The Future of Electronic Mail

BUTLER COX FOUNDATION

Research Report 82, July 1991



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Report synopsis

Despite its enormous potential as a universal transport mechanism both within and between companies, electronic mail is still widely regarded as rather peripheral. By the mid-1990s, however, electronic mail will become an integral part of mainstream computer applications. It is therefore essential that systems and business managers are aware both of the changing scope of mail-enabled applications and of the implications that this enlarged scope has for managing the corporate and technical infrastructures of an organisation.

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Contents

1	Electronic mail has unfulfilled potential	1
	Person-to-person electronic mail systems can provide benefits	1
	Person-to-person electronic mail can promote new ways of working	4
	Electronic mail can meet a wider range of business needs	6
2	Client-server architecture will make electronic mail easier to use Client-server principles will allow system components to be	8
	chosen separately	9
	Electronic mail clients improve the user interface	11
	Intelligent agents assist with electronic mail management	12
3	Current developments will unleash the full potential of electronic mail	15
0	Mail-enabled applications will provide enhanced workflow support	15
	Electronic mail systems will be used widely for electronic trading	18
	Electronic mail will be used for other types of communication	21
	Electronic mail will be used to support computer-to-computer applications	23
4	Electronic mail should be promoted and managed as part of the	
	corporate infrastructure	25
	Identify business applications that can benefit from electronic mail	25
	Convince ton management of the benefits	26
	Stimulate demand	28
	Create an effective management structure for electronic mail	32
5	Electronic mail should be developed as part of the technical	
U	infrastructure	36
	Migrate to a single electronic mail structure over time	37
	Take a pragmatic approach to mail systems based on international standards	39
	Develop directory services based on X.500 conventions	42
	Consider using a third-party service provider	43
		44

Report conclusion

A management summary of this report has been published separately and distributed to all members of the Butler Cox Foundation.

Chapter 1

Electronic mail has unfulfilled potential

Electronic mail has enormous potential as a universal transport mechanism both within and between companies. Emerging systems will have the capability of forging strong links with suppliers and customers, and of enabling communication to take place between business applications within companies, thus facilitating the redesign of business processes.

Yet for many, electronic mail systems are seen as trivial – designed by programmers, installed without vision, purpose, training or justification as an 'added extra', and used only by enthusiasts. This is the image, and in many organisations, the reality, of electronic mail, and it presents the biggest obstacle to exploiting its full potential. Those organisations that are able to see beyond this image, and to understand the potential that is developing as the technology matures and standards become established, can achieve significant business benefits.

The key characteristics of electronic mail are its ability to address individuals and its inherent store-and-forward capability. These differentiate it from other communications media such as telephone, facsimile, telex, online computer systems and data communications networks, and give it some unique advantages. The most important of these is decoupling the sender from the receiver. At a personal level, this means that the sender does not have to wait for the receiver to be ready, and the receiver can accept messages whenever it is most convenient. Of greater future significance, it provides an efficient, standard means of communication between otherwise incompatible computer applications.

Many organisations are already gaining significant benefits from the widespread use of person-to-person mail systems and are finding that this leads to new ways of working. As the technology matures, a new generation of electronic mail systems is emerging, with the potential to become a general-purpose communications medium between people and computer systems. Many businesses are still unaware of this wider potential. Furthermore, many of the electronic mail systems in use today are not an appropriate basis for the new types of business application.

Person-to-person electronic mail systems can provide benefits

Basic electronic mail systems provide a communications medium between people – most commonly as a means of exchanging and disseminating information in the form of messages. Some organisations are also beginning to use electronic mail for file distribution, for the joint production of electronic material, and for automating

Person-to-person electronic mail is used in four main ways the completion and transmission of forms. Used in these ways, person-to-person electronic mail provides a convenient and manageable communications service. Figure 1.1 describes how Girocentrale Wien uses electronic mail in all four of these ways. The level of benefit from person-to-person electronic mail depends on the type of organisation and the prevailing cultural attitudes, but it is particularly effective in supporting greater organisational flexibility and promoting new ways of working.

Figure 1.1 Girocentrale uses person-to-person electronic mail in each of the four main ways

Girocentrale Wien is a worldwide bank, providing specialist services to large corporate clients. The bank's head office is in Vienna, and there are branches in New York, Sydney, Hong Kong, London, Zurich, Milan and Budapest. The bank also has representatives in Prague and Berlin. Girocentrale uses a Wang office-automation system, introduced five years ago, to provide electronic mail services to the head office and branches.

The electronic mail service is used by Girocentrale in several ways. Mail messages are exchanged with branches to provide day-to-day operating information, to schedule meetings, or to discuss a particular issue. The mail system is also used as a bulletin-board service. All press information is put on the bulletin board one day before it is released to the press, keeping company employees informed about the progress of the business.

The mail system is also used for both the distribution and production of documents. Finished documents, such as reports and orders, are distributed between the bank's offices around the world. The mail system is also used to produce documents, which are drafted and passed between departments using electronic mail. Computer files containing data and financial information are also transferred from New York and London to Vienna using electronic mail. The financial information is then incorporated into reports.

Girocentrale has used the forms-processing capabilities of electronic mail to improve its service to customers wanting letters of credit. These can now be ready in a matter of days, rather than the two or more weeks previously required. A standard form for a letter of credit is held by each branch. If a branch customer requests a letter of credit, the form is completed and sent to Vienna for checking and authorisation. The receiving department in Vienna examines the contents of the form, and checks this against other information held on internal systems, such as past history and credit limits. The letter of credit is then agreed between the branch and the head office, and routed through the bank for approval.

Each person involved has to decide what to do with the form, what to check and what to complete. Each person has to consolidate or transfer any data needed for the form manually, then route the form to the next intended recipient. Subsequent amendments are confirmed with the issuing branch over electronic mail. Once approved by the board in Vienna, the letter of credit is sent back to the issuing branch, again via electronic mail.

Electronic messaging can improve communications between people

Electronic mail is most often used to disseminate information, in the form of messages, between individuals and within groups of people. Typical uses of electronic mail within companies are to support sales and distribution operations, project and product groups, research and development activities, and product design. For example, Cummins Engine (a US-based engine manufacturing company with a worldwide distribution network) has an electronic mail system that handles one million transactions a day from 16,000 users. In addition to Cummins employees, the system is used by 1,200 distributors and 1,000 customers and suppliers for whom Electronic mail supports organisational flexibility and new ways of working it provides news and advice on each product (including changes), information about training courses and so on.

In some organisations, particularly large global enterprises, question-and-answer use of electronic mail is of paramount importance. One chief executive from a European oil company, for example, justified the cost of a leased communications line from Europe to Latin America solely on the need for electronic mail to help his decision-making. He uses it to fire off requests for the upto-date statistics and information that are vital to his work.

Electronic mail is also a particularly useful means of disseminating information when there is an event of company-wide importance, such as a crisis or a takeover bid. Information can be distributed to everyone on an electronic mail distribution list within minutes. Electronic mail was used in this way to distribute full and accurate information to all offices while a company was in the process of being taken over. The company concerned believes that, because everyone was kept fully informed, it was able to retain full staff commitment, particularly among middle managers.

Electronic mail is a convenient file-distribution mechanism

The messages transported by a mail system can have other information attached to them, such as a file, an image or an additional text document. In this situation, the mail message is equivalent to a compliment slip or a covering note. The mail system has no intrinsic knowledge of the contents of the attached items, whose format and structure are independent of the electronic mail system. The mail system is, in effect, being used as an electronic courier service.

Some organisations are beginning to use the file-attachment capabilities of electronic mail to transfer files between people in the organisation. Typical file-transfer applications are the distribution of completed reports and of financial information for management accounting. Pilkington (a UK-based glass manufacturer), for example, uses electronic mail as part of its accounting function; this has reduced the time it takes to consolidate accounts from around the group from eight to four days.

The alternative to transferring files via electronic mail is to use a conventional data communications system. Electronic mail has advantages where it is the only common communications medium between all the locations and in cases where there is no guarantee that the receiving workstation is switched on and able to accept a transferred file.

Electronic mail can speed up the production process

Person-to-person electronic mail can also be used as part of a production process. In many companies, the people who work together on a project are not necessarily located in the same place, but the outputs they produce (in the form of electronic material) need to be consolidated into a final product. Their outputs may be sections of a document or a report, a body of research material, an engineering model, or a software application. Electronic mail enables remote staff to transfer their contributions to the specialist staff who will combine and consolidate the various contributions.

Electronic mail can be used to broadcast messages

As a file-distribution mechanism, electronic mail is an alternative to conventional data communications

With electronic mail, remote staff can transfer contributions to a production centre

Chapter 1 Electronic mail has unfulfilled potential

In effect, electronic mail can be used as the conveyor belt in the production process.

The European Space Agency, for example, uses electronic mail to work with contractors on the document-production aspects of engineering projects. The agency has its own electronic mail network with 15,000 external mailboxes. Engineering-contracting companies use these mailboxes to deliver engineering-design documents through the electronic mail network, which is also used to distribute the documents throughout the agency.

Although electronic mail is used by a growing number of organisations in this way, to transfer items to the next point in a document-production process, it is not straightforward to achieve this. The main difficulty is that document production in a multivendor environment is still fraught with difficulties, because of the absence of common standards for document formats. The simplest solution is to restrict all participants to using a mail system from a single supplier and the same document-production software.

Electronic mail can be used to automate forms handling

When applied to automate forms, electronic mail can improve the service provided to customers and can streamline internal administrative procedures. Common examples of administrative forms that can be automated with electronic mail are time recording, expense handling, personnel records, registrations of new employees, advertisements for training courses and job openings, requests for office supplies and so on. The Hughes Aircraft Company has introduced an Electronic Routeing and Approval system, based on its electronic mail network, for the approval of documents. Hughes estimates that this has reduced the approval time for some documents by 70 per cent.

Used in this way, electronic mail systems can be an effective tool for supporting simple business procedures, particularly for consolidating common information from diverse sources, or as a replacement of simple paper forms. When a form, such as an insurance-claim form, is part of a business procedure, that procedure can be speeded up.

Person-to-person electronic mail can promote new ways of working

Used in the ways described above, electronic mail serves as an enabling mechanism for creating an organisation that is more flexible and better able to respond quickly to change. In particular, electronic mail opens up new opportunities for people to work together. This may be simply by promoting team working and cooperation within a company, by making it possible to create multidisciplinary teams that cut across departmental or geographical boundaries.

Location independence

The fast and comprehensive communications provided by electronic mail enable staff working on a common task to be located at In a multivendor environment, document production via electronic mail is still difficult

Electronic mail can support simple business procedures

different sites or even in different countries. Some US corporations, for example, are beginning to develop software in third-world countries where skilled labour is less expensive. Electronic mail supports the detailed dialogue that has to take place between the developers and those who commission the software (and also provides the means of recording the dialogue). It also provides the communications channel for delivering the completed software.

In several studies, electronic mail has been identified as a critical factor in enabling organisations to operate transnationally. Many of the companies that we spoke to stated that they could not continue to operate globally without the support provided by electronic mail. In one company, for example, a project involving team members from Singapore, Germany and the United States could not have continued without the electronic mail facilities that enabled the individuals to communicate on a day-by-day basis.

Electronic mail is particularly effective in global working because it provides both a store-and-forward service between sender and receiver, and one-to-many communications. The store-and-forward nature of electronic mail enables a full (but off-line) 'conversation' to take place between people in different time zones. The one-tomany communications facilities provided by electronic mail also enable an individual in a transnational company to gain rapid access to relevant experts, wherever they may be located.

Fewer face-to-face meetings

Some organisations fear that the introduction of electronic mail will turn employees into 'battery chickens, plugged permanently into a computer screen', who have no need for direct interpersonal communication. Electronic mail does indeed reduce the need for face-to-face meetings, sometimes to great advantage. During the Gulf War in early 1991, for example, there was a huge increase in the use of electronic mail as companies cut back on international air travel. In addition, many international businesses are increasingly using electronic mail, rather than videoconferencing, to keep in contact, realising that face-to-face meetings are not essential. In general, however, we believe that other factors such as the building layout and design, the organisation culture, and the type of work have more influence than electronic mail on the way in which colleagues work together and the communications channels they prefer to adopt.

Cooperation within ad hoc teams

Electronic mail is particularly effective within an organisation that works on a project or matrix basis when individuals from different departments need to work together. In such a situation, electronic mail can promote interworking and cooperation within teams of people by providing shared access to a common pool of expertise and information.

Electronic mail has, however, been less successful in large hierarchical organisations. The problem is that departmental managers are suspicious of the ability that electronic mail provides to cut across the formal hierarchy. We know of one organisation that had to modify its system so that a departmental head could approve mail messages that were sent out from his department.

Electronic mail enables organisations to operate transnationally

Electronic mail reduces the need for air travel and for videoconferencing

In non-hierarchical organisations, electronic mail promotes interworking Chapter 1 Electronic mail has unfulfilled potential

Electronic mail can meet a wider range of business needs

The purpose of this report is to highlight the fundamental changes that are taking place in the uses to which electronic mail can be put. Today, the most common use is for simple text messaging, although, as we pointed out earlier, some organisations are beginning to use electronic mail for other purposes. These additional applications provide pointers to the wider uses of electronic mail, although it is not particularly convenient to adapt existing systems so they can be used in new ways. However, the technology of electronic mail systems is advancing rapidly, and is overcoming the limitations of existing systems. We describe the main developments in the technology in Chapter 2.

These developments mean that electronic mail will evolve to become a general means of communication between people, between people and computer systems, and between computer systems (see Figure 1.2). The use of electronic mail as a means of communication both with and between computers will bring new opportunities. In particular, electronic mail standards will permit incompatible computer systems to communicate. This provides an important new



Advances in technology will overcome the limitations of existing electronic mail systems way of communicating with customers and suppliers and also with

different parts of a devolved organisation. In Chapter 3, we describe how electronic mail will be used in the future as developments currently underway unleash the full power of the technology.

The main barriers to achieving the full potential of electronic mail are within the organisation itself. They include a failure to recognise the wider potential applications of electronic mail and to convince senior managers of the benefits, opposition to new ways of working, and inappropriate supporting management structures. To exploit the full potential of electronic mail, it should be promoted and managed as part of the corporate infrastructure. Managers at all levels in the organisation need to appreciate how mail systems can be used, in order to identify opportunities both within the business and with its trading partners. In Chapter 4, we set out the steps that need to be taken to create the right level of organisational understanding and support.

To achieve its full potential, electronic mail should also be managed as an integral part of the technical infrastructure. The development of a comprehensive electronic mail infrastructure is a complex and time-consuming activity, and in a large organisation, can take several years to achieve. However, the rapid advances in electronic mail systems and their application make it imperative that an organisation establishes quickly a clear set of rules and standards for electronic mail. Unless this is done, members run two distinct risks. First, they will be unable to take advantage of new ways of working, and new business opportunities made possible by electronic mail. Second, the number of inappropriate mail systems in widespread use will increase, thus increasing the cost, time and difficulty of migrating to more appropriate systems at a later date. We explain the options for developing corporate mail systems in Chapter 5, and set out our recommendations for migrating to the new generation of systems. We include, here, a discussion of the relevance and application of standards.

Details of the research team and the scope of the research carried out for this report are described in Figure 1.3.

Figure 1.3 Research team and scope of the research

This report was researched and written by Richard Bowler and Rebecca Morgan, both consultants with Butler Cox. Richard Bowler works on networking, messaging and office systems projects, and is based in Butler Cox's Amsterdam office. Rebecca Morgan works on systems and office systems projects, is responsible for the Office Systems group, and is based in London. During the research, they were assisted, in particular, by:

- Lothar Schmidt, a consultant in Butler Cox's Munich office.
- Barbara McNurlin, an associate of Butler Cox who carries out IT research in the United States.
- Buni Zeller, a consultant with RSO the agents for the Butler Cox Foundation in Italy.

The Soft.Switch company, which specialises in electronic mail networks and systems, provided an invaluable contribution to this research.

Extensive research was carried out in the United States, both with user organisations and with suppliers of electronic mail services and products. Foundation members and other organisations were interviewed in the United Kingdom, Belgium, the Netherlands, Germany and Italy.

The main barriers to the effective use of electronic mail are within the organisation

Without rules and standards, it will be difficult to achieve the full potential of electronic mail

Chapter 2

Client-server architecture will make electronic mail easier to use

The typical electronic mail system in widespread use today has three main components, as shown in Figure 2.1:

- The interface to the users, which includes the facilities to create a message, to choose who to send it to, to select the type of service required, to select any attachments and to place them in the outgoing mailbox. The interface also includes facilities to receive a message from the incoming mailbox, to read it, to file it, to reply to it or to discard it.
- The message store, comprising the incoming and outgoing mailboxes. Messages are delivered to the incoming mailbox from where they can be retrieved and read at the reader's convenience. Messages to be sent are passed to the outgoing mailbox, where they can be picked up and delivered at the system's and the recipient's convenience. The message store also often provides archiving and retrieval services for copies of messages that have already been delivered but have perhaps been lost or misfiled.
- The mail-transfer system, which manages the delivery of electronic mail messages. The mail-transfer system collects a message from an outgoing mailbox, transfers it across the mail service and delivers it to the appropriate incoming mailbox.



There are many limitations with this type of electronic mail system. The following criticisms are typical. "It is difficult to use." "I can't transfer documents from my PC." "I can't contact the people I really want to." "I spend all my time reading trivial mail messages." "We can't get information from our mail system into our computer system." "I receive only one or two important messages a day, but they get lost in a sea of 'for information only' or 'social' messages."

Existing electronic mail systems have severe limitations

A new generation of systems, based on client-server principles, will be easier to use

> Different suppliers will provide discrete elements of mail systems

These difficulties arise because many existing mail systems are 'closed' and therefore need special gateways to communicate with the outside world. They do not harness the power of intelligent workstations on the desktop; they cannot handle structured forms as well as free text; they cannot interwork with computer applications as well as with people.

A new generation of easy-to-use electronic mail systems is becoming available, stimulated by the introduction of intelligent workstations and graphical user interfaces. These systems are based on clientserver principles, which were described in Report 80, *Workstation Networks*. Their main advantage is that they will allow many of the components of an electronic mail system to be chosen separately. This will enable organisations to select the most appropriate user interfaces, message transport systems and directory services.

Client-server principles will allow system components to be chosen separately

The structure of electronic mail systems is changing rapidly. It could be argued that these changes were heralded 10 years ago by the arrival of the desktop personal computer. However, it is only now that the structure is evolving to harness the power of PCs, of local area networks, and of centralised computing resources, all linked together across corporate-wide networks. With a traditional mainframe-based electronic mail system, one application provided the user interface, message-storage and mail-transfer facilities. The trend in the next few years will be for different suppliers to provide discrete elements of the mail system, with each element conforming with a common architecture. The evolving architecture of electronic mail systems is shown in Figure 2.2, overleaf.

The elements of this architecture are:

- The mail server. The mail server is the heart of the system and provides the core electronic mail functions such as mailboxes, storage and service selection. The mail server is, in client-server terminology, a server application, and provides its services to clients through a defined applications program interface. Today, mail servers are normally provided as part of local area network operating systems. In the near future, they will also be provided as separate products based on industry-wide standards such as Unix.
- The user interfaces. Each user interface is, in itself, a client program that translates the functions provided by the mail server into a form that can be understood by people using the system. Initially, different user interfaces will be provided for different operating environments – for Windows 3.0, for DOS, for Unix and so on. The user interfaces can also be embedded in office systems, and can be customised for different user needs, such as word processing, engineering and banking. By harnessing the power of intelligent workstations on the desktop, they provide a range of new facilities that will enable people to manage their mail more effectively.



- The applications interfaces. Software products and in-house applications will be able to access the mail server directly to use the store-and-forward capabilities of the system. Thus, inhouse computer systems will be able to use the electronic mail system in the same way that a person does. To make access more simple for in-house developers, an intermediate software product will provide tools to interface an application to the mail server.
- Directory services. A directory service will provide the electronic mail addresses that the mail has to be sent to, matching names provided by the mail sender to addresses held in its database. More sophisticated directory services will provide links to other directory databases in the organisation, and will automatically update themselves according to the names and addresses on incoming or outgoing mail. As we explain in Chapter 5, the directory-service component of electronic mail systems should be based on X.500 naming conventions.
- Mail-transfer services. These services are the back-end functions that accept, route and transmit electronic mail messages to the intended recipient. The mail-transfer services are the network component of the electronic mail system. These can be provided transparently, to the same mail server, by in-house computer networks, by public electronic mail services, or by a combination of the two.

Mail-management services. These facilities enable the mail system to be managed and administered. They may, for example, provide probes (which check that a message can actually be delivered to the specified address), networkmanagement tools, billing and recharging systems or network display consoles. Mail-management services are becoming available as software products from independent suppliers, and will work with a variety of mail systems from different vendors. One such product is Mail Monitor from Soft.Switch.

Mail systems based on this type of architecture provide the following advantages over traditional mainframe-based mail systems:

- Flexibility, because the front-end (user interface) facilities and back-end (mail transport) facilities can be chosen separately.
 - Scalability, because the modular nature of client-server systems means that they can be expanded to cope with increasing requirements.
- Reduced overheads, because local mail can be handled by the on-site mail server. Only external traffic leaves the on-site server.
- Better performance and integration with desktop utilities, and higher levels of functionality.

From the users' point of view, however, the two most significant developments are improvements in the user interface, and the availability of software products that will improve the facilities for managing the flow of electronic mail.

Electronic mail clients improve the user interface

There is an emerging class of product that provides only the user interface to an existing electronic mail system – in effect, the client part of an electronic mail system. Typically, the electronic mail client will run on a user's intelligent workstation and will provide the facilities required to make the system easy to use. Electronic mail services are provided to the client through the server part of the system, which includes the mail-storage and transfer facilities.

To assess the impact of this new generation of electronic mail interfaces, we need to review the traditional facilities of an electronic mail interface, sometimes known as the electronic mailbox. These facilities fall into three main categories:

- Out-box management, including composing and editing outgoing messages, selecting addressees and determining how and when to send them.
- In-box management, including notification of, reading, replying to, forwarding, copying, saving, printing and deleting incoming messages. In-box management often also includes file or folder facilities to store incoming messages.
- Mailbox administration, including producing standard forms, address books and distribution lists.

The client part of an electronic mail system provides only the user interface

The traditional electronic mail interface has three kinds of facilities Everyone using a traditional electronic mail system has to access the system via the same user interface, regardless of the type of work or personal preferences. The user interface can be enhanced only by modifying the whole system and providing all users with the enhanced facilities. Electronic mail client software available from independent software suppliers overcomes this constraint. Each user is free to choose the user interface that best suits his way of working.

The MailMan product from the Reach Software Corporation illustrates this approach very well. MailMan is an electronic mail client based on Windows 3.0. An example of its user interface is shown in Figure 2.3. MailMan runs on a PC and acts as a front end to a local area network mail system, using the mail-transport functions of either a Banyan's Vines or Novell NetWare MHS mail system. MailMan improves the mailbox facilities available to existing users of Vines or MHS, without needing to change the underlying mail system. The improved facilities include navigator functions that enable the user to work on more than one message at a time, the ability to cut and paste between messages, comprehensive address lists, the ability to initiate an application from within the mail system while browsing through attached files, and so on.

Figure 2.3	MailMan provides a Windows 3.0 interface to users of Vines and NetWare MHS mail systems	f Banyan's
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Answer Compose	Forward Move Print Notily Save Az Delete	

Intelligent agents assist with electronic mail management

The user interface to electronic mail is also being improved by the introduction of 'intelligent agents' that assist in managing the flow of electronic information arriving at, and departing from, a user's desk. Already, some professionals receive 100 electronic mail messages a day; some of these will be more urgent than others. With a traditional user interface to electronic mail, all of the messages need to be read by the recipient.

MailMan provides improved facilities without needing to change the underlying mail system

Intelligent agents manage the flow of electronic information to or from a user's desk Chapter 2 Client-server architecture will make electronic mail easier to use

An intelligent agent acts upon messages according to how it is programmed An intelligent agent is a piece of software that sits between the electronic mail system and the person using the system. The intelligent agent, therefore, is just one example of software that can use the mail server's applications program interface. It will act upon messages according to how it is programmed. An early example of an intelligent agent is the Information Lens developed at the Massachusetts Institute of Technology (and described in detail in Report 73, *Emerging Technologies*) that is used for filtering incoming messages. Some examples of the use of intelligent agents are:

- Alerting the user when a particular piece of information is received, such as an urgent message or a response to a question.
- Presenting incoming mail messages according to priority, subject, sender and so on.
- Automating the response to a request for example, responding to a request for an item held in a spreadsheet file.
- Providing an 'answering machine' facility for example, by automatically replying to all messages stating that the recipient is on vacation for a week.
- Managing 'to-do' lists for example, by automatically sending messages to the user at particular times reminding him of actions now due.

An intelligent agent could be used in the following way. Suppose that the technical-support department of a supplier responds to questions sent in by electronic mail from its worldwide distributors. These questions relate to particular products or technical issues. Using conventional electronic mail, a distributor either has to remember which particular person to send the question to, or has to copy the question to the whole department, or has to send it to a departmental mailbox. The third option is clearly more convenient for the distributor, but involves some extra work within the technical-support department to redirect the question to the right person. An intelligent agent could 'read' the messages as they arrive at the departmental mailbox, and with a combination of subject matter and distributor name, direct the questions to the appropriate person. It may even be possible to respond to some routine questions automatically by providing a standard piece of information.

One example of an intelligent electronic mail agent is a product called BeyondMail available from Beyond Incorporated. BeyondMail is the first commercial implementation of the Information Lens. The product runs on an MS-DOS PC and uses Novell's MHS standard message-transport system for local area networks. The product is a mail client that provides a rules-based agent to handle both incoming and outgoing mail messages on behalf of the user. The user can create rules by completing a message profile, then defining the actions to be taken for such a message. The way that BeyondMail can be used to filter mail messages is shown in Figure 2.4, overleaf.

Having reviewed the technological developments that are overcoming the inherent deficiencies of existing electronic mail systems, we turn our attention to the way in which the new generation of mail systems will be used. The range of applications for electronic

BeyondMail is the first commercial implementation of the Information Lens

Chapter 2 Client-server architecture will make electronic mail easier to use

Figure 2.4 BeyondMail enables a user to define rules to handle mail messages automatically

How Beyond Mail Filters E-Mail Messages

Operating with MHS alone or with another vendor's E-mail package, this new software automatically sorts and routes or deletes incoming messages according to userdesignated rules. Users enter rule sets in an E-mail message format.



mail will be increased enormously, through its potential to be used as a general-purpose communications channel both between people and computer systems, and between computer systems.

Chapter 3

Current developments will unleash the full potential of electronic mail

The developments described in the previous chapter will enable electronic mail to become a general-purpose utility that will be an essential component of the organisation in the mid-1990s. Electronic mail will provide a basis for managing and accessing information, and for distributing it between people, businesses, workstations, corporate computer systems and databases. Electronic mail will also provide the basis for applications that manage the flow of work across the business and between organisations. In particular, there will be a new generation of applications that are based on an electronic mail system. These are commonly known as *mail-enabled applications*. They add value to the information that is carried across the electronic mail network – for example, by providing information relating to the context of a conversation, or by adding structure to a message.

Public electronic mail services based on international standards will also be available, and these will provide a common electronic communications channel between organisations. These services will enable a business to manage its communications with trading partners and to provide value-added services. For example, a company might use electronic mail to provide a customer with access to an internal catalogue database.

Mail-enabled applications will provide enhanced workflow support

In Chapter 1, we described how traditional person-to-person electronic mail is already being used as a conveyor belt in a production process, and to automate the distribution of forms. In these cases, electronic mail is providing support for flows of work, but in an *ad hoc* manner.

Figure 1.1, for example, described how Girocentrale Wien uses the forms-processing capabilities of electronic mail to produce a letter of credit. This involves only a few steps, with clearly understood responsibilities at each stage in the process. In this example, a business procedure that used to be based on *ad hoc* paper flows has been speeded up by using *ad hoc* electronic mail flows. To support more complex or more variable workflows, other tools and facilities are needed, such as applications integration, routeing and rules for the structuring of forms. These facilities are provided through mail-enabled applications.

Mail-enabled applications integrate computer systems with electronic mail

Mail-enabled applications make use of the message-handling facilities provided by an electronic mail system. In effect, a computer

Facilities to support complex workflows are provided through mailenabled applications application becomes a user of the electronic mail system, generating, receiving and processing the messages transmitted over the mail network. (In the United States, the term 'mail-enabled applications' is used by electronic mail vendors to describe software products that enhance the facilities provided by existing electronic mail systems. We use the term more widely, to describe business applications that are built on top of existing electronic mail facilities. Such applications may be built by using the software products, or they may be developed in-house.)

The concept of passing messages between applications is not new – computer-based message-handling systems, payments systems and airline reservation systems have been using messagepassing techniques for a long time. Emerging groupware applications often use message passing as the means of transferring information between applications. Using electronic mail as the communications channel for passing messages to and from an application simplifies many of the problems associated with integrating different applications running in different hardware and software environments. Provided that two applications can interface to the same electronic mail system, information can be passed between them.

Once computer applications and people share a common electronic mail system, many new opportunities become possible. Initially, however, mail-enabled applications will have two main types of use.

The first main type is where information is provided by people, normally through completion of structured forms, and consolidated by a computer application. A contract-engineering company, for example, charges its customers according to the number of hours worked on each project. At the end of each month, each engineer completes a timesheet showing how his working time has been spent, and sends it back to the office. All timesheets are collected and entered manually into a computer application. The application adds up the hours worked on each project and generates the invoices, which are then sent out through the post. This process can be speeded up and the amount of manual intervention reduced by sending the timesheets as electronic mail forms directly to the computer application itself.

The second main type is where information is provided by a computer system and acted on by people – newswire or inquiry services are typical examples. In a newswire service, the system continuously searches for relevant information from internal and external sources. Users of the service specify a set of key words that describe the types of information they are interested in. When the service identifies a piece of information that matches the key words, it sends an electronic mail message to the user's mailbox. In an inquiry service, the user sends in a mail message containing his inquiry. The inquiry database carries out an off-line search against the inquiry, and sends the results to the user's mailbox. One US publishing company is already using this type of mail-enabled application to support its sales force, as described in Figure 3.1.

In time, mail-enabled applications will be an important means of supporting process working – integrating people and applications into a single unit. In Report 79, *The Role of Information Technology* Mail-enabled applications will initially have two types of use . . .

... where information is provided by people and consolidated by a computer application ...

... and where information is provided by a computer system and acted on by people

Chapter 3 Current developments will unleash the full potential of electronic mail

Figure 3.1 A mail-enabled application gives mobile workers access to a full range of information

The Ziff-Davis Publishing Company in the United States publishes a range of industry magazines, including *PC Computing*. The company depends on advertising revenue for the success of these magazines. A salesman for the publishing company will talk to a prospective customer about the advantages of placing an advertisement in a particular magazine or issue. The customer will want to know the relevance of the magazine to his product, the association of his product with any particular article, and the nature of the readership.

The publishing company now uses Lotus Notes to provide the salesman with information in response to the customer's questions. In the evening, the salesman can send an electronic mail message from a portable PC, identifying the customer, his product and his likely interests. In the morning, the salesman accesses his mailbox and retrieves information relating to this particular customer.

Ziff-Davis believes that this information is critical in closing a sale. A second benefit is that the salesman can respond to a potential new customer quickly and knowledgeably. Third, Ziff-Davis is beginning to find that it has more comprehensive marketing information about specific industry sectors than dedicated marketing companies have, because of its constant contact with people in the industry and its comprehensive way of handling the information.

in Transforming the Business, we described the business benefits that can result from a move from functional working to process working. We also highlighted some of the inherent limitations of existing computer-based applications that will have to be overcome before process working can be fully supported. In its basic personto-person form, electronic mail can provide an 'information circuit' that links the people in a business process, particularly in an organisation where mail is the only common form of electronic communications. Mail-enabled applications are likely to be used when a business process spans different locations, dissimilar systems and even business partners, where technical alternatives, such as access to common databases, are not appropriate.

Reach Software Corporation, for example, is developing a software product that will provide workflow support over a standard electronic mail system. Building on the MailMan product described in Chapter 2, the new product will structure the information and provide intelligent-routeing functions and applications integration. As a standard message 'object' is moved around the organisation, its content and presentation will change according to the recipient, and its progress will be actively tracked by the system. The message will be integrated with, or use data from, other applications in the organisation, without those applications having to be changed.

Existing computer applications can be integrated with electronic mail either by building a bespoke interface with the mail system, or by using a software product specifically designed for such purposes. The software product provides the command syntax and conversion facilities to transform a mail message into a database query or an input to a computer application, and *vice versa*. Beyond Incorporated's @Mail, for example, allows a user to create, send and receive messages from within Lotus 1-2-3 and Symphony spreadsheets and transmit them via any Novell MHS-compatible mail system. Initially, such software products will be provided to run on local area network mail systems like MHS, Banyan's Vines and, in the future, LAN Manager. In time, they will also be available

In time, mail-enabled applications will support true process working

Existing computer applications can be integrated with electronic mail by a bespoke interface or a specially designed software product to run on X.400 mail networks, or any other mail network that supports the X.400 applications programming interface. (The X.400 series of recommendations are the international standards for electronic mail. They are described in more detail in Chapter 5.)

Existing groupware tools show what is possible

The emerging class of applications known as groupware illustrate the potential of mail-enabled applications. Groupware (which we discussed in some detail in Report 73) is a generic term for computer software that supports the ways in which people work together. Groupware systems are usually based on integral database and electronic mail services. At present, two of the best known groupware products are Action Technologies' The Coordinator, and Lotus Notes. Lotus Notes demonstrates what is achievable with an integrated system of this type, supporting the different uses for mail-enabled applications described in this chapter, and many more besides.

In Report 73, we said that groupware would ideally be implemented as applications based on existing corporate electronic mail systems. The reason that most current groupware products use their own internal mail or communications services is that most commercially available mail systems are not sufficiently standard, are not available to the required user population, cannot be accessed by the groupware software, or do not provide the required functionality. However, from now on, there will be a steady flow of new mailenabled software products that provide similar functions to current groupware systems, and that run on standard electronic mail systems. These products will extend the application of groupware tools across the organisation and even to business partners.

Electronic mail systems will be widely used for electronic trading

In the past, close cooperation was required with a business partner if the electronic mail systems of the two organisations were to be fully integrated. The problems of interlinking an organisation's electronic mail system with those of several business partners were almost insurmountable. It is not surprising, therefore, that most electronic mail systems have remained confined to a single organisation. Even within an organisation, a single proprietary standard could not always be applied and enforced. The result is that many Foundation members now have several incompatible mail systems, each based on a different vendor's proprietary standard. The difficulties of establishing comprehensive connections across multivendor environments has been a major deterrent to the growth of electronic mail systems both within and between organisations.

The situation is now changing with the increasing availability of electronic mail networks that conform to international standards. Such networks will mean that electronic mail can be used both to forge closer electronic links with business partners and to provide the first-choice means of communication with other parties. We believe that, by the mid-1990s, electronic mail will be a fundamental component of electronic marketplaces, enabling business partners to trade electronically and undertake cooperative ventures. Groupware products illustrate the potential uses of mail-enabled applications

New mail-enabled software products will extend the application of groupware tools

As electronic mail systems conform to international standards, they will provide a means of electronic trading Electronic mail services based on international standards will provide a way of transferring EDI messages

Electronic mail facilities extend the benefits of EDI

Electronic mail will be used to provide EDI services

Electronic data interchange (EDI) involves the transfer of structured, formatted messages between trading partners across a communications network. EDI services can be based on filetransfer-type services provided across a data communications network, or they can be provided across an electronic mail network. At present, when EDI services are provided via an electronic mail network, the mail service is usually tailored to provide direct support for the EDI applications. In other words, it is a specific and dedicated mail network, not a general-purpose mail network.

Emerging public electronic mail services, based on international standards, will provide an alternative means of transferring EDI messages. In the Netherlands, for example, both the Memocom and the new X.400 public mail services are already used to provide EDI services to the retail and public-health sectors, among others. Carrying EDI over a public electronic mail network provides several distinct advantages:

- Wider coverage, giving access to a wider range of business partners, through use of globally accepted standards. Because of this, a company will be able to trade as easily with a partner on the other side of the world as it can with one in its own country.
- Increased operational effectiveness, removing the need to maintain a separate EDI network, or separate EDI connections. One great advantage will be better control over the costs of doing business.
- Increased choice of service provider. Organisations will not be restricted to using the single EDI service provider that serves its own closed community.
- Improved security and reliability. Public services will be developed to meet the security and reliability requirements of the most demanding sectors of industry, thus benefiting all subscribers.

In the short term, the attractiveness of using public mail services to carry EDI traffic will be determined by the tariffs for using the services. In the longer term, it will be the need to integrate EDI with other electronic trading applications, and to reach a wider range of business partners.

Electronic mail will be provided alongside EDI links

EDI is transforming many aspects of trading. In its purest form, the EDI messages being sent need no interpretation – the classic example being where orders are placed electronically. However, many business relationships rely on a degree of cooperation and information exchange between the trading partners. Consider, for example, the situation where a purchaser states, "I'll take whichever pack size can be delivered fastest". Conventional EDI cannot accommodate such conditions. Typically, these types of orders are handled separately over the telephone. Free-format text messages sent over electronic mail, however, enable qualifying messages to be sent with the order. Figure 3.2, overleaf, shows how the London insurance market is using electronic mail in conjunction with EDI.

Chapter 3 Current developments will unleash the full potential of electronic mail

Figure 3.2 The London insurance market is using electronic mail to complement EDI

The London insurance market consists of several hundred insurance companies, Lloyd's underwriters and insurance brokers. It realised that, if it was to maintain its market share, a more streamlined approach needed to be applied to three key business areas – risk placing, claims processing and inter-market accounting. To illustrate the complexity and scope of the requirement, the previous accounting systems used some 18 million punched cards per annum.

The potential for using EDI and electronic mail was recognised and the I,IMNET project was initiated to address the three key business areas, using IBM's IN managed-network service as the basis. The accounting aspects of the system are handled by EDI, as are the structured-messaging aspects of claims processing. However, to gain full value from automating the claims procedures, the structured messages are supplemented by associated free-format text messages, which are carried via Screenmail, the IN electronic mail service. The risk-placing aspects of the system also require the integration of EDI and electronic mail, and this aspect of the system will be implemented in 1992.

Screenmail is now widely used for informal messaging. Interestingly, while this capability has been available since the accounting aspects of the system were implemented, its use for informal messaging took off only after an application using Screenmail had been delivered. Use of electronic mail for structured business communications alerted users to its true potential.

Screenmail is not perceived as being a particularly 'user-friendly' system. However, the business benefits derived from its introduction outweigh the difficulties associated with the specific implementation.

Already, there are EDI systems where the 'message' passing between the trading partners consists of both the order and the commentary. The recipient has the discretion to amend the order based on the commentary, and uses electronic mail to confirm his action to the buyer. If it is structured and formatted in a standard way, this confirmation can be relayed directly to the buying organisation's relevant computer application, without the need for human intervention.

The benefits of EDI are thus extended by the inclusion of electronic mail facilities. Given the wide range of information that may be transported using electronic mail, it will increasingly become the preferred means of disseminating information between traders and information providers.

A new class of electronic-trading services will emerge

EDI is a particular instance of electronic trading in general, where data such as a purchase order is transferred directly to a supplier's system. Person-to-person text messaging is another particular instance of electronic trading, which can be used for general information exchange (as in the above example) or for enquiries on the progress of an order.

There is a substantial amount of electronic trading that will depend on a person within one organisation communicating with a computer application in another organisation. A particular example of this is channel marketing, where each customer has access to a full product database that includes prices, availability, new features and so on. Another example is where a broker or agent completes an application form and transmits it to an insurance company for the issue of a policy. The combination of structured forms handling, intelligent routeing and common mail services will make electronic

Electronic mail will support trading based on communications between a person and a computer application Chapter 3 Current developments will unleash the full potential of electronic mail

mail a simple and effective means of delivering a wide range of electronic-trading applications.

Electronic mail will be used for other types of communication

From its current role as a support mechanism for internal messaging, electronic mail will evolve to become a general-purpose carrier of other types of communication. A two-stage evolution will occur. First, electronic mail will be used to integrate different forms of communication – through the mailbox. Second, electronic mail will transport other types of communication across the mail network. Thus, electronic mail will be used as an alternative to realtime data communications systems.

Electronic mail systems will provide gateways to other communications services

Electronic mail can now be used to integrate other forms of communication, by providing employees with a single interface to other messaging services such as facsimile, telex, voice mail and the post. There are several benefits to this type of integration. First, a measure of corporate control can be imposed on other communications services, such as facsimile, enabling the organisation to provide better levels of service and to control costs. A significant advantage is that the organisation can then decide on the best way to route messages to particular business partners. Examples of this type of integration are:

- Facsimile messages can be generated at the workstation and transmitted through a mail gateway. Similarly, incoming facsimile messages can be converted to text documents through an integral optical character recognition (OCR) reader and displayed and stored as text files. In more simple systems, where the received message does not need to be modified and where there is adequate storage capacity, the message can be displayed and stored as a bit-mapped image.
- Telex messages can be sent and received through the electronic mailbox, through an appropriate mail-to-telex gateway.
- Notification of incoming voice-mail messages may be given by an electronic mail system. Likewise, some systems enable an outgoing electronic mail message to be delivered as a voice-mail message, by using a voice synthesiser.
- Letters can be sent as electronic mail to the most convenient posting point, then automatically printed, ready for placing in envelopes and mailing.

NeXT's electronic mail system, for example, provides facilities that allow a mail message to include a voice message, an image, a graphical file, application data and text. These different types of information are fully integrated within the electronic mail message; they are not sent as attached files. Figure 3.3, overleaf, shows how some of these different types of information are integrated in NeXT's mail system. The NeXT system can send an electronic mail message that includes text and images as a direct facsimile transmission. It will also accept an incoming facsimile and automatically

Electronic mail can provide staff with a single interface to other messaging services

With NeXT's mail system, different types of information are fully integrated within the message



pass it through an internal optical character recogniser, converting the facsimile to manipulatable text. If the internal recogniser cannot decode the facsimile, the incoming transmission is stored as a bit-mapped image.

The William Morris talent agency in the United States is using the features of the NeXT mail system to its advantage. The agency places actors and actresses in theatre, television and film productions. As the first step, the agency uses the NeXT mail system to send a description of the person and his or her availability, a picture, and a recording of his or her voice. This enables the production company to make an initial assessment of the suitability of a person for a particular role.

Electronic mail will become an alternative to other communications services

In the longer term, electronic mail will not only be used to integrate different forms of communications; it will be used as a complete alternative to other communications services. We do not suggest that electronic mail will *replace* other communications services. Rather, it will provide alternative facilities that, in some cases, will be more appropriate to the particular requirement. For example:

- Graphical images, captured through an attached scanner, will be transmitted over electronic mail systems. Currently, the only way to transmit, electronically, an image that is not stored as a data file is via facsimile. Electronic mail would be more appropriate if the graphical image were part of a business transaction, where the flow of information was supported by workflow software within the mail system – for example, in the handling of insurance claims.
- Voice messages will be recorded, transmitted and received over electronic mail systems, without the need for a separate voice-

Electronic mail will provide alternative facilities that may be more appropriate for some kinds of communication Chapter 3 Current developments will unleash the full potential of electronic mail

messaging system. Electronic mail would be more appropriate if the voice message needed to be associated with another electronic 'object', such as a photograph.

Electronic mail will be used to support computer-to-computer applications

Most of the applications of electronic mail described so far in this chapter enable people to communicate with computer applications. Electronic mail will also be used for direct communications between computer applications. As such, it will become an alternative to realtime data communications networks. We have already described how store-and-forward electronic mail can be used to transfer EDI messages directly between the computer systems of trading partners. Electronic mail will also be used for an advanced and reliable form of file transfer – for example, to consolidate the outputs of various data processing applications into the input for a central reporting system. In future, we expect to see the storeand-forward communications facilities provided by electronic mail being used to support distributed-database systems and distributed applications, for the following reasons:

- Store-and-forward networks, by their very nature, can easily be expanded to any size. Thus, mail networks are an effective alternative to complex, global communications networks.
- Mail networks provide built-in facilities such as archiving, acknowledgement on receipt, directory access and distribution lists, which otherwise have to be built into individual applications.
 - A store-and-forward network does not require the communicating applications to be synchronised or even to be of the same type. Indeed, the receiving application does not have to be operating when the message is transmitted to its mailbox. This makes a store-and-forward network appropriate when the sender has no control over the receiving application.

Some companies have already recognised the advantages of using store-and-forward electronic mail to provide distributed applications. In the United States, Wells Fargo (a San Franciscobased commercial bank) has 97 branches that provide banking and payments services. The main banking systems run on a central mainframe, and exchange data with branch systems using an electronic mail system provided by cc:Mail Incorporated. Wells Fargo decided to use the mail network to interlink applications because the system was already available in all branches, implementation costs were lower than the costs of the alternatives, the system provided reliable transmission facilities, and the messages were timestamped and acknowledged.

The change from using electronic mail as a simple messaging service to using it for the types of services described in this chapter will take time. Some organisations already recognise the wide range of applications that is possible. Unfortunately, few have an organisational environment that will encourage the new applications of electronic mail, and even fewer have the technical infrastructure in place that can support them. In the next chapter,

The store-and-forward facilities provided by electronic mail will support distributed-database systems and distributed applications

Chapter 3 Current developments will unleash the full potential of electronic mail

we describe the organisational environment that will enable electronic mail to succeed. In Chapter 5, we discuss the technical issues and identify the plans that are necessary for building an appropriate technical infrastructure for electronic mail.

Chapter 4

Electronic mail should be promoted and managed as part of the corporate infrastructure

The barriers to achieving the full potential of electronic mail lie within the organisation

A structured approach to the promotion and management of electronic mail is recommended

In the previous chapter, we identified the potential of electronic mail to become an essential part of the corporate systems and communications infrastructure, providing improved business communications, and supporting complex workflows. The barriers to achieving the full potential of electronic mail lie primarily within the organisation itself, rather than with any inherent limitations of the technology. If an organisation cannot overcome these internal obstacles, it is likely to end up with an extensive and expensive collection of diverse electronic mail systems that cannot be used effectively.

Organisational barriers occur in three main areas:

- Among top managers, there is often little awareness of the potential of electronic mail to deliver a wide range of applications and services to the business. They are therefore reluctant to take the lead in sponsoring electronic mail initiatives or in pioneering their use.
 - Among the user population, electronic mail is sometimes seen as a threat, especially when it is used to change particular business procedures, or to cut across organisational boundaries.
- Among the information and office systems departments, electronic mail is often seen as a trivial application. In addition, the organisational structure may not be appropriate for planning, providing and supporting a corporate-wide electronic mail system running highly specific applications.

These barriers have to be broken down if electronic mail is to achieve its full potential. We recommend that organisations adopt a structured approach to the promotion and management of electronic mail, regardless of the status of the systems that they currently have in place. Our proposed approach consists of four stages – identifying specific business applications for electronic mail, getting top management to sponsor and champion its use, stimulating user demand by marketing it within the organisation, and creating an effective management infrastructure to coordinate the activities of the various departments involved. Such an approach should ensure that appropriate opportunities are efficiently exploited.

Identify business applications that can benefit from electronic mail

As we have seen, electronic mail provides a base upon which a wide range of business applications can be provided. In the past, the great majority of electronic mail systems have been introduced as a general-purpose office-communications service. Sometimes, the system has met a real business need, but often by accident rather than by design. Usually, no specific applications have been identified and electronic mail has had no great impact.

The following actions should reveal business applications that can benefit from electronic mail:

- Review information flows to and from business partners. Electronic mail is appropriate in one-to-many or many-to-many trading, or where there is a mixture of formal (structured) and informal (unstructured) traded information (such as the LIMNET service to the Lloyd's insurance market, which was described in Figure 3.2).
- Review internal working practices. Electronic mail can support both cooperative and sequential working practices. It is particularly effective when members of the working groups are situated in different locations or use incompatible computer systems.
- Include electronic mail in the normal systems-planning procedures. Electronic mail may meet applications requirements that cannot be fully met in any other way – for example, for management reporting, where reports are produced on remote PCs and consolidated into a management report on a corporate system.
- Analyse the use of current communications services. Electronic mail may be a better alternative than other forms of communication. One company that we know of regularly uses facsimile to transfer documents between its European offices, even though it has an electronic mail system that could do the job better and at lower cost.
- Identify new communications requirements. Electronic mail can be a very appropriate way of meeting new communications requirements.

Convince top management of the benefits

Success in exploiting electronic mail is partly dependent on recognising its full potential, as we have seen, and partly on changing top-management's attitude to electronic mail. As Figure 4.1 illustrates, while electronic mail is perceived as being a simple messaging medium, top-management's attitude will at best be grudging acceptance of the costs involved. Successful exploitation of electronic mail depends on matching management's attitude with the sophistication of use. The full benefits of inter-business links and group working will be obtained only if management's attitude is changed. This is necessary because electronic mail does not provide benefits to individuals in isolation; it supports a way of working and a way of doing business, and it is therefore essential that it is sponsored and championed by top management. Top management therefore needs to have a vision for the use of electronic mail within the organisation.

Laurie Bride, who has responsibility for strategic planning for interand intra-company networks at Boeing Computer Services (a major US-based computer services company), has such a vision. She If electronic mail is seen as a simple messaging medium, it will win only grudging acceptance from management

Mail systems have often met busi-

ness needs by accident rather

than by design

Sponsorship by top management is essential

26



stated, "Companies that are not planning to transmit a large amount of electronic mail by the year 2000 will have major problems. With the market as it is – with its global aspects and political changes – the ability to move information when and where it is needed is becoming more important. If you cannot move information, you will miss opportunities. It will be similar to not having a telephone."

There are three main ways to create this top-management vision for electronic mail – through contact with other organisations that have profited from it, through pressure from within the organisation and demonstration of tangible results, and by developing a sound business case for particular applications.

Contact with other successful organisations

Top management needs to understand the potential of electronic mail to become a fundamental part of the corporate communications infrastructure, alongside existing computer and telephone systems. The most effective way to encourage this view is through contact with other organisations that have used electronic mail successfully. For example, Westland Utrecht, a Dutch mortgage bank, is looking at the implications of electronic mail because it knows that its competitors are. The company depends on communications with its 200 agents to provide effective services to its customers. It also relies on good internal communications between staff and with its holding company. The board knew that other companies were making successful use of electronic mail to meet these communications

Seeing the success of others will encourage management to follow suit

needs and asked the systems department to examine the potential for electronic mail within the company, and to estimate the costs involved. The board realised that this was an infrastructure expense and did not request a cost justification. A pilot electronic mail service is now underway to stimulate enthusiasm for the system.

Demonstration of tangible results

A second way of generating top-management vision is to demonstrate that electronic mail can be used as the basis of applications that produce real and tangible results. The best way of doing this is to ensure that an electronic mail application is implemented first among a group that have an identified requirement for the application, and a positive attitude towards electronic mail. The group that is selected for the initial implementation will usually be quite happy to adopt the application because of the benefits to be gained, and because of the privilege of being a selected group.

Develop a sound business case for particular applications

A sound business case should be developed for the introduction or development of particular business applications that will be based on electronic mail. In some companies, it is mandatory to do this before expenditure can be authorised. Business applications can be justified both in terms of direct financial benefits and in terms of improved business performance.

However, it is more difficult to cost-justify the electronic mail infrastructure required to support the applications. While an electronic mail infrastructure can result in direct cost savings (reduced facsimile or courier costs, for example), these are difficult to prove. The introduction of a general-purpose electronic mail infrastructure may sometimes be justifiable on business grounds, even if there is no application plan to support it, but it is very unlikely that the infrastructure itself will be cost-justifiable.

Figure 4.2 summarises the likely outcomes of trying to justify the investment of an electronic mail infrastructure or applications in terms of direct financial benefits or improvements in business performance. It shows that investment in applications can be justified in either way. However, expenditure on the underlying infrastructure will often involve business judgement, which is why it is crucial to identify the applications that will be built on the infrastructure. As we pointed out in Report 75, *Getting Value from Information Technology*, the best way of justifying any IT infrastructure investment is in terms of the potential benefits of the applications that will be built on the infrastructure investment is in terms of the potential benefits of the applications that will be built on the infrastructure.

Stimulate demand

The successful electronic mail implementations that we investigated in the course of our research have a single feature in common – demand has come from the business departments. Stimulating this demand is essential if apathy or resistance to electronic mail is to be overcome at all levels within the organisation. It is quite likely that people within the organisation are, It is wise to choose a group with a positive attitude to implement the first application

Investment in applications can usually be justified; an investment in infrastructure seldom can



in fact, already looking for the team-support facilities that electronic mail can provide, but like any other product or service, it needs to be marketed. Managers should take an active role, looking for ways of using electronic mail to enhance the value of the service that their staff provide. Service providers should identify the main sources of information for departments and make these available over electronic mail.

Recognise that electronic mail is a group productivity tool

Electronic mail is primarily a group productivity tool rather than a personal productivity tool and the organisation therefore needs to promote and encourage group or team working, if it is to realise the full potential of electronic mail. Group productivity tools are much more complex to introduce, however, because:

- As with any group initiative, there must be a driving force a leader or an organiser. Group initiatives rarely happen by themselves.
- The identity of the individual may become secondary to the identity of the group, thus decreasing individual recognition.
- A member of a group depends on the cooperation of others, but has little control over their individual contributions. His own performance may suffer because of others.

These difficulties can be overcome by ensuring that the working culture is suitable for group working, and hence for electronic mail.

Ensure that the working culture is suitable for electronic mail

Business departments will make effective use of a new system only if it is consistent with their working culture. If the organisation is

Like any other product or service, electronic mail needs to be marketed

To realise the potential of electronic mail, the organisation needs to promote team working very hierarchical, for example, promoting electronic mail as a system that cuts across levels in the organisation is unlikely to increase the demand to use the system. In Chapter 1, we gave the example of one manager who asked for the mail system to be modified so that he could check the messages being sent out by his staff. This will not encourage his staff to use the system.

If, however, the working culture is based on cooperative groups, promoting the group-support, bulletin-board and newsletter capabilities of electronic mail is likely to increase demand. The use of electronic mail to publicise social as well as business activities can also make the service both acceptable and interesting to staff.

Several organisations to whom we spoke have published 'etiquette' guides giving the 'dos and don'ts' of using electronic mail. A sample of the entries in one such guide is given in Figure 4.3. Involving business departments in the production of such guides will encourage a sense of 'ownership' of the electronic mail facilities.

Figure 4.3	Some organisations have published to use electronic mail	'etiquette guides'	on how

The following is an extract from one company's guide to using electronic mail. "Effective use of electronic mail requires everyone to share the same cultural value about using it. Our philosophy is to be proactive about the use of electronic mail and the productivity improvements it brings. Every employee has access to the system, as do more than 300 of our vendors, suppliers and strategic partners.

Since electronic mail is a relatively new form of communication, we have compiled these brief pointers to using it. Remember it is a quasi-interactive medium, so emotions and the subtle nuances that can be expressed in nonverbal communications, such as gestures, are more difficult to convey.

- 1. Identify yourself and your affiliation clearly.
- 2. Be careful trying to relay any emotions. Clearly label the expression as an emotion.
- 3. Separate your opinion from the facts and label your opinion as such.
- If you must insult or criticise someone, make sure he has an opportunity to respond to the criticism.
- 5. Keep messages short and to the point.
- 6. Assume that the message you send is part of the company's permanent record.
- Assume also that the message will be universally read, even if you sent it only to one person. The message could be printed and distributed in hard copy form. You are not always in control.
- 8. Never use all capitals in a message. This is the equivalent of shouting.
- 9. When sending a file attachment, specify the file format or type of document. The receiver of your message may not know, or have access to, the application software used to create the attachment.
- Write your name or initials at the bottom of your message. It lets the reader know the message is complete and is useful when messages are forwarded several times.

Above all, be clear in what you say."

Employ marketing techniques

Effective marketing of electronic mail can increase demand at all levels in the organisation. The Woolwich Building Society (a major UK home-loans and savings institution) achieved considerable success when its marketing department was called in to promote Demand will be greatest where the company culture is based on cooperative working

There are numerous ways of marketing electronic mail within the organisation

electronic mail internally, using all the techniques that it brings to bear on consumer-oriented financial products. Its achievement is described in Figure 4.4.

Figure 4.4 Like any other service, electronic mail needs to be marketed

The Woolwich Building Society, a leading UK financial-services organisation with over 500 branches, justified its electronic mail system on the basis that, overall, the facilities would enable productivity to be increased by 7 per cent. The challenge was to ensure that staff adopted the system so that the potential improvements in working practices were realised and delivered tangible benefits to the organisation.

Senior managers were committed to using the electronic mail system, which meant that their staff had a strong incentive to use it too. To increase awareness of the new system, the marketing department was commissioned to launch electronic mail as if it were a new customer product. It was given a product name, 'ARROW'.

Five objectives were identified for the marketing exercise:

- To motivate staff and encourage user acceptance of the system.
- To promote understanding of the system and to help address educational needs.
- To promote corporate and individual benefits.
- To encourage use.

- To differentiate electronic mail from other systems.

The following activities were undertaken with a view to meeting these objectives:

- A user survey was conducted to obtain feedback on the initial pilot installation. This provided valuable material, enabling the implementation team to reassure users that their needs were understood and that their views were being taken into account. It was also a source of quotations that could be used in promotional literature.
- An ARROW newsletter was produced describing how the project was progressing and what developments were planned. The newsletter reported success stories, describing how the use of ARROW had assisted in specific tasks. The newsletter promoted the concept of a post-implementation questionnaire, reinforcing the message that users' views were important. It also explained the details of the attractive prizes that could be won as part of the ARROW launch. Every time someone logged on, his name was automatically entered into a prize draw. There was also a competition that required users to answer a series of questions posed by the systems over a period of several days.
- In addition to the newsletter, articles were published in the house magazine, Woolwich World, which was used to alert staff to the introduction of ARROW.
- A video was produced pointing out the differences between the old and the new office environments. To emphasise the differences, the old environment was filmed in the fashion of a silent film from the early 1900s, while the modern office was portrayed in full colour.
- All new users were welcomed onto the system with a personal electronic letter reinforcing the role of ARROW in the organisation.
- Full use was made of traditional marketing gimmicks (for example, biros, pencils, desk clocks), all of which carried the ARROW logo.

As a result of this approach, the take-up of the system was swift and comprehensive. The post-implementation review revealed that the productivity gains exceeded expectations, and highlighted areas in which further gains could be made.

Other possible approaches to marketing an electronic mail service are:

 To make a business group that has been using electronic mail successfully the 'sales force' for the service within the organisation.

- To identify champions. Individuals from the user community who are keen to be involved with electronic mail should be identified and involved in the initial implementation. They will then act as champions and promote the use of electronic mail among their colleagues. They will also act both as a communications channel between the user community and the service providers, and as a first line of support for resolving dayto-day problems.
- To set up a demonstration area. Such an area keeps people informed, can be a very useful source of application ideas, and reduces the perceived threat of new and unknown services. It was adopted very successfully by a large petrochemical company, which set up a demonstration area (known as 'Test drive a Mac'), when it was introducing new office services.
- To produce high-quality promotional material. Promotional material can include brochures, videos, newsletters, bulletins, events and so on. The Dutch Ministry of Home Affairs is running a series of electronic mail projects to improve the exchange of documents in the public sector. It has published a high-quality brochure that describes the aims of the programme, the relevant standards, the different projects of which it is composed, the timetable, the cost and the project organisation. It also provides the names and contact numbers of those involved in the project. Such an approach demonstrates the importance that the ministry attaches to the initiative and helps to generate enthusiasm and commitment.

Create an effective management structure for electronic mail

Managing an electronic mail system that spans the enterprise and links up with other businesses is a demanding challenge. The mail infrastructure will include centralised facilities such as gateways to other electronic mail systems, and to other forms of communications like facsimile, telex and post. These facilities will be used by most departments in the organisation. The mail infrastructure will also support highly specialised local applications – making a set of electronic forms available to support a business procedure in one sub-department, for example. The supporting management structure for electronic mail therefore needs to span the entire organisation, to ensure that the mail system provides an end-to-end service in a coherent manner.

Earlier in this chapter, we discussed the importance of identifying the applications that electronic mail can support. In many organisations, management of electronic mail systems is the responsibility of local units, such as the office systems department. While these local units are capable of identifying local applications, they are not likely to identify corporate-wide applications – and if they do, they have neither the remit nor the resources to implement them. To compound this problem, management of a corporate mail system is usually limited to providing connections between different local mail systems. It does not usually include a remit to identify and implement new applications. The supporting management structure for electronic mail needs to span the whole organisation

Local units do not have the perspective to identify corporatewide applications To exploit the full potential of electronic mail, Foundation members need to recognise two quite distinct management roles:

- Mail-system development. The development role ensures that the mail infrastructure is exploited to provide value-added services across the organisation and between the organisation and its trading partners.
- Mail-system administration. The administration role optimises the provision of these services to all users.

Each of these roles has elements that need to be performed at both corporate and local levels. (In large, multinational organisations, there may be further intermediate management levels, such as national or business-unit levels. For simplicity, we are concerned here only with corporate and local.) Figure 4.5 illustrates that there is a need for a coordinating function that binds these different roles into a coherent management infrastructure.



The development role is usually ignored

In many organisations, electronic mail has been implemented as a project, by a project team, who then hand it over to an operational group for ongoing management. The need for further development is usually ignored, or subsumed within other activities. The result is that no one person or group has responsibility for identifying and implementing further value-added applications. The result is that the electronic mail system is likely to stagnate. While the system may have addressed the critical business needs when it was first introduced, its usefulness and relevance to the organisation's changing circumstances will gradually diminish.

At the corporate level, developers of the mail system need to provide services that meet the needs of the whole organisation. Examples include management-information and reporting systems, executive-information systems, inter-group electronic trading,

A corporate and local function should link development and administration of electronic mail

Usually, no-one has responsibility for the ongoing development of mail systems

corporate bulletin boards and news services, and standard administrative forms.

At the local level, developers are responsible for providing specific mail-enabled applications to their own particular business community. Users who have become familiar with a basic electronic mail system will continue to seek new ways of exploiting the system – to manage their mail more effectively, to automate forms, to provide workflow support and so on. At Cummins Engine, most of the business forms that were automated via the mail system were identified by staff outside the systems department. Revised procedures based on the automated forms were then introduced with the help and cooperation of the mail service providers.

The two distinct roles of central and local development must be recognised if best use is to be made of scarce systems development resources and if full value is to be obtained from the investment in the electronic infrastructure.

Mail administration must be recognised as a critical function

The potential and scope of electronic mail systems is so vast that the administration of the system can no longer be regarded as a single task. Two discrete and complementary roles must be recognised if a responsive and flexible service is to be made available that both meets users' needs and exploits the mail infrastructure.

The role of the *corporate administrator* must cover all aspects of system optimisation and the provision of a standard system to the full user community. The corporate administrator must therefore determine and get agreement on corporate-wide standards to which all local systems must then adhere or interface. Typical examples of the roles to be fulfilled by the corporate administration function include:

- Determining the directory standards to be observed and the provision of the associated directory services, both inter- and intra-company.
- Defining message routeing mechanisms to ensure that external communications costs are contained as far as is possible.
- Identifying and negotiating with suppliers of software and third-party services to ensure consistency throughout the organisation.
- Providing access to corporate information systems.

All the organisations with corporate-wide electronic mail networks to whom we spoke emphasised the importance of recognising the need for corporate administration as early as possible in the development of electronic mail. Corporate guidance and control is essential if an organisation is to achieve the full potential of electronic mail without incurring unnecessary expense in developing linkages between different systems.

The role of *local administrators* is to implement, manage and exploit the mail systems within the guidelines laid down at the corporate level. The local administration role includes: Two distinct roles of central and local development must be recognised

The corporate administrator is responsible for corporate-wide standards

The local administrator operates within guidelines set at the corporate level

- Defining individual users' mailbox addresses.
- Implementing both corporately and locally developed mailenabled applications.
- Providing support for the applications.
- Resolving technical problems relating to specific items of hardware.

Help-desk support must also be provided at both the corporate and local levels to deal with the diverse range of queries that the introduction of electronic mail will inevitably generate. As with any critical application, full help-desk support must be made available if the users are to adopt the system and derive benefit from its use.

Local and corporate groups must be coordinated

Cooperation between local and corporate groups involved in the development and administration of electronic mail is essential if all the potential benefits are to be achieved.

To make local mail services available to the whole organisation, and to ensure that corporate mail services are implemented in a way that is relevant to the diverse needs of local units, a clear chain of communication is required between users, local developers, corporate developers, local administrators, corporate administrators and the help desks. Where the requirement for support spans more than one local mail community, group working will be needed across functional boundaries. Typically, business users in the different local mail communities will already have good lines of communication and will work together as business partners. The organisations that we spoke to emphasised that development groups need to adopt the same cooperative way of working.

The means for fostering cooperation and liaison will be different in different organisations, depending on their culture, geographic distribution and management style. In smaller organisations, the liaison role may well be handled from within the corporate group. However, once the electronic mail community spans several sites and systems, the liaison role may need to be separately defined. In some cases, a separate chain of command may need to be established outside the electronic mail management structure to ensure that corporate and local needs are satisfactorily balanced. Electronic mail systems themselves are often used to support this need for liaison and cooperation, with groupware and other mailenabled applications being used to provide the essential close contact that must be maintained between staff fulfilling the range of roles described above.

Having reviewed the managerial and administrative issues associated with the future use of electronic mail, we turn to the technical issues that must also be addressed if electronic mail is to deliver its full potential.

Help-desk support is essential at both corporate and local levels

A clear chain of communication is required around the whole organisation

If the mail system spans several sites and systems, a liaison role may be necessary

Chapter 5

Electronic mail should be developed as part of the technical infrastructure

Electronic mail systems can now be purchased 'off the shelf at prices that are within the budget of a single department (this is especially the case for local area network mail systems). Mail facilities are also now provided as standard functions with all integrated office systems (IBM's PROFS and Digital's ALL-IN-1, for example), with most local area network operating systems, with many applications and with many operating systems. The result is that many organisations now find themselves with several different and incompatible electronic mail systems, each used in different parts of the business by a 'closed' user community.

Difficulties occur when there is a need to interconnect these diverse systems. Each will need to be modified so it can link to the others, so that it can convert messages to or from different formats, so that it can interconnect with public electronic mail services, and so that it can share directory information with the other systems.

Moreover, it is difficult to provide a high level of functionality and service when several mail systems are interlinked. The tendency is to end up with a subset of common (usually basic) facilities. Scarce (and expensive) technical resources will be required to achieve the interlinking and it is also difficult to hide the complexities of the interfaces from the users. The interlinked systems will also be costly in terms of hardware and software resources. Another drawback is that the attention of in-house service providers will be focused on interlinking different electronic mail systems, rather than on meeting business needs.

The implication is that, wherever possible, a single, comprehensive, corporate-wide electronic mail system based on the most appropriate standards should be installed. This will overcome the problems outlined above and provide a solid base on which to build. Unfortunately, few organisations are in a position to implement a new, single, organisation-wide electronic mail service, and for most, the fit of new mail facilities with their existing systems is more important than conformance with a predefined standard.

Organisations do, however, need a clear policy for electronic mail so that they can introduce different components as needed, and minimise the difficulties and costs of migrating in the future. The essential elements of our recommended policy are to migrate to a single electronic mail structure over time, to adopt a pragmatic approach to standards, and to develop directory services based on the X.500 naming conventions. For organisations that do not have the management structure to support a common systems policy or corporate-wide electronic mail services, third-party suppliers provide a possible solution. It is difficult and expensive to interconnect diverse systems

Where possible, a single corporatewide system should be installed

It is essential to have a clear policy for electronic mail so that components can be introduced as needed

Where different mail systems operate in an organisation, performance suffers

Local area network mail facilities are becoming readily available

Migrate to a single electronic mail structure over time

Organisations that have a variety of electronic mail systems installed in different parts of the business encounter a wide range of problems. Among the more significant are the high cost and limited performance of the gateways required to interconnect the systems, incompatible document and file formats, dissimilar directory structures, poor management facilities, duplicated services, confusing access to the company from the outside world, and difficulties with creating electronic links with trading partners. To overcome these problems, organisations should plan to migrate to a single corporate-wide electronic mail structure as soon as practical. In particular, those that are spending large sums of money on interconnecting existing electronic mail systems should compare the cost with the cost of installing a single electronic mail infrastructure.

Base new systems on a workstation and mail-server architecture

Any electronic mail systems installed from now on should be based on the client-server principles described earlier in this report. The mail server might be a local area network server, a minicomputer or a mainframe computer. In particular, mail facilities based on local area networks provide high levels of functionality and good integration with PC applications at relatively low cost. More important, software products that can be used to build mail-enabled applications will initially be made available for LAN-based electronic mail systems.

More and more local area network mail facilities are now becoming available. Soft.Switch, for example, is developing a Unix-based server implementation of its mainframe-based mail system (known as Soft.Switch Central) that will provide comprehensive mailtransport facilities, directory services, mail-management services, and gateways to other vendors' mail systems and external services. This type of mail server will enable organisations that currently have a variety of LAN mail systems to provide comprehensive mail facilities, without having to incur the expense of installing large centralised gateway facilities. The Soft.Switch architecture is shown overleaf in Figure 5.1.

Adopting this approach does, of course, require everyone who needs access to electronic mail to have ready access to an intelligent workstation. Most LAN-based mail systems are based on this architecture, as are products such as IBM's OfficeVision, Digital's ALL-IN-1 Phase II, Hewlett-Packard's NewWave and AT&T's Rhapsody.

Develop a backbone mail-transfer system

Some organisations have two or more of the better-known electronic mail systems, such as those provided by IBM's PROFS or Digital's ALL-IN-1. These systems will usually be interconnected via a high-function gateway, and access to public mail services will usually be provided via gateways specific to each system. Other organisations have a greater number of different mail systems, and



in such cases, the interconnection of different mail systems through specific gateways is virtually impossible.

The mail architecture that such organisations should be planning to migrate to is shown in Figure 5.2. It shows a backbone mailtransfer system that is used to interconnect the different mail systems.



A corporate-wide backbone mail-transfer system provides distinct advantages to large organisations that need to interlink a range of existing electronic mail systems: Where interconnection via gateways is impossible, a backbone mail-transfer system is the answer

 Information passing from any one mail system to any other will have to pass, at most, through two conversion stages – thus minimising the losses that often occur as information passes through gateways.

 Business units will have greater freedom of choice in selecting their mail system. Provided that the selected system conforms with the standard for accessing the mail-transfer backbone, users have immediate access to the rest of the mail community.

— The organisation has the choice of building its own corporatewide mail-transfer system, or of contracting the provision to a third-party provider. In the latter case, the third party does not necessarily need to have access to the private mail systems connected to the backbone (which may contain sensitive information), or to the user names.

 Intensively used and expensive gateway facilities, such as a fullfunction telex store-and-forward router, can be accessed via the backbone mail-transfer system, rather than via each individual electronic mail system. This avoids duplication of services and applications.

 Systems management, and systems-management utilities, can be provided across the mail-transfer system, increasing the level of service to each attached mail system.

If organisations do not have the option of providing a single corporate-wide mail system, this architecture provides a convenient way of creating an organisation-wide electronic mail infrastructure. It will also allow the proliferation of different LAN-based mail systems that is likely to occur over the next few years to be accommodated in the mail infrastructure.

The architecture shown in Figure 5.2 requires clearly defined standards that specify the interfaces to external public mail services, the standards for the backbone mail-transfer system itself, and standards for interfacing individual mail systems to the backbone. Such an architecture is already used by many organisations, albeit inadvertently. This occurs when one mail system predominates, with other systems connecting to it via specific gateways. These gateways usually provide different levels of functionality depending on the connecting system, and this restricts mail delivery across multiple systems to a minimum level of functionality - normally only basic text. Other organisations are specifically planning to introduce a mail architecture based on this approach. Shell, for example, has completed a two-year pilot trial to assess the viability of using this architecture for electronic mail, and is now working on the full implementation. Its experience is described overleaf in Figure 5.3.

Take a pragmatic approach to mail systems based on international standards

The X.400 series of recommendations jointly defined by the Consultative Committee for International Telegraphy and Telephony (CCITT) and by the International Standards Organisation (ISO), describe a model for a distributed, vendorindependent electronic messaging system. They specify the

A backbone mail-transfer system will allow different LAN-based mail systems to be accommodated

Figure 5.3 Shell International is developing an X.400 backbone mail architecture

In 1989, Shell started a pilot X.400 electronic mail trial, called the Demonstrator project. The aim was to determine whether the X.400 standard was suitable for providing a general backbone mail interconnection service to Shell's other main mail systems – IBM's PROFS, Digital's ALL-IN-1 and Hewlett-Packard's Desk. The pilot system was successful, and Shell is now implementing a full X.400 backbone mail service.

The objectives of the new X.400-based service are:

- To allow the different Shell mail systems to intercommunicate with each other.
- To provide sufficient reliability and service levels to allow the mail service to replace Shell's private telex network.
- To provide a standard and auditable way of communicating with other organisations.

Shell believes that, at the end of the 1980s, technical difficulties prohibited the widescale use of X.400 services within organisations, but that many of these technical difficulties have now been overcome. The introduction of X.400 services is therefore now a practical proposition. Shell warns, however, that companies need a high level of technical expertise to interpret the meaning of suppliers' statements about X.400. Despite assurances of conformance and interworking, Shell has found that some of its main vendors' products have not functioned as it would like, and it has had to use products from other vendors instead.

messaging protocols used by each participating system, the logical structure of the overall system, the functionality of the principal components, and the way the components interact with some external services such as the X.500 directory services. The first series of X.400 recommendations appeared in 1984, and were extended significantly in 1988. Many of the X.400 public mail services currently available are based on the 1984 standards. These services are being enhanced to comply with the 1988 X.400 standards. However, the 1988 standards are now sufficiently mature to allow them to be used as the basis for corporate electronic mail infrastructures. In particular, products based on the 1988 standards are becoming available.

The significance of X.400 is that any electronic mail system complying with the standards will be able to send messages to, and receive messages from, any other X.400 system. Eventually, it will become the basis for a worldwide messaging system similar to the worldwide telephone network, although this would require cooperation between national telecommunications administrations. During our research, however, we discovered widespread misunderstanding of the role of X.400, and its application to solving today's corporate electronic mail problems. With the electronic mail architecture depicted in Figure 5.2, standards need to be defined at four levels. X.400 is the mandatory choice for one of the levels, a sensible choice for another, and a likely future choice for a third. At the fourth level, an X.400 system should be chosen only if it provides the required functionality.

The external access standard must be X.400

The external access standard specifies the interface between the mail backbone and the outside world, either to mail systems in other organisations, or to public mail services. X.400 is the mandatory choice of protocol for interconnecting the mail backbone to public

X.400 standards are mature enough to form the basis for corporate electronic mail infrastructures

Standards need to be defined at four levels

Organisations should adopt X.400 as quickly as possible for all connections to the outside world

> X.400 will usually be the most appropriate choice for the backbone protocol

In time, X.400 will be the best choice for internal access protocols

mail services. It is also the preferred choice for interconnection to other organisations' mail systems. X.400 is already used by many organisations to connect to public services, usually via an X.400 gateway attached to each of the mail systems used by that organisation. Access to other organisations' mail systems usually requires bilateral agreement or both parties to adhere to a common standard. In the academic world, for example, different electronic mail systems are interconnected via the worldwide Unix-based Internet network. We believe, however, that Foundation members should adopt X.400 as quickly as possible for all connections to the outside world.

X.400 will be a common choice for the backbone mail-transfer system

Standards will also need to be defined for the store-and-forward transport of mail messages across the mail-transfer backbone. For reasons of economy, simplicity, performance, integrity and manage-ability, a single backbone protocol should be defined, based on industry-wide standards. The main choices are X.400, IBM's SNADS (SNA distributed services – the standard that forms the basis of IBM's electronic mail products), Digital's Mailbus, or SMTP (simple message-transfer protocol – the Unix equivalent of SNADS or Mailbus).

The backbone protocol should be chosen to match the organisation's existing internal data communications and systems infrastructure. In a large IBM environment with an extensive SNA network, for example, use of SNADS will be more cost-effective and will provide greater functionality than a separate X.400-based backbone. All other factors being equal, however, X.400 is the most appropriate choice for the backbone protocol. X.400 provides highly functional message-handling capabilities, and there is no need for gateways to provide access to external services.

In choosing the products that will form the backbone system, it is important to remember that the purpose of the backbone is to provide a corporate-wide *networked* mail system that is complete and manageable. Many of today's X.400 product offerings provide a standalone switch – not the multiple-node network required for the backbone.

The internal access protocols should conform to the backbone architecture wherever possible

Internal access standards are required to enable the individual mail systems installed in different parts of the organisation to access the backbone mail-transfer system. The protocols chosen should provide the highest level of functionality to most of the individual mail systems. In time, the X.400 protocols will be the best choice, particularly where the backbone is based on X.400. In general, the internal access protocols should be chosen to conform with the backbone protocols. Thus, in an IBM environment, SNADS will continue to be the best choice. A particular point to consider when choosing the internal access protocols is the level of complexity involved in interfacing individual electronic mail systems to the backbone. Individual mail systems that are not based on the same standards as the internal access protocols will have to be provided with a highly functional gateway in order to access the backbone.

Individual mail systems should be chosen on the basis of integration, function and ease of use

The fourth level of standards in the electronic mail architecture concerns the standards that define the internal structure of the individual mail systems used at departmental level. In general, these systems should be chosen to provide the highest levels of functionality to users, regardless of the internal protocols they use. Thus, an X.400-based electronic mail system should be chosen only if it can provide the same levels of performance as alternative systems and at a similar cost. The chosen systems must, of course, be capable of implementing the internal access protocol. Thus, if the backbone system is based on X.400, each individual mail system will need an X.400 gateway, even if the system itself is not based on X.400 standards. Doing this will ensure that users of different minicomputer-based and PC-LAN-based mail systems can use the same underlying backbone mail-transfer system, without loss of flexibility or performance.

Develop directory services based on X.500 conventions

Someone wanting to make a telephone call without knowing the telephone number may either look up the number in a printed directory, or call the PTT's directory enquiries services, or access a computer system that holds a database of telephone numbers. Similar directory functions are required in an electronic mail system, so that the originator of a message (either a person or a computer system) can find out the mailbox address of the recipient.

The corporate electronic mail directory is one of an organisation's most important information resources. Such a directory is essential if corporate-wide electronic mail services are to be provided, and if coherent electronic links are to be established with business partners. Lack of a directory is one of the major problems that organisations face when they want to migrate to new electronic mail architectures. We therefore believe that organisations should take immediate steps to develop coherent directory policies based on the naming conventions of the X.500 international standards.

The X.500 recommendations define the structure of entries held in a directory database and the services that the database will provide. They also envisage a distributed database environment so that, in theory, X.500 directories could be interlinked to form a single, worldwide electronic mail directory. The entries in an X.500 directory will be accessed by electronic mail systems to obtain the addressing information required to route a message to its intended destination. X.400 mail systems are designed from the outset to be able to use X.500 directories. Other systems can also access X.500 directories, but special interfaces will need to be written to allow this to happen.

The structure of an X.500 entry is complex because it needs to include information about the particular person, device or service to which the entry relates, including the name, country, network address, the organisation, an identifier such as job title and so on. (These are known as the attributes of an entry.) However, by using the X.500 naming and structure conventions, an organisation will An X.400-based electronic mail system should be chosen only if it can provide similar cost and performance to others

A directory is essential for corporate-wide electronic mail services

X.500 defines the structure of entries held in a directory database

Using X.500 conventions will minimise future migration difficulties

Implementation of distributed directories is extremely complex

A third-party service provides two main advantages

minimise future migration difficulties and will ensure that a valuable information resource can be exploited as X.500 products emerge.

Existing directories and naming schemes for other communicationsbased services, such as computer networks, should be migrated over time to conform with the X.500 standards. Organisations should also develop a registration policy to ensure that all the relevant information is loaded into the directories.

Products to create and store X.500 directories and to enable them to be used are becoming available, but we urge extreme caution in using these products today. The implementation of effective, highperformance, distributed directories is an extremely complex problem. In addition, the X.500 standards are not yet stable – for example, those elements relating to the handling of replicated entries have not yet been defined. The next version of the X.500 standards is due in 1992, and it will be several years after that before stable, mature products, based on this version are available.

We sought the view of Banyan Systems, which has provided a global distributed directory with its Vines product since the early 1980s. Banyan's experience is that, although X.500 can in theory allow for unlimited levels in the directory hierarchy, user organisations find that three levels are sufficient and are easier to manage. The company believes that, until X.500 is a stable, mature standard, suppliers providing X.500 implementations will have to provide their own answers to many of the basic directory-design decisions. Like other suppliers, Banyan is, of course, integrating the X.500 standard into its directory developments.

Consider using a third-party service provider

In the preceding sections of this chapter, we have described the elements of a policy that will ensure that business benefits can be derived from electronic mail. As we have described above, many of the relevant standards are still subject to amendment and enhancement, while others have yet to be ratified. This situation means that organisations wishing to obtain the benefits from the mail-enabled applications described in this report must consider carefully how to expand their mail networks across diverse systems. There are essentially two options available for the creation of a corporate-wide electronic mail backbone – either to develop an inhouse solution or to use a public service provided by a third party.

Third-party network services provide the opportunity to gain the immediate benefits of mail without incurring the overheads associated with developing an in-house system. By guaranteeing a standard, established and consistent interface, a third-party service provides two main advantages: existing discrete systems can be connected and the internal staff who support the corporate electronic mail system do not require a detailed understanding of the workings of complex international standards.

In addition, third-party suppliers have the skills and resources to exploit fully the features available with advanced mail systems. Users of their services thus gain access to advanced techniques for the manipulation and transfer of information between disparate systems – facilities that are usually available in-house only to the largest, most sophisticated private-network operators. In addition, third-party services usually provide a high level of systems audit and management – features that are of great value when initial systems are being set up and monitoring of use is required.

Several users of third-party services gave another, less obvious reason for choosing this solution. In many organisations, the positioning of the corporate network-administration function may be seen as a political issue. Using a third party to provide the service and to define many of the corporate standards can be a way of avoiding 'ownership' issues.

Report conclusion

In this report, we have shown how electronic mail is evolving from being an alternative means of communication to having the capability to fulfil a strategic role within the corporate business and systems strategies. We have illustrated how the use of electronic mail systems will change over time and highlighted the issues to be addressed if the potential benefits are to be obtained.

For many years, electronic mail has often been regarded by systems staff and users as a peripheral application. By the mid-1990s, however, electronic mail will have become an integral part of mainstream computer applications. It is therefore essential that systems and business managers, at all levels and across all disciplines, are aware of the changed and constantly changing scope of mail-enabled applications.

The development of electronic mail has now reached the stage where it can help organisations to make radical changes in the way tasks are performed and procedures are managed. We believe that, in many organisations, the extent of its use will be limited only by the vision of the management. This report has provided information and advice that will ensure that Foundation members are fully aware of the potential of electronic mail. Use of a third party gives an organisation immediate access to advanced techniques

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The Butler Cox Foundation is a service for senior managers responsible for information management in major enterprises. It provides insight and guidance to help them to manage information systems and technology more effectively for the benefit of their organisations.

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