to the originator with copies to those who
 received copies of the original message.
- Forward. With this function, the message is sent on to someone else with an appropriate annotation such as, "Please deal" or "Tell him no".

The use of the Comet "forward" command is shown in figure 11.

The ability to file a message and subsequently to retrieve it, implies that the system provides for the long-term storage of messages. In general, filed messages should be stored until they are discarded, though it may be desirable to remind users periodically of the amount of storage the filed messages are occupying.

This storage, which we call here a "text archive", may contain reference documents as well as messages. The ability to retrieve messages and documents by title, or keywords, or author or date, is essential if the system is to be used effectively.

3. Privacy

Some messages and documents are commercially confidential, or even are restricted by considerations of national security. Most European countries already have, or else are developing, data protection legislation to restrict the storage and the disclosure of "personal information" (these laws are discussed in chapter 6). A privacy system will be needed to ensure that such messages are read only by the intended recipient. Such a system may require the ciphering of the text in transit, and it will certainly require that the message is not printed either in a mailroom or anywhere else where it can be seen by people who do not have the proper authority.

Where active delivery applies, only a notification of the existence of the message should be delivered actively.

INTERFACING WITH OTHER SYSTEMS

Few organisations will be able to justify both the investment and the effort that are involved in developing a free-standing electronic mail system. Whenever possible, the system must use existing terminals and existing communications lines.

Figure 11 Example of the use of the Comet "forward" command

On 12th January Bill Smith receives the following message from Paul Marchetti, and forwards it to Rebecca Jordan with a covering note of his own:

```
COMMAND: READ CCA 11-JAN-78 18:22:03 640 1
TO:
         BILL SMITH
         PAUL MARCHETTI
FROM:
          WED 11-JAN-78 18:22:03 EST
DATE:
          DEPARTMENT PARTY
SUBJECT:
I LIKE THE IDEA OF A PARTY. I SUGGEST A MOZART'S BIRTHDAY
PARTY ON JANUARY 27. I'LL EVEN OFFER MY HOUSE.
COMMAND: FORWARD
      REBECCA JORDAN
TO:
CC:
SUBJECT: YOUR VACATION
TEXT:
WHEN ARE YOU LEAVING? WILL YOU BE AROUND IF WE HAVE THE PARTY
THEN?
 MESSAGE ENCLOSED.
 COMMAND:
           SEND
           12-JAN-78 12:15:03 420 1
 CCA
 MESSAGE SENT.
```

When Rebecca Jordan inspects her mail this is what she sees:

```
12-JAN-78 09:10:52 420 1
CCA
TO: REBECCA JORDAN
FROM: BILL SMITH
DATE: THU 12-JAN-78 09:10:52 EST
SUBJECT: YOUR VACATION
_____
WHEN ARE YOU LEAVING? WILL YOU BE AROUND IF WE HAVE THE PARTY
THEN?
 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
FORWARDED MESSAGE:
CCA 11-JAN-78 18:22:03 640 1
TO:
          BILL SMITH
          PAUL MARCHETTI
FROM:
          WED 11-JAN-78 18:22:03 EST
DATE:
SUBJECT: DEPARTMENT PARTY
 I LIKE THE IDEA OF A PARTY. I SUGGEST A MOZART'S BIRTHDAY PARTY ON
 JANUARY 27. I'LL EVEN OFFER MY HOUSE.
```

Also, communication is only one of several functions that office staff perform. These staff will require support in their other functions as well.

For these reasons, an electronic mail system should desirably interface both with other communications systems and with existing data processing systems.

1. Communications systems

In order to communicate with those people who do not use the electronic mail system (who may be both within and outside the organisation), electronic mail systems should interface with at least one public communications system. The public mail is the most valuable choice, because of its universality. But it may also be useful to connect an electronic mail system either to telex or to value-added or videotex networks. Wherever possible, the system should be able to decide for itself on the particular medium that it will use in delivering a particular message. But no matter which method of delivery is used, a single addressing format should be used.

The electronic mail system should accept documents from existing word processors, but it is not practical to construct an electronic mail system that can be interfaced with all types of word processors. The management services department will be wise to insist (if it can) that all communicating word processors that are installed in the organisation support a well-defined standard protocol. The protocol must be fully specified and it must include all special characters and procedures.

If a wide range of communicating word processors must be supported, the help of a specialist company should be sought. The US-based providers of value-added networks, for instance, have interfaced a wide variety of machines to their systems.

2. Data processing systems

The terminals that an organisation uses with an electronic mail system will probably not be used solely for the purposes of electronic mail.

An organisation's electronic mail system will be a convenient vehicle for distributing the output from some of the batch and background jobs that are run on the organisation's computers. If the electronic mail system is to perform this function, the output programs on the organisation's computers will be required to place documents in the electronic mail system. The channel that this provides will not only be able to handle routine output from the computers. Provided that a suitable priority system is available it will also be able to convey urgent messages associated with operational failures and anomalies.

It may also be convenient to use the electronic mail system to send data to the computer. This will require that the applications concerned are given addresses within the electronic mail system, and that an interface is developed between the applications and the electronic mail system. The electronic mail system therefore becomes an instrument for achieving convergence between office systems and data processing systems.

MANAGEMENT REQUIREMENTS

Like any other system, an electronic mail system will need to be supervised and developed. It will be easier to perform these tasks if the system is able to provide information about its own status and performance, such as is discussed below.

1. Audit trail

Like all forms of written communication, electronic mail has the advantage that it can provide a permanent copy. However, electronic records can be changed without leaving

any trace of the information that was changed. Consequently, if an electronic mail system is to be required to provide an audit trail, the system should be designed in such a way as to make it impossible to change the text of a message after it has been accepted. Alternatively, the system should provide that all changes are logged automatically.

2. Tuning

In a system that is of any significant size, performance must be monitored so that the system can be adapted to meet changing requirements. Also, to enable future enhancements to be planned on a rational basis it will be necessary to monitor the ways in which the system is used. It will often be useful if the system enables a random sample of messages to be extracted for intensive study of the way in which the system is currently being used.

3. System extension

It should be possible to extend the system to new locations and also to add new types of devices without making extensive engineering changes. When first installed an electronic mail system is likely to be limited in its functions, and so there must be clear ways of adding new types of messages and new functions. For example, two extensions that might be needed are the inclusion of image and voice messages and the linking of a message system with a document archive that is held on a mainframe computer.

The design of the initial system should anticipate possible extensions in a number of areas including:

- Character sets.
- Coding systems used within a message (e.g. ASCII, Group 3 facsimile).
- User commands.
- Terminal types to be supported.

CHAPTER 5

TRENDS IN TECHNOLOGIES AND PRODUCTS

The systems and the requirements discussed in chapters 3 and 4 are concerned mainly with text-based messages. We have concentrated in this report on text-based electronic mail because we believe that companies are least familiar with this type of system and will choose such a system to experiment with when they first decide to introduce an electronic mail system.

The wider definition of electronic mail includes not only text-based message systems but also systems for voice messages and systems for distributing messages based on images. Facsimile transmission is a well-established technology and many companies have been using this form of electronic mail for many years.

Foundation Report No. 4: identified the basic technologies for processing text, voice and images. In this chapter we consider the products and the technologies for handling each of these three types of messages as they relate to both present and future electronic mail systems. We then consider the longer-term prospects for integrated electronic mail systems that will encompass all three types of messages.

TEXT-BASED ELECTRONIC MAIL

The systems and services discussed in chapter 3 are all privately operated, and they fall into the two categories of bureau systems and in-house systems. A limited form of publicly available electronic mail has existed for many years in the telegraph and the telex services that the PTTs operate. Private telex systems are also well established in some companies. We next discuss the PTTs' plans for text-based electronic mail systems, and we then consider the likely developments of text-based electronic mail terminals and the impact they are likely to have both on private and public electronic mail services.

1. The PTTs' services

Almost every PTT loses money on its telegraph service, and telegrams form a declining part of their business. By contrast, telex is an expanding service. The main advantage of telex lies in the existence, worldwide, of about a million telex machines (about half of which are in Europe).

Although telex is both cheap and fast, it lacks a number of the requirements for an electronic mail system that we identified in chapter 4. For example, some of its deficiencies are:

- There is a limited character set available for use.
- There is no store-and-forward capability.
- Standard machines are noisy and expensive, and they are not usually located close to both the originators and the recipients of messages. Also, trained operators are required if the machines are to be used efficiently.
- A message has to be addressed to a machine, rather than to an individual.

The PTTs are well aware of the business opportunities that the potential market for textbased electronic mail offers them, and they are also aware of the deficiencies of telex as an electronic mail service. They are therefore defining a successor service, which will be called teletex. The initial teletex standard is expected to be ratified at the plenary session of the CCITT that will be held in April 1980.

Teletex will be based on digital transmission at 2400 bit/s (more than 30 times faster than telex), and will use a full character set. It will provide full interworking between terminals in all participating countries and also with existing telex machines. Teletex terminals will, in effect, be communicating word processors that are able simultaneously to carry out local operations and receive communications. The terminals will be capable of producing documents that are at least of A4 size.

The network used for teletex may, at the discretion of the particular PTT, be the telex network, the telephone network or a dedicated data network. Initially, the teletex network will provide the identification of the calling and the called terminals, the time stamping of calls, encryption, remote editing and information retrieval. The CCITT will encourage the PTTs to add additional facilities to their teletex service at an early stage, including:

- A store-and-forward capability.
- Abbreviated addresses.
- Multiple addresses.
- Line identification.
- An indication of the charge (by call).

The Scandinavian PTTs will introduce the first teletex services in 1981 and other European PTTs will introduce their teletex services later. Marketing strategies will vary between countries. The Swedish PTT, for example, intends to provide a powerful word processing terminal with teletex connection, and ultimately to supersede its existing telex network. The German Bundespost will move more slowly, and it sees teletex as essentially a communications service.

Teletex will be most appropriate to small businesses, especially if it is effectively linked with telex. Large companies will often prefer to buy or to develop systems that more precisely meet their needs, but these systems will need to be connected with teletex for intercompany communication.

Some European PTTs are developing, or have plans to develop, public service videotex systems. The emphasis of these systems initially will be on information retrieval, although message services are possible within the videotex framework. In Britain, the Prestel public service has the response frame facility, by which users may send to information providers, either orders or requests for further information. This facility could be a significant method of introducing the general public to the concepts of electronic mail.

The Prestel response frame is limited by the use of a numeric keypad. However, the British Post Office has plans to include a full user-to-user message facility in Prestel, using alphanumeric keyboards, although this facility is not likely to be available before 1982. The British Post Office also has plans to connect Prestel users to the telex network, but it has not yet made a definite commitment to do this.

The videotex market trial in France, and the Bildschirmtext trial in Germany will both provide message facilities.

2. Developments in terminals

Until recently, almost all word processors were used at a single site (usually a typing pool) and each word processor was generally used to replace several typewriters. Some currently available word processors have a communications feature, and the proportion of these that has been sold over the past two years has increased dramatically. Within the next two years every new word processor will probably have a communications capability.

The great advantage that communicating word processors offer electronic mail systems is improved quality of the basic word processing system. However, they are currently too expensive to be installed in large numbers, and for the immediate future they will generally be used in places like typing pools.

The prices of communicating word processors are expected to fall slowly over the next few years, and the lower prices will make it easier for companies to justify installing word processors in several place within the organisation. In addition, two developments make the communicating word processor important as a possible base for electronic mail systems:

- The emergence of multifunction terminals.

The introduction of cheap, intelligent typewriters.

If the cost of a machine has to be justified by its use for a single function alone then it will usually be possible to justify it only if several people use it for different periods of time at different times during each day. (Very cheap machines, like telephones and calculators, are, of course, an exception to this.) If a terminal can give a single worker access to a number of different facilities that he needs to use frequently, then it will often be possible to justify providing each worker with his own terminal. It will then be convenient to use that terminal also for electronic mail. Communicating word processors are now evolving into multifunction terminals, and if they are backed by appropriate applications systems they will be able to provide word processing, transaction processing and timesharing computing, etc. (The impact of cheap intelligent typewriters was discussed in chapter 3.).

The text archive within an electronic mail system will have facilities for storing and retrieving data, and it will be an important component of future systems. The development of large, cheap memories (especially those based on videodiscs) could allow many terminals to have local stores of hundreds or even thousands of documents.

VOICE-BASED ELECTRONIC MAIL

The telephone is universally used to send and receive voice messages, but it has the great disadvantage that both the caller and the person called need to converse simultaneously with each other. To overcome this disadvantage much attention has been given to enhancing the use of the telephone by providing store-and-forward facilities for voice messages (sometimes called voicegrams). The requirements for a voice-based electronic mail system are the same as those already identified in chapter 4.

Any electronic mail system that is used for handling voice messages will certainly need to use telephones as terminals. Telephone answering machines already provide a limited form of voice message system, and many users already have extensive experience of using these machines. However, people who have to leave messages on a telephone answering machine generally consider that such a machine has two disadvantages so far as the caller is concerned:

 The caller who is expecting to conduct a conversation, finds instead that he has to formulate his ideas quickly and convey them in a logical sequence in the short time that is available to him. Once he has recorded his message, the caller has no way of revising it. He can only modify it by re-recording all or part of it.

The Delphi Communications Inc. telephone answering service provides one way of overcoming these disadvantages. Calls to an unattended telephone are re-directed to a human operator, who has responsibility for more than 100 business lines. As the call is answered, the Delphi system uses a VDU to tell the operator the name of the person who is being called, and it displays a list of prompts, so that the operator can help the caller to record a clear and logical message. The person called retrieves his stored messages by dialling into the system, using spoken commands without any operator intervention. The Delphi equipment will be available in Europe through Nexos Office Systems Ltd., the government-backed UK office systems company.

There are obvious advantages to using voice messages as the basis for an electronic mail system, but there are also the following obvious disadvantages:

- A message cannot be scanned for significant words and phrases.
- The speed of playback is fixed.
- The cost of storing digitised voice information is up to 1000 times higher than the cost of storing the equivalent text.

The technology is now available to build a public voice message system. The Bell Corporation in the US is actively developing such a system, but, so far as we know, no European PTT is planning a similar system.

In the long term we expect voice message systems to become an integrated part of office systems. Voice messages (and audio-visual messages) will be held in information databases, and it will also be possible to add voice annotation to stored text.

IMAGE-BASED ELECTRONIC MAIL

The only technology that is currently available for transmitting images is facsimile, which has now been available for eighty years. Newspapers regularly pass photographs over their own dedicated picture circuits, and a public service — Phototelegram — is available in cities in many parts of the world.

Modern office facsimile machines that provide a lower quality than the specialised machines used by the press, have been available for fifteen years. They are usually divided into the following three groups:

Group 1 machines

These are first generation machines that use analogue transmission to send an A4 page in four or six minutes. The quality is poor, the chemicals used for development often smell, and machines from different suppliers were originally incompatible (though a CCITT standard does exist).

Group 2 machines

These are more recent analogue machines that transmit a page in two or three minutes. These machines are more convenient to use than the machines in Group 1, and they are compatible because they were developed to a CCITT standard. They are more expensive than Group 1 machines and the quality of reproduction is not as good as with an office copier.

Group 3 machines

These are digital machines that are capable of transmitting one page in one minute or less. The CCITT standard has not yet been ratified and so compatibility is poor, although it is likely to improve. Many digital machines are capable of transmitting a page in less than a minute (typically in 20 or 35 seconds), using a 9600 bit/s line.

CCITT is considering a standard for Group 4 digital machines to be connected to a digital network. In addition, several manufacturers are developing very fast machines operating over wideband circuits. These very fast machines include one being developed for Satellite Business Systems by AM International (formerly Addressograph-Multigraph). This machine will transmit one page per second over a 1.5M bit/s line, and it includes two priority levels, multiple addressing, and the temporary storage of documents. It will thus be able to meet many of the requirements for an electronic mail system that were identified in the previous chapter. Unfortunately, the expected price (£40,000) will restrict its use to the mailrooms of major corporate centres.

At present, the price of Group 3 machines restricts them to providing links between mailrooms in separate buildings and between mailrooms in separate companies.

In the near future, the price of facsimile transceivers is expected to fall. The French Post Office has placed orders for a large number of Group 2 domestic facsimile transceivers for its Transfax service that will sell for £210 each. The PTT estimates that it will sell 200,000 units a year for at least five years.

Facsimile networks can be established in which faster machines are used for trunk routes and cheaper machines are used for local connections. In the US, facsimile services that permit incompatible machines to communicate with one another are provided by RCA (Q-Fax), ITT (Faxpak) and Graphnet. These services provide store-and-forward facilities, with buffer storage being provided either electronically or on paper. Such value-added network services are not, as yet, available in Europe, and without the economies of dedicated facsimile transmission networks Europe remains an expensive environment for communicating information by facsimile methods.

Facsimile transmission has the following advantages:

- Diagrams, pictures and letterheads may be transmitted.
- Handwriting may be transmitted.
- The direct relationship between the transmitted documents and the received documents encourages confidence in the accuracy of the received message.

The disadvantages of facsimile transmission include:

- A flexible facsimile network is expensive, and yet it fails to meet many of the requirements identified in the previous chapter. Thus, without character recognition (which is expensive) there can be no flexibility in addressing, and no support for filing or retrieval.
- Transmission costs are up to 100 times higher than for coded text. However, if a private data transmission circuit is idle during the night, up to 400 pages may be sent during the night hours at 9600 bit/s with no additional transmission costs.

Experimental facsimile links between European postal authorities and the US postal service are

now being developed as an alternative to the physical carriage of mail. Inter-European and national facsimile mail services may also be offered by the PTTs at a later date.

The telecommunications authorities will also offer facsimile services. These services will involve the use of rented equipment placed on customers' premises. These services are already available in the US and have been promised by several European PTTs.

THE INTEGRATION OF VOICE, IMAGE AND TEXT

The electronic mail systems that organisations install initially will use a single form of document - voice, text or image. Most organisations will choose to start with text, but some will extend this to also include diagrams in a coded form. In the longer term, organisations will wish to integrate some or all of the three forms for such purposes as:

- Voice annotation of a typed document.
- Pictures to illustrate a spoken or a written argument.
- Diagrams and text to assist a telephone call.

The integration of text-based systems and the telephone is already evident in the development of modern PABXs. A computerised PABX can provide a base for a text-oriented electronic mail system. One example is the CBX2000 offered by Rolm in the US.

Any computer terminal that has a standard interface can share a telephone extension on the CBX2000. No modem is required, and both the telephone and the terminal can be active at the same time. Electronic mail is addressed to an individual and is stored on a spare processor until the addressee checks his mailbox. Plessey have the marketing rights for the CBX2000 in Europe and, though they have announced that they will not offer the Rolm electronic mail system, it seems probable that they will offer some form of electronic mail based on the CBX2000. Also, ITT offer the System 710 communications processor which can be attached to their PABXs. The 710 provides message switching and incoming and outgoing telex interfaces, and it also links PABX-connected terminals to other computers.

The telephone system is an attractive base for an electronic mail system, if only because the wiring for the telephone has to be there anyway. Thus, the telephone points the way towards an integration of speech and text processing that offers interesting prospects for future office systems.

If an organisation's first attempt at an electronic mail system is text-based then message-level integration with voice and facsimile can be added later, provided that:

- Suitable terminals are available.
- Adequate storage is available.
- The basic protocols will accommodate the very large message sizes that are required for transmitting voice and images.

If an organisation's first experimental electronic mail system is able to recognise that documents have an internal logical structure, then "paragraphs" transmitted in different media may be mixed in a single document to provide illustration, annotation, etc.

SUMMARY

We expect to see the development of the following three main kinds of electronic mail terminal:

- The enhanced telephone The voice system will be enhanced by a display screen and a keyboard and, possibly, by both a handwriting input unit and a facsimile unit.
- The secretarial workstation This will be a word processor extended to provide integrated facsimile and access to data processing computers.
- 3. The specialist workstation

This will take the form of a system with several screens, of which at least one will provide facsimile display and colour graphics. The system will process programs to support the work of the specialist staff members and it will also provide access both to remote computers and databases.

However, for the present, facsimile transmission is expensive and difficult to integrate with other systems, and voice message systems are still immature.

Most business communications do not require pictures and diagrams, and, for this reason, most organisations will choose to experiment with text-based electronic mail systems.

CHAPTER 6

REGULATORY ISSUES

Two types of regulation influence the decisions that organisations are able to make about introducing and running electronic mail services.

First, there is the question of the monopoly that the PTTs have, and the extent to which that monopoly constrains the scope of electronic mail systems. (In chapter 5, we discussed the associated issue of present and future PTT services in this field.) Second, there is the question of data protection laws. We discuss both of these factors below.

THE PTT MONOPOLIES

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Each European country has its own distinct, legislative approach to communications. In each country a large part of the telecommunications market is exclusively reserved for the PTT. In addition, each PTT has the power to license users to run equipment and to offer services in breach of the monopoly. The extent to which the various PTTs do this varies considerably.

The PTTs have two main rights:

1. They have control over the type of apparatus that may be attached to public transmission facilities, and thus over the way in which any apparatus may be used.

2. They have a monopoly on "third party" service.

"Third party" service is the term that is used to describe the service that a company provides when it carries messages from a second company to a third. If one of the three companies is a subsidiary of either of the other two, then the communication is second party, rather than third party, and second party service is generally freely permitted. The PTT monopoly does not usually restrict the carriage of the following types of messages:

1. Between the several sites of a company, provided that any lines that have to cross the property of any other company are leased from the PTT.

2. Between any two companies (but subject to the same proviso as in 1. above).

3. Between the companies in a group (i.e. companies under a single ownership), where the messages are carried either by one of the group companies or by a subsidiary that has been established specially for the purpose.

The PTTs certainly prefer to handle all third party traffic themselves, but they are prepared to allow certain exceptions, such as the following:

 Certain companies have obtained permission to run their own microwave networks. It is doubtful whether any PTT would give a company permission to establish a new network, but the British Post Office has recently allowed a large company to extend its network.

- Groups of companies in the same business may be allowed to form a company (known as an affinity group) to operate a common communications system. Prominent examples of such systems are the airlines' SITA network and the banks' SWIFT system.
- Where transmission is not the major function of the system, then a PTT will allow several companies to connect to systems run by another company, and timesharing bureaux are an obvious example. Where a timesharing bureau has a message system that may, in practice, be used between unrelated users, the PTTs in most European countries will turn a blind eye to this usage. The PTTs are, however, undoubtedly concerned about this practice. Their concern is illustrated by the fact that they allow European companies to use the US Tymnet network to retrieve information but they do not allow them to use Tymnet's On-Tyme message service.

In recent years, the PTTs have also become concerned about the development of affinity group networks. The Bundespost (the West German PTT) has introduced a volume-related tariff for the leased lines they use, and the French PTT has threatened to increase its leased line tariffs to force users onto its Transpac packet-switching network. The British Post Office, by contrast, has shown no signs of introducing discriminatory pricing.

As the PTTs' public data networks come into service the PTTs in several European countries will probably apply further pressure to encourage users of private data communications facilities to use public networks.

The legal situation is complex in each country, and further complexities sometimes arise if traffic is to travel across national borders. The rules are also subject to the changing policies of the PTTs, and this atmosphere of change makes it difficult to generalise about PTT regulations. Any organisation that is seeking to develop a large or an innovative communications system will be well advised to first consult its PTT.

THE DATA PROTECTION LAWS

Electronic mail is affected by a second body of law — the legislation on data protection (or privacy). This legislation varies greatly between countries. There is no legislation in either the UK or Italy, whereas there are rather stringent laws in Sweden and Norway. Most of those countries that do not currently have legislation are now preparing it.

The scope of the actual and the prospective legislation also varies between countries. In France, public and private sectors are treated in the same way, but in Denmark different laws apply to the two sectors. The German law protects individual people only, but in Austria legal entities, such as companies, are also protected.

In most actual and proposed laws, the activities of collecting and storing personal information are controlled, and an electronic mail system will probably be controlled if it has an associated text archive. Where an organisation has such an archive, it may be required to maintain a log of accesses to the data. This requirement applies, for example in Belgium.

Most countries limit the transfer of personal data across their national boundaries. The Swedish law, for instance, forbids the transferring of personal information to any country (the UK, for example) that has a less stringent privacy law.

It is clear that electronic mail systems must be developed with the necessary features to meet legal requirements (such as, for example, the requirement to provide audit trails). It is also likely that the use of interconnected data transmission systems for international electronic mail will need to take account of transborder data flow regulations.

CHAPTER 7

GETTING ELECTRONIC MAIL SERVICES STARTED

It is evident that there is a need for additional communication services to supplement the telephone and the post and to replace telex eventually. In the longer term, the type of electronic mail system described in this report will form part of a service that integrates both private and public facilities. In this report we are primarily concerned with what use organisations can make of electronic mail in the near to medium term.

In this chapter we examine the main issues that organisations face in seeking to introduce electronic mail on an experimental basis. We examine three particular issues which are, in our view, of prime importance to those who have responsibility for corporate information systems. These three issues cover the question of the organisational responsibility for electronic mail, the selection of pilot applications and the provision of an electronic mail service.

Obviously there are other environmental issues which may prove to be of importance – and, in some organisations, industrial relations may well be one of these – but we believe that those other issues are best tackled according to individual requirements and circumstances.

THE ORGANISATIONAL RESPONSIBILITY FOR ELECTRONIC MAIL

Many large organisations are gradually moving towards a situation in which data processing, telecommunications and office systems are managed (or at least are planned) in a coordinated manner. Those organisations that have a unified management structure covering these fields are not too likely to find that the introduction of electronic mail raises any conflicts of responsibility that are difficult to resolve.

It will be possible to introduce electronic mail in the near future (at least in experimental form), and we explained earlier in the report that it is at the heart of office automation, and also that its application spans both office communication and also some aspects of data processing. Electronic mail will have a pervasive effect on the business of the organisation, and whoever assumes responsibility for introducing it is likely to assume a central role in the drive for office automation.

In those organisations where data processing, telecommunications and office systems are managed separately the introduction of electronic mail can be expected to create some degree of conflict between the various parties involved.

SELECTING PILOT APPLICATIONS

The potential applications for electronic mail fall into two broad categories:

- Applications based on data processing.
- Additional office communications applications.

We discuss these two categories of application below, but we mainly concentrate on the latter category, since this represents a completely new area of system opportunity.

Applications based on data processing

Many data processing applications are concerned with the collection and the distribution of information. Examples of those applications include:

- The distribution of monthly accounts and sales information prepared by a batch data processing system.
- The collection of timesheet data from dispersed offices.
- The distribution of product and marketing information, including specifications and price changes.
- An "active" project control system based on the use of critical path analysis techniques.
- The circulation of import and export documents, particularly those used in connection with the delivery of goods by mail services.
- The collection of information for fast-reaction inventory management systems.
- The collection and distribution of information related to reservations (for example, car hire bookings).

In the past, the needs of those applications have been met by developing bespoke data processing systems which required the use of specialist staff to operate them. Electronic mail now offers an alternative method to the management services department to implement particular classes of systems.

The data processing applications that would be most suitable for electronic mail will be those where a high level of human reaction is required and also those where the information to be transmitted does not need to be highly structured.

Additional office communications applications

For all organisations, the use of electronic mail to supplement or to partially replace existing facilities such as the telephone, mail and telex will be a new venture. Organisations will therefore be well advised to adopt a cautious approach when introducing electronic mail, and to start with a pilot project. An approach based on a pilot project is, in our view, well justified because of the type of objectives that the first introduction of electronic mail needs to address. The objectives concerned are:

1. To determine the facilities that are needed and also the facilities that will provide the greatest benefits.

2. To identify those individuals in the organisation who will benefit most from electronic mail (remembering that, in the long run, the major pay-off will probably come from greater productivity from managers and specialist staff).

3. To establish the conditions in which electronic mail will succeed in enhancing or replacing other forms of communication. (There is some evidence that the real benefits arise only when there is a "critical mass" of messages per user. Also, real benefits are likely to arise in a situation where a number of office staff (probably at least 20) are in frequent communication with one another on a regular daily basis.)

4. To develop tools and techniques for assessing the value and the usability of electronic mail.

It is of paramount importance that a benign test site should be selected, particularly because the effect of the system on the organisation will not be known in advance. For this reason, some organisations will choose to experiment first in the management services department, and will later launch pilot projects in other parts of the business.

A pilot project can be based on either an individual department or a function, and the function may be one that is distributed between several sites. We suggest that the following criteria should be applied when selecting departments for pilot projects:

1. Management should have a strong desire to participate and all the staff in the selected department or function should be willing to co-operate.

2. The selected department or function should contain a high proportion of managers and specialist staff.

3. There should be a considerable amount of inter-communication in the selected department or function. Ideally each individual needs to receive several messages each day from most colleagues.

4. The volume of messages should be sufficiently large to achieve the "critical mass" at which the service becomes an integral part of the office environment.

THE PROVISION OF AN ELECTRONIC MAIL SERVICE

A pilot project is likely to be successful only if it offers sufficient facilities. The project can be expected to fail if users perceive a need to operate a parallel "paper-based" system just in case the electronic mail system either is not available whenever it is needed or else is subject to breakdown.

A pilot system should provide the following facilities:

- 1. Ready access to terminal facilities.
- 2. All-day operation (taking account of most eventualities).
- 3. Addressing by name and address lists.
- 4. Simple word processing for creating messages.
- 5. The ability to scan messages received.
- 6. Ample storage and retrieval facilities.
- 7. At least one way of connecting a communicating word processor.

An additional desirable facility is the ability to send messages to non-users via the telex network.

A major hurdle that needs to be overcome is the fixed cost of providing the facilities required for electronic mail. This is more likely to apply to pilot systems than to applications where electronic mail is a substitute for data processing. As mentioned earlier, the selection of a pilot project may depend upon the use of equipment which is already installed for some other purpose. If that

equipment is to be used in the project it must, of course, have sufficient spare capacity for the purpose and be suitable for use in the project.

We next discuss below some of the types of existing equipment that may be used in an experimental project:

1. Terminals

Computer terminals are the obvious starting point for an electronic mail system. If they are already widely and strategically dispersed within the organisation a few more may be sufficient to provide adequate access to the new system. If videotex terminals are to be distributed within the organisation then these may be used, and it will be necessary to ensure only that they have suitable keyboards and that the supporting software is able to carry messages.

Communicating word processors can play an important part in an electronic mail system. When they are used in typing pools they allow typists to prepare rough drafts, and they also allow the author to use some other terminal to make his own revision. They also allow local storage schemes to be used as part of a company-wide electronic mail system.

Unfortunately, the protocols supported by communicating word processors vary, and it is not only the basic protocols that need to be considered. Many communicating word processors use certain control characters to indicate font, type size, italics, margins and page size, etc. These characters may be incompatible between two communicating word processors that support the same transmission protocol. The procedure for using the communications option of a communicating word processor is often cumbersome though it will, of course, interface with the system's word processing and filing facilities. Where communicating word processors are used as the basis for an electronic mail system, the central facility does not need to provide word processing facilities, but the local filing and retrieval facilities are not likely to be suitable for end users.

An electronic mail system will nearly always require some extra terminals. These may be installed on individual users' desks or, alternatively, they may be installed in semi-public spaces where each will provide a service for several people.

2. Communications systems

An existing private network will be a valuable base for an electronic mail system, and if high line speeds are needed such a network may well be essential.

If the network is an analogue voice network it may be necessary to treat it as a set of dial-up lines, so as to avoid wasting capacity. In any case, dial-up lines are likely to play some part in the system and they must be provided for.

A digital network will provide for the interconnection of various kinds of terminals and word processors, and this interconnection will be a major advantage.

If a private network exists, it can be a critical factor in justifying an electronic mail system. Mail can be sent overnight using spare capacity, and this approach can make facsimile more attractive than might otherwise be the case.

Where an internal telex system exists it may be possible to use this as a basis for electronic mail. This will be especially convenient when many messages must be sent either to distant offices, or to places abroad, or to offices that are staffed by people who are not employees of the company. Modern telex switches, such as the ITT 6400 ADX, avoid some of the distinctive problems of public telex, the main ones of which are:

- The limited character set.

- The lack of facility for addressing to individuals.
- The lack of store-and-forward switching.

An internal telex system may provide an excellent basis for an electronic mail system.

Where the existing telex system is of the simpler kind, then it might be best to develop the electronic mail system separately. An interface between the two systems will, however, be desirable, to enable telex messages to be delivered via the electronic mail system, and vice versa.

If a telex system is chosen as the basis, then the telex switch will provide basic switching. Otherwise, either the data network's communications processors or an electronic PABX may play this role.

In most electronic mail systems the store-and-forward switching functions will need to be provided separately by either a mainframe or a dedicated mini.

3. Computers

The existence of a timesharing system provides an excellent vehicle for an electronic mail system to support technically-oriented professional staff. It is an easy matter to add word processing and electronic mail to the timesharing computer at a modest capital cost, although the increased operational costs may be less attractive.

Problems will, of course, arise when such a system is extended to those who are not familiar with the timesharing system, such as managers, clerks, and secretaries. The most likely problems with those individuals are:

- The dialogues may be too complex for them.
- They will need to have some knowledge of the timesharing system.
- The new system will not fit naturally into their work, and so they may not use it.
- They will find it difficult to appreciate the need to integrate electronic mail and other data processing functions.

It will usually be possible to connect a communicating word processor to the system, but it will not usually be possible to connect a facsimile transceiver.

An operational teleprocessing system is also a possible basis for electronic mail, and it is appropriate for those staff who use the teleprocessing system in their daily work. The teleprocessing system will usually give faster responses and higher reliability than a timesharing system, and it also allows connection to be made between messages and transactions.

Several systems based on dedicated processors are available as electronic mail switches. These include Comet (PDP11), Arbat's Contact-11 (PDP11), and the various ADX systems from ITT. Comten have also promised message store-and-forward facilities on their 3805 front-end processor.

The advantages of a separate processor include higher reliability, faster response, and a reduced number of errors. In practice, there is the further advantage that, because the system will probably be purchased from a commercial source, less effort will be required in developing and maintaining the system. Most existing dedicated systems are difficult to integrate with other on-line data processing systems.

Where more than one of these systems exists, compatible systems may be provided on, for example, teleprocessing and timesharing systems, and mail will be exchanged between the systems at convenient intervals during working hours.

SUMMARY

Many organisations are considering how to introduce electronic mail systems into their business and we believe that the time is now right to introduce pilot systems into the organisation. The introduction of pilot systems requires careful thought about the organisational responsibility for introducing electronic mail, the selection of applications that will provide a good test-bed, and the technical considerations of the service itself. Some types of data processing applications will be candidates for electronic mail, but to have the widest impact in the organisation, a pilot project should be seen as an additional medium for office communications.

Wherever possible, existing equipment (terminals, communications and computers) should be used for a pilot project, in order to avoid the cost of installing a bespoke electronic mail system before it can be justified on a company-wide basis.

CHAPTER 8

CONCLUSION

Many people regard electronic mail as a future concept that has little relevance to today's business communications. However, our research has shown that considerable progress has already been made in designing and using successful electronic mail systems. Organisations that are using intra-company electronic mail services are finding that they bring immediate benefits. In the near future many other organisations will be building on the experience of the early pioneers of electronic mail to establish their own pilot projects.

The European PTTs are also developing their teletex service for inter-company mail. The aim of teletex is to provide an electronic transmission medium, as an alternative to mailing business communications, that will permit correspondence to be reproduced at the receiving terminal as if it had been produced on a good quality typewriter. However, most business communication in large organisations is intra-company and, for this reason, electronic mail will initially be more important for intra-company mail than it will be for inter-company mail.

The basic technology for electronic mail now exists, and the introduction of an electronic mail service into an organisation offers a real opportunity to introduce technology into the office. The key issue that now needs to be addressed is how to gain the experience that will guarantee that electronic mail is introduced successfully into an organisation. We believe that the time is now right for large organisations to establish pilot electronic mail projects in order to gain the necessary experience.

Electronic mail is an important element of the wider area of office systems, and those who grasp the responsibility for introducing electronic mail into the organisation will be well placed to take on the wider responsibilities offered by office systems in general.

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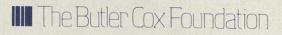
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