
INFORMATION TECHNOLOGY

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The term “Information Technology” (now generally abbreviated to IT) is a comparatively recent addition to the English language. It has been defined in many different ways. The most suitable definition for our purposes is:

“Information Technology is concerned with systems for the creation, acquisition, processing, storage, retrieval, selection, transformation, dissemination and use of vocal, pictorial, textual and numerical information. Current systems typically utilize a micro-electronics-based combination of computing and telecommunications.”

The starting point for a closer understanding of IT is the phrase “combination of computing and telecommunications”. For over thirty years now computers have been used wherever man is at work, but especially in business and governmental organizations, as data processing machines. They are able to receive data through a variety of input devices, and process (i.e. sort, classify, do calculations on, store, retrieve from store, and summarize) that data according to instructions held in an internally stored programme. The information which results from the processing can be made available as printing on paper, as visual display, on microfilm, and as voice output (or audio response).

The early computers were very large, stand-alone, machines. But during the 1960s and early 1970s a very significant development was the attachment of terminals to the large central computer. The remote user now had access to the power of the computer in his own office or work-place. The link between the terminals and the central computer was provided by telecommunications technology, using existing or specially-installed telephone lines.

With the invention of the mini-computer in the early 1970s, further progress became possible. Large organizations installed mini-computers in geographically dispersed locations such as warehouses, factories and branch offices. Staff at these locations carried out their own data processing on their mini-computer which at the same time could transmit information to and receive information from the

central computer through telecommunications links. Often the dispersed locations could communicate with each other by the same means. These arrangements which are now common in large organizations are known as “distributed data processing”. They are based, in the words of our IT definition, on a “combination of computing and telecommunications”.

Other examples from every day life where the two technologies can be seen working together are:

1. Reservation systems for airlines, theatres and hotels.
2. Electronic point – of – sale (EPOS) data capture systems in supermarkets and large retail stores.
3. Automated teller machines (ATMs) which are increasingly to be found built into external walls of the High Street banks.

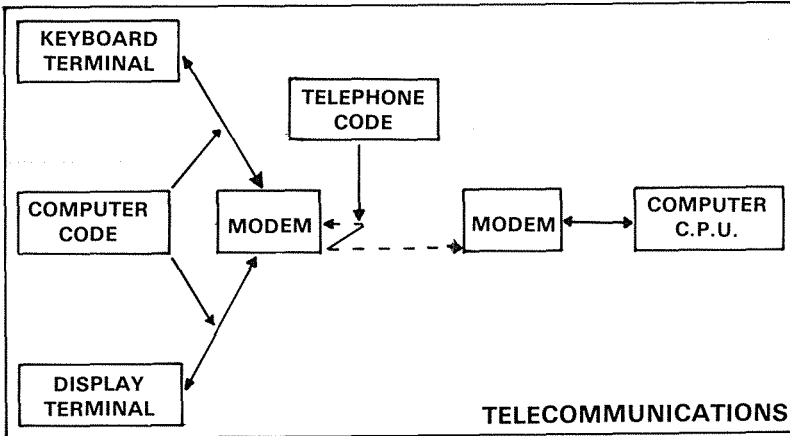
All these systems, and many more examples could be given, permit the two-day transfer of data, through a telecommunication link, between terminals (or small computers) and a large centrally-located computer. The systems are excellent examples of information technology as described in the opening definition.

This revolution, and revolution is not too strong a word, is now beginning to have a significant impact on the work of offices, beyond the day-to-day processing of data and provision of information for management. In the last few years a new range of micro-electronic-based products and services have become available and new ones are regularly being developed. This article will consider two of the more important of these IT products and services shortly but, first, some explanation of what is meant by “telecommunications technology” and of what developments are taking place in this area is required.

Telecommunications

Whilst readers may have an adequate understanding of the different elements of a computer and how they work together under programme control, they may not be familiar with telecommunication technology. A brief account of this is therefore provided. The telephone system was originally designed as a medium for transmitting the human voice. It works on a “analogue” basis, the voice being represented by electrical signals varying in frequency and amplitude. The computer holds data in digital form, using binary digits “one” and “zero”. To transmit

this digital data down a telephone line it is necessary to convert the data into analogue form and then reconvert it to digital signals at the end of the transmission link. The device which carries out this two-way conversion is called a Modern (*Modulator/Demodulator*). The following diagram illustrates the arrangement.



The telephone system, as we have seen, was not designed for the transmission of data. Speeds are relatively slow and, despite powerful checks, data can be lost in transmission. It is for these reasons, and because of the general acknowledgement of the importance that data transmission will have in the information technology based society of the 1990s, that a new network, which would be similar to the existing telephone network or the electricity supply grid, is being developed.

The establishment of this digital network can only serve to stimulate the growth of systems in which all users of computers can interchange data and information with each other safely and speedily, irrespective of geographical location. For example, there will be no technical reasons why all business transactions concerned with the settlement of debt should not be carried out electronically. Company A's computer will invoice Company B's computer through a national digital network. Company B's computer will, through the network, ask its bank to settle the debt electronically with Company A's bank, at the same time advising Company A of this action. Trials of these and similar systems have already taken place in the U.S.A., West Germany, Japan and the U.K.

Electronic Mail

The convergence of computing and telecommunications technologies, allied with the invention and use of a range of other IT products, is beginning to make electronic mail possible. Each week brings a shower of announcements about new developments in electronic mail and message handling devices. These developments make telex and letter post look like museum antiques.

Electronic mail is best viewed quite simply as a practical alternative to the conventional postal service. There are a variety of services available. The distinguishing feature of them all is that messages are transmitted not on paper, as in conventional mail, but through telecommunication links.

(a) TELETEX

At present there is a well-established. TELEX service which carries teleprinter signals over telephone lines. The equipment is relatively simple. At both source and destination of the message there is a teleprinter with keyboard and printer. A paper copy is originated for all messages sent and received.

However, a new and greatly improved service has now been introduced. The new service, called TELETEX (not to be confused with TELETXT, see below), enables a subscriber to transmit, receive and reproduce letters or messages by means of special terminals which may be either memory typewriters or word processors. Transmission of an A4 page of text is possible to a number of destinations in less than 10 seconds. There are special security features incorporated in the system, including the use of passwords. When the text arrives at its destination it is stored electronically and need not be printed until an operator is in attendance. In fact, it need not be printed at all – it could be displayed on a screen instead.

Systems similar to TELETEX in the U.S.A. and West Germany can accept for transmission messages originated by voice or by computer.

(b) Facsimile Transmission

Facsimile transmission is a well-established service for sending a copy of an original document to the receiver. The signal for transmission is generated automatically by the facsimile machine which scans the page to be sent. An A4 page takes about 3 minutes to transmit.

In the U.K. these are two separate services. The Post Office's INTELPOST receives pages for transmission between 18 British cities

and between London and Toronto. British Telecom's service is called BUREAUFAX and can transmit to 19 different countries. Both these systems use computers to store transmitted data if the receiving terminal printer is busy or faulty. In this way batches of pages can be accumulated in the computer's store and transmitted automatically at the appropriate time.

The use of facsimile transmission is not confined to documents. It is possible to transmit pictures (e.g. from newspapers), forms, charts, and so on.

(c) Computer-based Services

These services, as the name implies, put the computer, or a computer network, at the heart of the electronic mail system, eliminating completely the need for paper as the input and output medium. The computer acts as a central store of messages, despatching messages to users when instructed to do so or making them available to the user when it suits the user to retrieve them. As part of the system, the computer also provides word processing facilities to its user. This service can be rented from a public – access network (see External Data Bases below).

With computer – based electronic mail, users have personal codes which permit them to enter messages into and receive messages from the system at any location or time. Portable terminals in future will permit the user to plug into a country – wide digital network and transmit messages which can be stored if the recipient is not available. Similarly, the central computer can transmit or “broadcast” messages to any number from a stored list of designated users of the network. These systems are still few in number but they indicate the direction in which electronic mail, as an automated office service, is heading.

Two last points can be made in conclusion. Electronic mail is much quicker and more reliable than the ordinary postal service. It also has the great advantage that it can transmit information without the use of paper. There is a psychological barrier in the way of a general acceptance of paper-less mail but all past experience indicates that this barrier will be overcome and that electronic mail will be a common means of communication in the future.

With regard to the telephone service, the electronic mail's advantage lies in the fact that messages can be transmitted, stored and forwarded to the recipient at a time that suits both caller and recipient. There is no longer a requirement for them both to be available at the same

time.

Access to external data basis

Systems exist which permit the user, in business or in the home, to have access to large volumes of data held in external data bases. The data is transmitted via the telephone network or broadcast and displayed on the screen of a television set. There are two types of service:

VIEWDATA: These services permit an interactive link between user and the data base.

TELETEXT: These services are non-interactive. The user can select and retain the texts and graphics transmitted to his television screen.

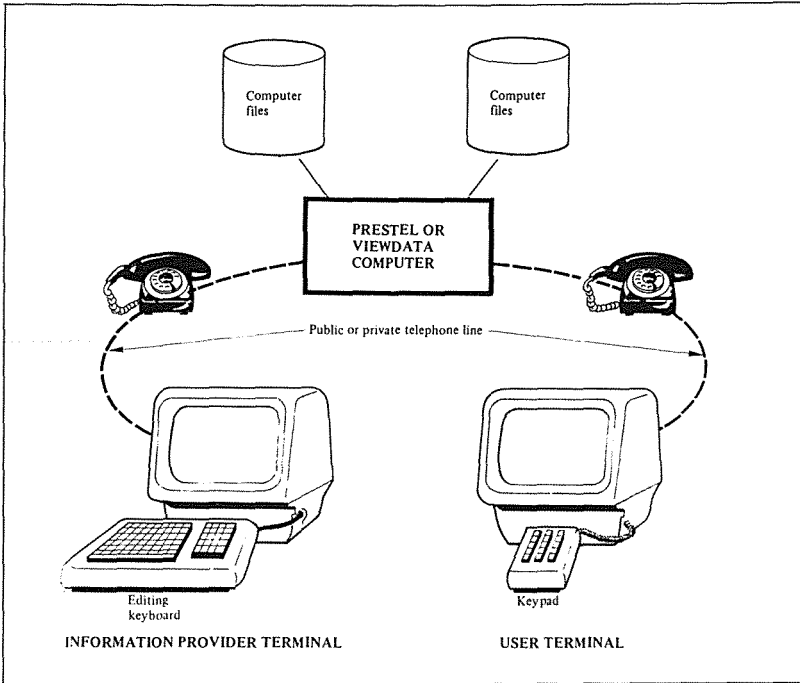
There is a tremendous variety in the information that can be available in both services: national and international news; sports news; weather forecasts; travel services; stock market prices; exchange rates and so on. They will now be described in more detail.

VIEWDATA. This is a system for accessing information on a large data base using a telephone line and a television set that has been specially adapted. The user has a simple keyboard to communicate with the system. Through the keyboard he can select the information he requires and, for example, book travel tickets or make hotel reservations.

The information is held in the computer's data base as a series of frames or pages. If the page number required is known, access to it can be made directly. Alternatively, a set of menus is displayed, which lead the user page by page to the information required. It is possible for the user to keep his own files of information in a Viewdata system but an enlarged keyboard is needed for this facility.

Viewdata is a generic term for interactive information services. In the U.K., the principal viewdata service is called PRESTEL. Prestel was introduced in 1979. It was originally intended, very optimistically, for domestic use, with a T.V. set adapted for Prestel in every home. However, the cost was too high for the ordinary householder who, anyway, had access to information in newspapers, magazines and over the telephone. It now finds its main use in business.

Prestel is operated by British Telecom who provide the computers which hold and permit access to all the information. British Telecom also, of course, charge for the use of the telephone lines for the



Concept of a viewdata system. On a working system there will be many user and information terminals.

duration of the "call", i.e. an access to the system.

The information held by Prestel is provided by organizations such as the Stock Exchange and *The Financial Times* newspaper but also by specialized companies who act as agents for all those organizations who wish Prestel to hold information about themselves.

A development within Prestel has been the formation of groups of companies and organizations who use the system to store information about themselves for each other's use. This idea has been taken further with the introduction of "gateways". Instead of providing British Telecom's computers with information, providers of information store the information on their own computers. Users of Prestel can gain access to this information via a "gateway" between the Prestel system and the information providers' own computers.

Another modification to the overall system has benefitted small businesses which might find the cost of telephone charges for using

Prestel rather high. A micro-computer suitably modified with communications equipment and with the right software can now communicate with Prestel. What happens is that selected pages of information can be copied from Prestel and written on to a diskette held in the micro-computer. This information is now available for the user on the micro-computer's screen.

TELETEXT. The Teletext system transmits pages of information through the air using normal television broadcasting techniques. An adapted television set receives the information sequentially one frame after another. This is a big disadvantage because the receiver has to run through other pages to come round to the particular information required.

In the U.K., there are two systems; CEEFAX, which is transmitted by the BBC, and ORACLE, the ITV system.

The information stored does not compare in volume with Viewdata systems but, after the initial cost for the modification of the T.V. set, it is completely free.

This article has been primarily concerned with two of the most important services IT can provide, namely Electronic Mail and Access to External Data Bases. However, it should be noted that IT products are affecting, to a greater or lesser extent, virtually all areas of human endeavour. In particular the use of IT is bringing about rapid and accelerating change in the following fields at present: manufacturing, retail trade, publishing and printing, banking and finance.

A revolution in electronic communications is under way. The technology *can* work. Whether it *will* work is another matter.