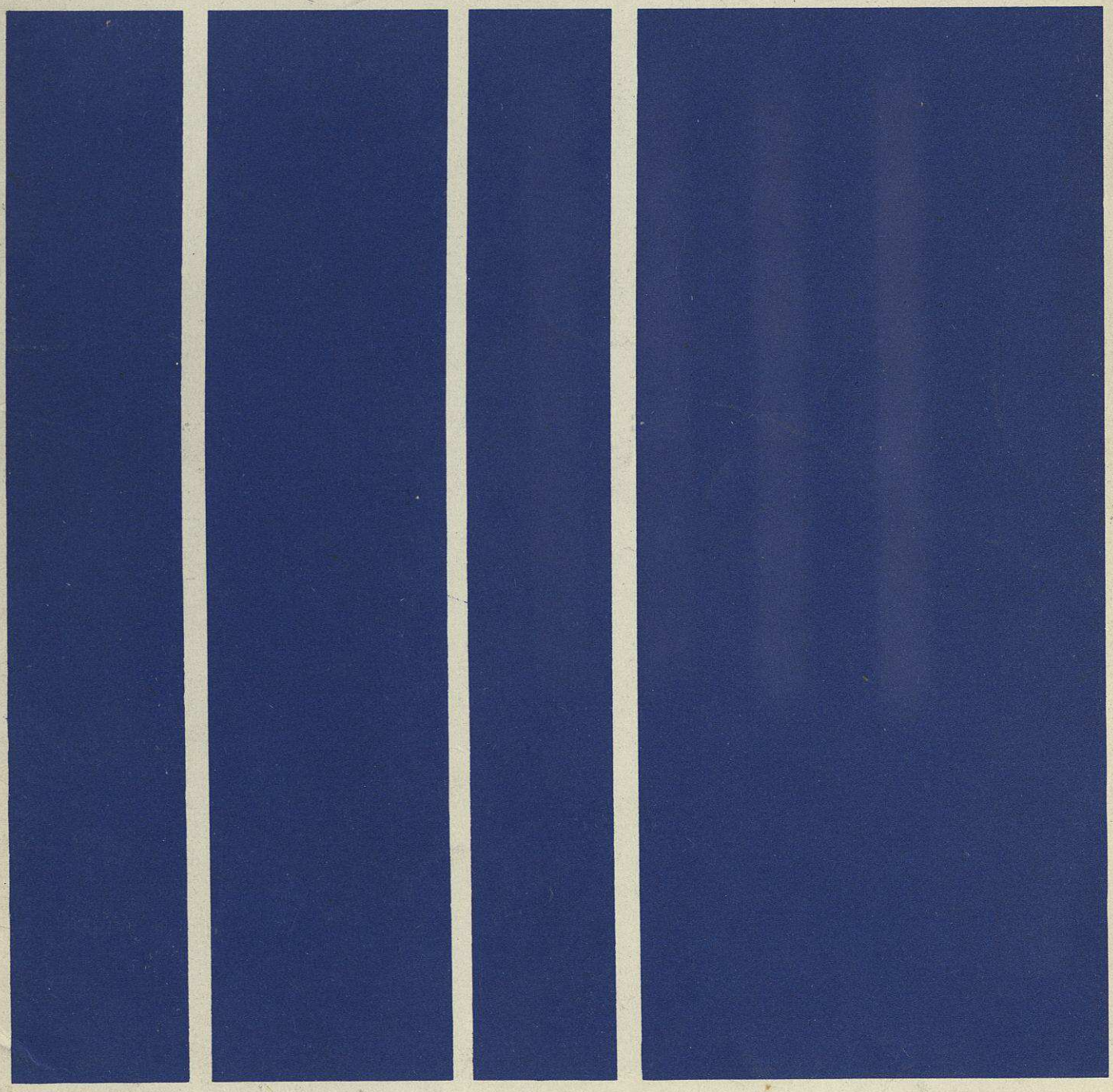
Report Series
No 6

Viewdata

March 1978



The Butler Cox Foundation

Abstract

Report Series No 6

Viewdata

by Roger Woolfe
March 1978

Viewdata is the name of a new service linking the telephone and TV to provide cheap and easy-to-use information retrieval and interactive computing in British homes and offices.

It is working today. A pilot trial has been in operation for more than two years and a market trial with over one thousand TV terminals begins in key cities in the next few weeks. Over 100,000 frames (screensfull) of information are already allocated to more than one hundred independent businesses wanting to bring them to the attention of other businesses or to the general public. The information ranges from flight time tables to share prices, from job vacancies to second hand cars.

Viewdata's interactive features open the door to a variety of applications, such as calculation services, shopping by TV and sending messages to other Viewdata users or (in a few years time) to telex subscribers.

All the UK TV manufacturers are involved developing new designs of colour domestic sets and small monochrome business sets with integral keypads and built-in decoders and modems.

The Post Office has made the original development effort and the major investment – over £5 million so far. The system has been sold to the W German PTT and the Post Office is actively involved in negotiations with several other European countries.

Compared with conventional media and services, Viewdata offers a combination of features which are both attractive and unique. But there are alternatives in existence or under development aimed at providing similar services. How does Viewdata compare in terms of convenience, security, cost and capacity? What are its weaknesses and limitations? It is designed to be simple and rugged but as a consequence is it too slow and restrictive? And are more advanced and sophisticated alternatives likely to emerge which could obsolete it in the near future?

This report helps to answer questions like these by examining Viewdata in some detail. It has been written both for managers directing external business strategy and for those concerned with the planning of internal information systems.

The Butler Cox Foundation

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Acknowledgement

Acknowledgement is due to Sam Fedida, the inventor of Viewdata and until recently the leader of the Post Office's research team responsible for its development, for his help with the preparation of this report.

I. INTRODUCTION

A Purpose and Scope of the Report

Viewdata is the name of a new information service from the British Post Office, designed to serve the business community as well as the general public. The idea is to link adapted TV set terminals to a network of computer databases via the telephone system. The service is interactive (two way): a user can interrogate a database using a simple hand-held keypad attached to his terminal, receiving in return information for display on the screen. In addition to this, the interactive capability opens the door to a wide range of applications such as transmitting messages and shopping by TV.

Viewdata is working today. A pilot trial has been running for over two years, and a representative market trial will begin this summer. The service is planned to become fully operational by the end of next year and could extend right across the country during the 1980s. Ultimately millions of Viewdata terminals could be in use, connected to hundreds of computers each supporting a database equivalent in size to a thousand fair sized books.

Anxious to improve the return on its huge investment in the existing telephone network by increasing its utilisation, the Post Office has made rapid progress since starting to develop Viewdata in 1970, and now claims a two year world lead. The TV set manufacturers see Viewdata as a means of stimulating a fresh market, as colour television approaches saturation and sales of replacement sets represent their major demand.

Recently there has been a great deal of business and public interest in Viewdata as evidenced by press, TV and radio reports, and by demonstrations at conferences and exhibitions both in the UK and abroad. It has been described as the most exciting new development in communications, and even as the vehicle for ushering in a new era of home computing and electronic mail.

Compared with conventional media and services, Viewdata offers a combination of features which are both attractive and unique. But there are alternatives in existence or under development aimed at providing similar services. How does Viewdata compare in terms of convenience, security, cost and capacity? What are its weaknesses and limitations? It is designed to be simple and rugged but as a consequence is it too slow and restrictive? And are more advanced and sophisticated alternatives likely to emerge which could obsolete Viewdata in the near future?

The aim of this report is to help answer questions like these by examining Viewdata in some detail. We start in Section II by describing the services which it offers and how to use them. Section III begins with a summary of its main attractions and weaknesses, and then goes on to examine its costs to users from two points of view. The first of these is the point of view of a business which provides information for storage and retrieval on the system – the costs, revenue opportunities, problems and risks. The second point of view is that of the businessman or private individual who wants to use the services which Viewdata can offer.

Next, in Section IV, we describe some complementary and competing systems which are emerging, and draw conclusions about the applications which are likely to be most appropriate for Viewdata.

Section V is about how Viewdata works. Inevitably the discussion is somewhat technical but

our aim here is firmly on revealing the underlying principles in such a way that the implications which really matter – format limitations, integration with other services, cost reduction possibilities and so on – can properly be appreciated.

This is followed in Section VI by a description of the present status of Viewdata as it approaches the end of the pilot trial, and an outline of the plan for the market trial which will follow. We also look ahead in this section to the start of a public service in the UK, describing how the Post Office envisages the service expanding geographically across the country in the 1980s, and how its capabilities might be extended to support a broader range of services. The possibility and problems of using Viewdata internationally are described, together with the prospects of European standardisation on the system, which is clearly a matter of vital concern for its long term future. Finally in this section we look at other developments which are likely to alter dramatically the role of television in the home and to present new methods of information processing in business: both areas are important to the future of Viewdata.

Section VII, the final one in the report, brings together a summary of the key influences in the development of Viewdata, and a short description for managers on how to stay in touch – or, for those convinced of its potential, how to climb onto the band wagon as it gathers speed.

Some businesses will regard Viewdata as a means of creating new business opportunities – for example by bringing their services to the attention of the public, or by providing information to other businesses or to the public in a form which is both convenient and up-to-date. Others will see it as an alternative form of providing internal management information. This report therefore is designed to be read by managers responsible for directing external business strategy, or by those concerned with the planning of internal information systems.

B Background

For those who are unfamiliar with it, this section provides a brief summary of the main services which Viewdata has been designed to provide.

A major attraction of Viewdata is the almost limitless store of information it will be able to offer. Some of the information ('public') will be generally available to all users; the remainder ('private') will be available only to restricted ranges of users and private individuals.

Public information might include topical items such as news and local events; reference information such as directories, travel timetables and entertainment; and economic guidance such as taxation, shopping prices and interest rates. The Post Office will be responsible for providing the network of computers, renting space on the databases to Information Providers who will create and maintain the information and set a price for its use.

Private information is similar, but access to it will be restricted to specific users sharing a common interest called Closed User Groups such as farmers, travel agents or bank managers, and also to private individuals. Such users will also be able to access public information, thus enjoying the privacy of a private network while retaining the economic and other advantages of a public service.

In addition Viewdata will work as a message communication medium by allowing users to select standard messages, or to create their own, which can be passed to other users for display on their terminals through the system's store and forward capability. Message communication is an example of interactive working. Other interactive services which Viewdata could provide include education, calculation and credit purchase.

Finally, businesses could set up their own in-house systems independent of the national network but able to access it when necessary.

The Post Office has used the domestic TV rather than the computer industry standard visual display unit (VDU) as the basis for its terminal because its original view was that the domestic market would predominate and TV sets were ubiquitous, convenient and relatively inexpensive.

At an early stage the decision was taken to adopt the Teletext standard for transmission and display; and one major advantage of this is that much of the additional set circuitry can be shared. This immediately raises the question of how Viewdata and Teletext relate, because at first sight the two appear very similar: both are able to display similar-looking text, numbers and simple graphics in up to seven colours on the screen.

Teletext is the generic name for the broadcast services introduced recently by the BBC (called Ceefax) and the IBA (called Oracle). To understand the principle of Teletext, imagine a Kodak carousel containing eighty slides rotating constantly once every twenty seconds, displaying the slides in rapid succession at the rate of four every second. The carousel is at the TV transmitter, and the contents of each slide is transmitted in the form of coded pulses superimposed upon the existing picture signal. To capture and display a slide on an adapted TV receiver a user must first indicate to the TV receiver by using a simple keypad the number of the desired slide, and then wait for the carousel to come round to the correct position and to transmit the contents of the slide. The TV receiver stores the pulses, decodes them and displays them on the screen as long as the user needs. When another slide is required the sequence must be repeated. Selection is at the receiver end; there is no need to have a return connection from the TV receiver back to the transmitter.

In reality, the slides in the carousel analogy are replaced by 'pages' stored on a computer, but the principle of a database which is completely scanned at the rate of about four pages per second remains. For eighty full pages the maximum waiting time is about twenty seconds, and the average is half this — about ten seconds. The waiting times put an effective limit on the number of pages available for selection at any given time, though of course individual pages can be updated or altered as often as necessary at the transmitting end. And just as with normal television pictures, the form of the signal imposes no limit at all on the number of TV receivers able to display one page simultaneously. The 'user loading' can be 100%.

By contrast, with Viewdata there is no theoretical limit to the number of pages of information available for selection from the database. But selection must be done by arranging a return path back from each user to the database so that interactions can take place, and the problem of how to arrange for a user to determine the identity of the page required becomes a major one — equivalent to finding the right page in the right book in a large library. Once identified, individual pages can be accessed very quickly — generally in around one second. However users wishing to access the system simultaneously have to queue to await their turn, so the user loading cannot in practice be 100% — or anywhere near it.

The Post Office stresses that Viewdata will not compete with Teletext, and that applications appropriate for one are not the same as those appropriate for the other. But the advent of Teletext is important to Viewdata because it is opening the market for TV text display, and the common circuitry will help to keep receiver costs down.

There are three main partners currently involved in the development of Viewdata, and its success depends largely on each performing its role in close association with the others. The three partners are the Post Office itself, the TV set manufacturers, and the Information Providers.

The Post Office provided the original inspiration for the idea, funded its early development and has taken the initiative in planning the trial phases. But in the longer term its contribution will be limited to providing storage for the databases and common highways for information interchange. By the end of the market trial its investment will be in excess of £5 million, with probably another £30 million at least earmarked for the start of the public service. To recoup and profit from this investment there will be three sources of revenue: increased use of the public telephone network through the normal charging structure for telephone calls, a charge to Information Providers for their pages in the system, and a charge for pages accessed by users.

The TV set manufacturers together with their component suppliers are responsible for supplying terminals of various designs to stimulate the market. The Post Office is allowing modems

to be built inside the terminals, and the terminals to be attached directly through isolators to the public telephone network, which is a significant break with its previous policy. It also plans to connect the Viewdata network into the international telex service. Both of these developments will have important business ramifications. All the major set manufacturers in the UK are now involved and their investment to date probably exceeds £2 million. Some will see the sales of Viewdata terminals and adaptors for existing sets as a source of extra revenue to pay off this investment; others will regard the advent of Viewdata as a means of entering wholly new markets including business terminals, electronic mail and the home computer market of the future.

Finally the Information Providers – businesses having information to disseminate which fulfils a public or a business need – have the daunting challenge of creating and maintaining thousands of attractive, comprehensive and easily accessible pages. Their investment will probably exceed about £6 million by the end of the market trial. Their direct financial return will be from charging users a price for page accesses. The Post Office will arrange for the recovery of user charges and after subtracting its own charges for page accesses, will pass the net revenue back to the Information Providers.

Co-ordinating the activities of these three partners is arranged through a hierarchy of liaison groups, and its successful operation is one of the corner stones in the ultimate success of Viewdata.

II. VIEWDATA SERVICES

This section describes the services which Viewdata is able to provide, based on ideas to some extent promoted by the Post Office. For convenience they are categorised under four main headings: providing information, sending messages, interactive services, and personal and in-house services. Whether or not they are *appropriate* is a matter which we discuss in Section IV.

A Providing Information

Providing information is the largest service area capable of immediate development, and the one which so far has received the most attention. As explained in the previous section it can be subdivided into public information services and private information services, both of which are described in turn here.

1 Public information services

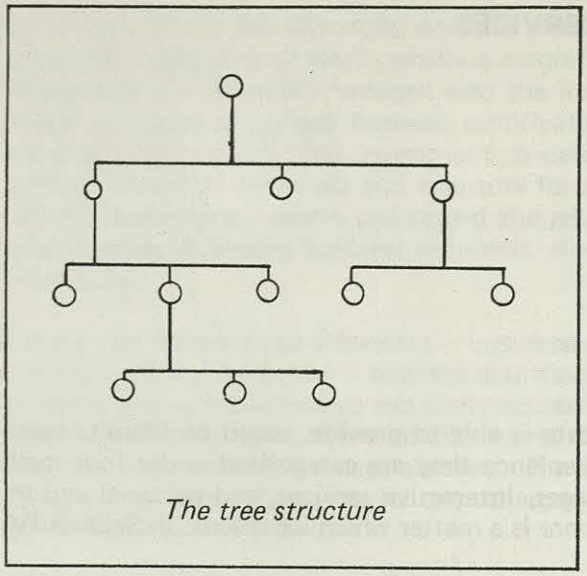
A great variety of information can be contained in this category, aimed at the public at large. It includes topical items such as news, sports results and weather – at national, regional or local level; reference items such as timetables and directories; leisure information such as games, hobbies, DIY, gardening, recipes, holiday and tourism; economic guidance including consumer information, price, taxation and investment guidance; and specialist information on topics such as choosing a career.

The information itself will be supplied and maintained by the Information Providers (IPs). Sometimes it will be free: for example, government and hospital services. More often there will be a charge: for example, a good food guide or a list of camp sites in Pembrokeshire.

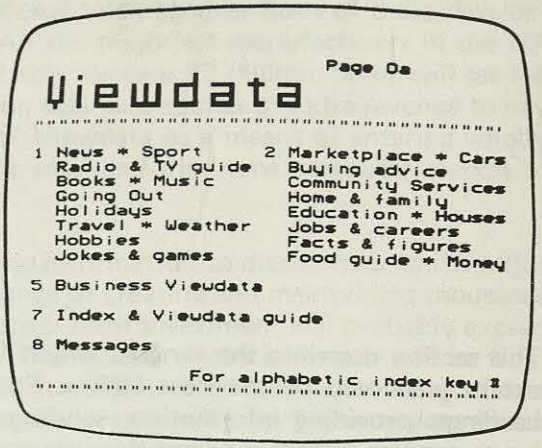
The access procedure is common to all pages regardless of considerations such as the IP or the price. It is designed for the general public so the need for simplicity is fundamental. The principle is progressive indexing through records arranged like the roots of a tree, each root leading down to a number of roots at the level below. In fact the common parlance is to refer to the structure of records as a tree structure (though root structure would be more appropriate), so we will use this term from now on. When we do, imagine the tree to be inverted. The complete tree structure is called the Viewdatabase, and it comprises the databases of all the individual IPs.

Topics lead down to a selection of subtopics at the level below. The basic unit of information in the Viewdatabase is the page. Users are guided to the pages they wish to read by means of the treeing structure. Each page consists of one or more frames, and each frame contains the data to display a screenfull. Normally there can be up to ten choices on a page, so six levels could give a choice of over 100,000 pages – though in practice not every page will confront a user with the full (called a 'strict') choice.

In practice a user begins a 'session' by logging in to Viewdata either by dialling in or by automatic pushbutton connection. The index page is then transmitted through the telephone and displayed on the screen showing a selection of information by magazine (main category) with a choice under each heading:



The tree structure



At present there are two magazines aimed at the residential market, and one at the business market:

	home magazine 1	**home magazine 2**	**business magazine 5**
0	news	guidance for home & family	business news
1	sport	community services	market place
2	radio and TV	market place	stock exchange
3	going out	cars and motoring	finance
4	holidays and tourism	homes and mortgages	industry specialist services
5	travel and transport	money and insurance	business services directory
6	hobbies and pastimes	education	government information
7	jokes, quizzes, games	jobs and careers	facts and figures
8		facts and figures	Post Office services
9		food guide and recipes	calculations

Two other magazines have been identified for other services: magazine 7 for Viewdata services, and magazine 8 for messages.

Selection is by means of a simple keypad like a pocket calculator which is connected to the terminal and hence back to the database, also through the telephone. A user selects the chosen magazine number by depressing the corresponding key number, then continuing to depress corresponding keys to gain successive pages through the tree structure. Each page is uniquely numbered, and can be accessed by depressing the corresponding keys on the keypad. If the number of the desired page is known it can be accessed directly by keying *N# where N is the page number (up to 9 digits long).

A typical hand-held keypad

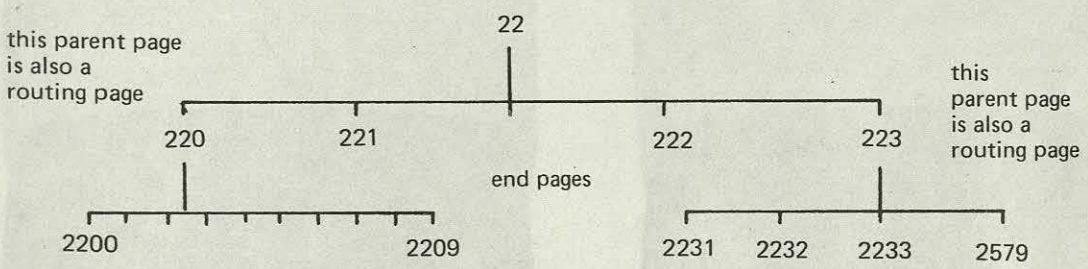
The * and # keys can also be used for other simple functions:

* 0 #	to return to the index page 0
* #	to recall the previous page (up to three times in succession)
* 0 0	to retransmit the current page (if corrupted)
* *	to correct a keying error

Multiframing (more than one frame to a page) allows the information in one page to be

extended over more than one frame. The successive frames of a multiframe page are identified with a suffix letter – a, b, c, d etc. through to z. Each successive frame can be gained simply by keying #.

An advantage of the tree structure approach is its simplicity. No further operating instructions are required other than the ones just described together with prompts which can be shown quite clearly on each page to help with the selection of choices, or to return for example from an end page (lowest level) to the index page. However a disadvantage is that users can easily find themselves going down the wrong branch, or unable to find the right one, unless the routing (guiding) pages above are quite clear. An essential additional aid is to provide a means of cross referencing between pages at different levels in an IP's database, and even between different magazines. Viewdata can provide for this by allowing cross reference page numbers to be shown below their parent page numbers as 'descendants' even though they are 'non-filials'. The meaning of these terms is made clear in the diagram below.



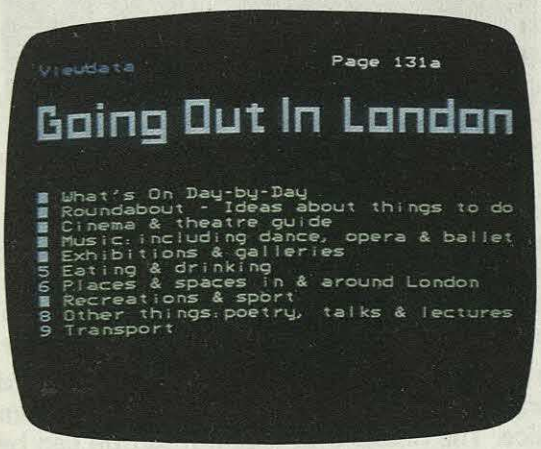
pages 2200 to 2209 are all filials of page 220, which has a 'strict' choice consisting of all ten possibilities.

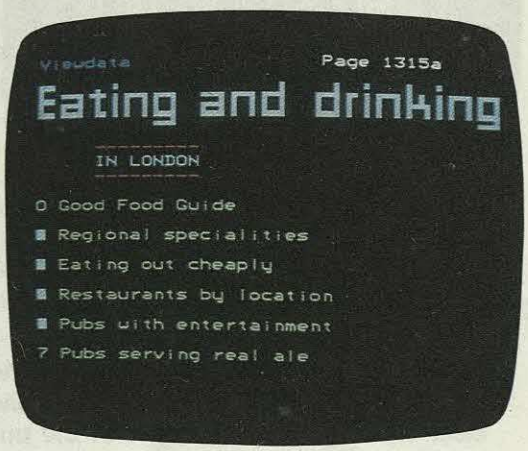
the routing page 223 here leads to information on pages 2231, 2232 and 2233 about holiday resorts; it might also offer information about travel held on page 2579 in another part of the database.

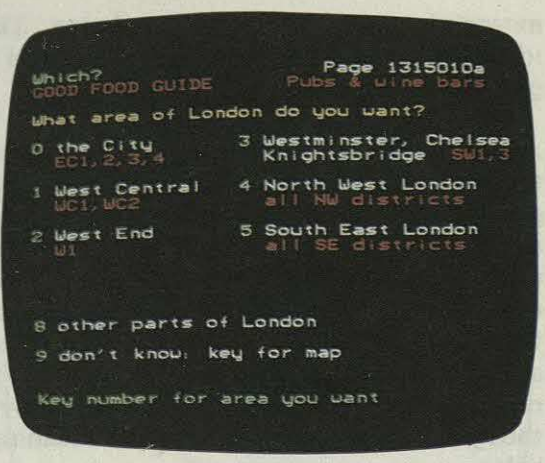
The top level routing pages are supplied by the Post Office, and they lead down to the entry points of IP databases at lower levels. Thus IPs must depend on the Post Office to provide routing pages which are well designed and entry points which are satisfactorily placed.

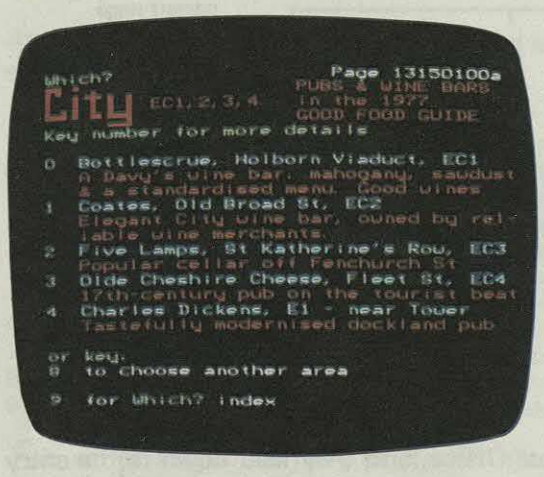
The actual number of levels in the Viewdatabase will vary from place to place but it is unlikely to be less than five. The maximum number which can be accommodated is nine, the same as the maximum number of digits in a page number.

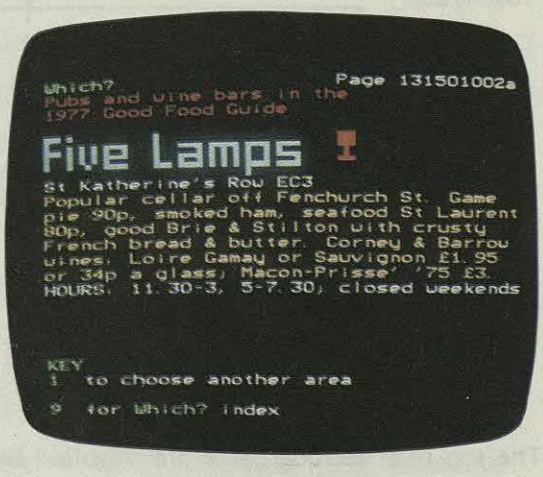
The following are examples of pages in the public information service:

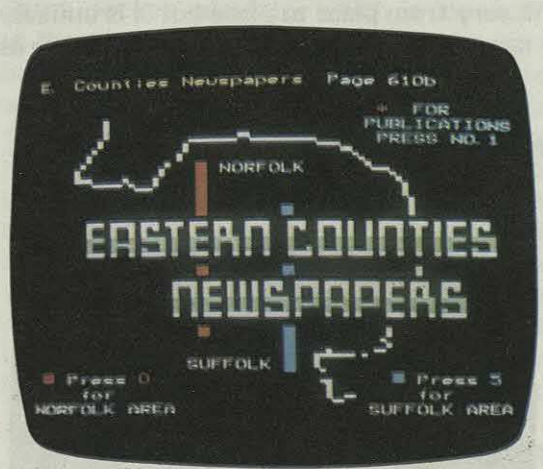








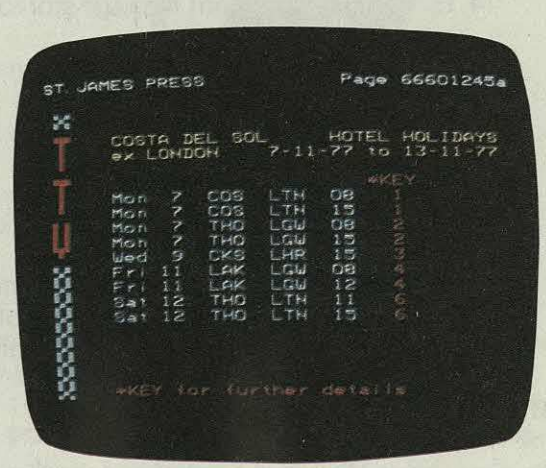


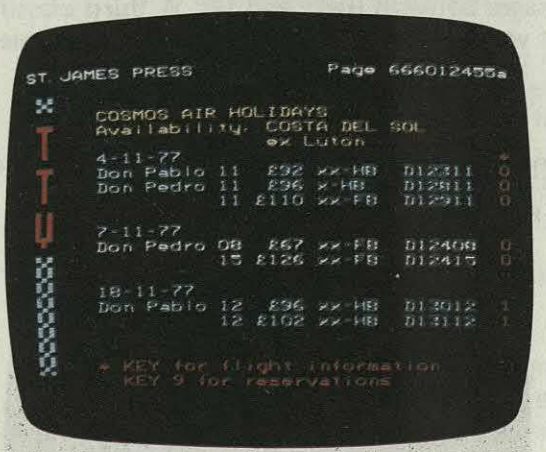


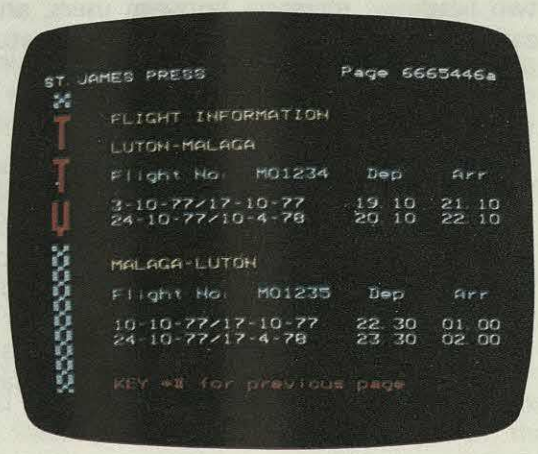
2 Private information services

The access to private information on Viewdata is restricted through the use of a password to a Closed User Group (CUG) of one or more individuals or businesses. There are two clear advantages compared with the public service. The first is that the information can be kept reasonably secure, which may be important for business reasons, and the second is that access charges can be reduced through a subscription service.

The precise format of the password has yet to be fixed, but in the pilot trial a temporary four digit format has been used, appended to the normal six digit Viewdata user number. This ten position number (it will probably be encoded automatically by one push button fitted to CUG terminals) gains access to the entry page of the CUG. Thereafter the access procedure to the information pages is via routing pages in exactly the same way as for the public service. In practice, CUG subscribers will probably know the precise page number they should access to gain a specific piece of information. The following Viewdata pages give an impression of the kind of information available to a CUG:







It is quite possible (though this is not planned at present) that certain types of information will be accessible both by members of the general public, and on a subscription basis from terminals within a group – in this case not strictly speaking a CUG. Information of this sort would not be restricted purely for business reasons. The advantage of the subscription group access would be lower per frame costs for high frequency access. An example of this kind of information is share prices and movements which are required continuously by say professional brokers but less often by private investors.

CUG subscribers will be able to access the public database in the normal way, and pay for that service in the normal way. Thus many CUG subscribers might find themselves using their Viewdata terminals to access a mixture of public and private information. The following example illustrates this, and it also includes the use of the message and interactive services which are described in B and C below:

09.10 Retrieve the latest market prices and the RPI from the business magazine (No.5) both updated overnight.

09.30 Call out the previous night's incoming US messages from the message area (magazine 8).

10.00 Check flight times to Brussels – and enter a reservation.

11.15 Send a message to a colleague who is at a meeting and is not answering his phone.

12.00 Access CUG to obtain market research information.

14.15 Display an urgent message stored during the lunch break.

14.20 Return lunch time call on the message service.

16.00 Check the profiles of companies tendering for a contract by accessing their business card files through another CUG.

16.20 Check the current stock market quotation on the leading tendering company.

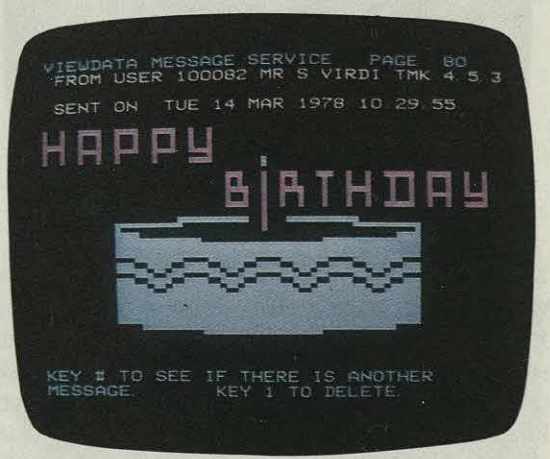
16.45 Note the BR travel flash indicating that the 17.35 is cancelled. Check the times of alternative trains and leave the office early to catch the 17.10, leaving the power on overnight to collect further incoming messages from abroad.

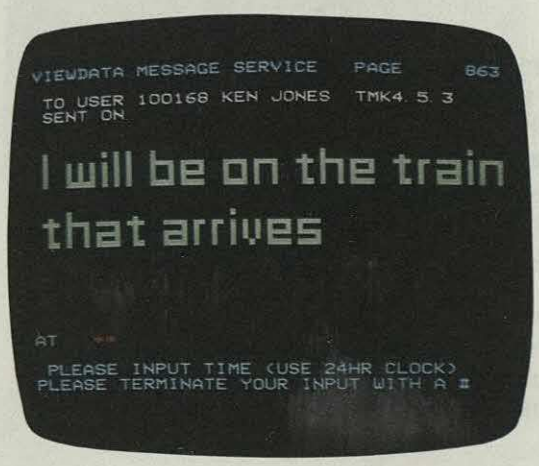
B Sending Messages

In time, using Viewdata to send and receive messages may become as important as information retrieval. The messages can take a variety of forms which can be classified conveniently under two headings: messages between users, and messages between users and IPs. A third classification which is somewhat different in nature but very important is connection with the telex service. All three are described below.

1 Messages between users

The simplest type of message for transmission between users is one which is entirely prepared and pre-formatted, and available from a selection under a variety of headings in magazine 8. An example of this is a simple greeting such as 'happy birthday'; the message plus the sender's Viewdata number and similar details can be displayed on the recipient's terminal.

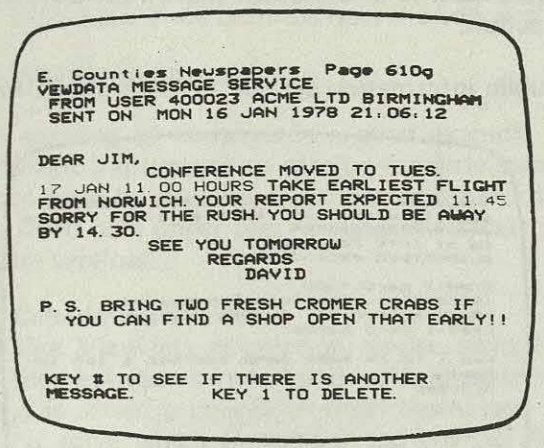


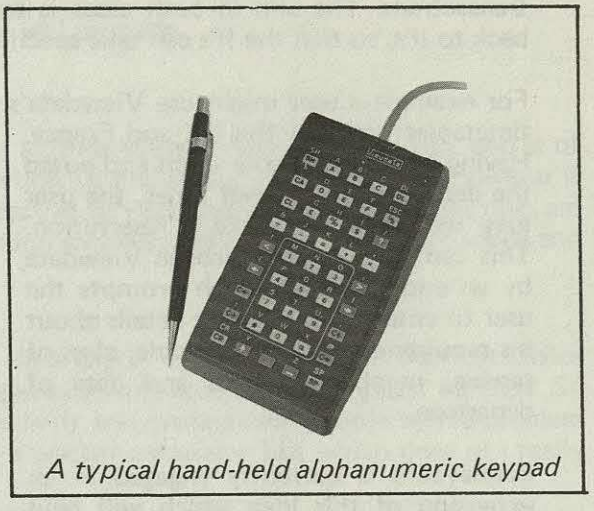


A variant allows simple numeric data to be keyed in to the pre-formatted message by the sender to add to its meaning. For example in 'Please meet me at the station at time nn.nn' the sender can key in the appropriate time.

Alternatively, users equipped with an extended alphanumeric keypad can construct their

own messages with no restriction except for the normal ones which apply to the whole system. The design of the extended keypad shown here is very slow to use in practise,





A typical hand-held alphanumeric keypad

and will probably be replaced by a keyboard more similar to a typewriter – or to the editing keyboard which we describe in Section IIIB.

The following is a brief description of the procedure for sending a prepared message:

- The sender enters magazine 8 and chooses an appropriate message in the same way as selecting information.
- A flashing star on the prepared message indicates the need for the sender to enter the recipient's Viewdata number. The computer looks up the recipient's name in a reference table and displays it to the sender as a check.
- The sender enters numeric details (such as a train arrival time) in response to another flashing indicator on the display.
- The sender keys # to send the customised message to the recipient's local Viewdata computer.
- The local computer places a phone call to the recipient. If the number is engaged, it will try again later. If it is not engaged but there is no reply after a short ringing interval, the computer will turn on a flashing 'message waiting' indicator on the recipient's terminal.
- Attracted by the flashing light, the recipient gains the message by dialling into his message area and displaying it on his screen.

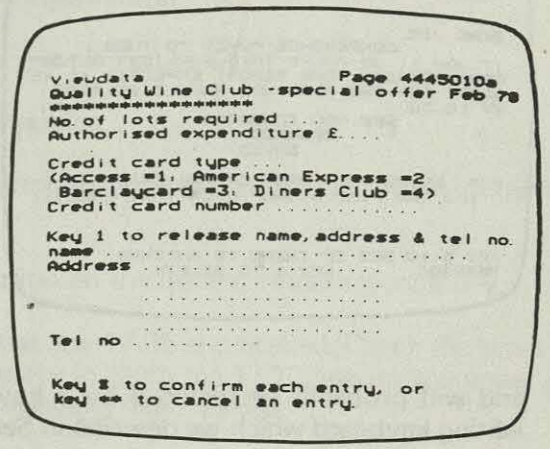
This procedure applies to recipients whose terminals are not fitted with a cassette recorder or a printer – hence the need to store the message at the local Viewdata computer. Those fitted with cassette recorders will be able to use them for message storage because they can be controlled remotely from the Viewdata computer. How this is done, and the form which cassette recorders might take, is described in Section V.

The most advanced form of user-to-user message sending so far developed for Viewdata is the split screen conversational mode, demonstrated for the first time in January of this year. This was originally developed for the deaf. It allows half duplex (one direction only at a time; telephoning is full duplex and allows simultaneous communication in both directions) 'conversation' between two users, each of whose screen is split to show the sent message at the top and received at the bottom simultaneously. The conversation can continue over many successive frames, each half screen being cleared and refilled as the dialogue continues.

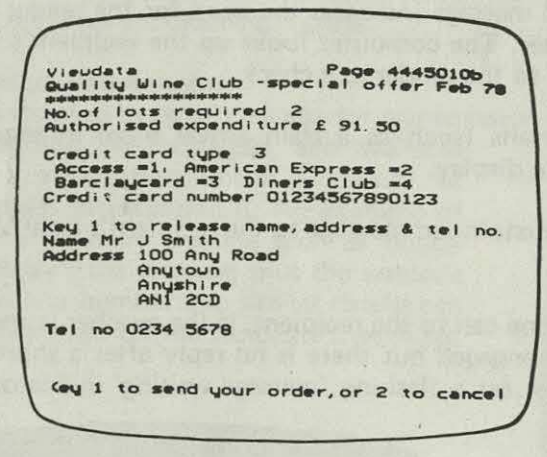
2 Messages between users and IPs

There are two main types of message in this second category: enquiry frames and purchase transactions. The aim in both cases is to pass specific information from individual users back to IPs, so that the IPs can take specific action.

For example a user might use Viewdata's public information service to learn about flight timetables between the UK and France. Having found a suitable flight and noted the departure and arrival times, the user may well want to make a reservation. This can be arranged through Viewdata by an enquiry page which prompts the user to enter brief numeric details about his requirements – for example, class of service, number of seats and date of departure.



Barclaycard is currently engaged in an extension of this idea which will help users and vendor IPs to effect a purchase settlement. An enquiry frame will contain a choice leading to a 'form frame' which the purchaser will be able to complete by entering his credit card number, thereby signifying his acceptance of the deal and authorising a purchase transaction. The Viewdata computer will cross-reference the purchaser's Viewdata number to his name and address and pass this together with his credit card number to the vendor's receiver, which could be fitted with a printer. The vendor IP will send a copy of the details to Barclaycard for settlement in the normal way. No cash changes hands and the purchaser does not have to visit the vendor's premises. It is even conceivable that a CUG operation could be established to identify to vendor IPs the Viewdata numbers of prospective purchasers with a suspect credit record.



This settlement procedure is no different in principle to telephone or mail order purchase, though it could have far reaching consequences because of its convenience. It should not be confused with electronic fund transfer (EFT) which aims to replace cheque and many cash transactions by direct electronic debiting of accounts.

An enquiry or form frame will often require users to make more than one response. If so, responses must be entered in sequence from the top using # as a field delimiter.

3 Connection with telex

One very important aspect of message sending with Viewdata is its ability to be interconnected with the telex service. This will bring two main benefits. First, it will allow Viewdata terminals to be used as an alternative to telex terminals within businesses already subscribing to telex, helping to overcome the not uncommon problem of delays between an executive's office and the remote telex terminal itself. Second it will allow Viewdata

users who are not subscribers to telex to connect with that system and to benefit from its advantages.

In Section V we describe how the connection will be made.

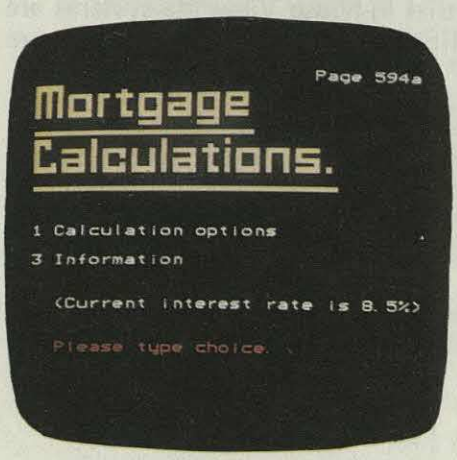
C Interactive Services

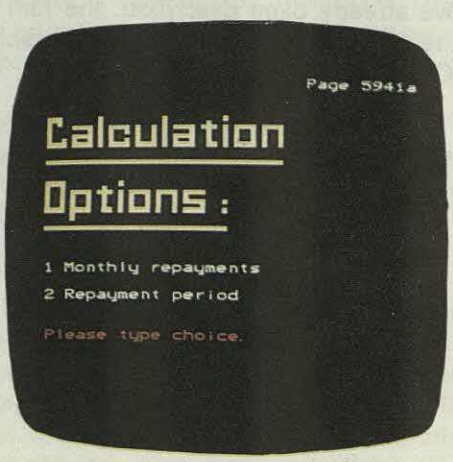
The sending of messages is a good example of an interactive service on Viewdata, and is of sufficient importance to merit a separate subsection (B above) for its description. However it is not hard to visualise a number of other interactive services and some of the major ones are described here under two headings: first, calculation services; and second, education, social and leisure services.

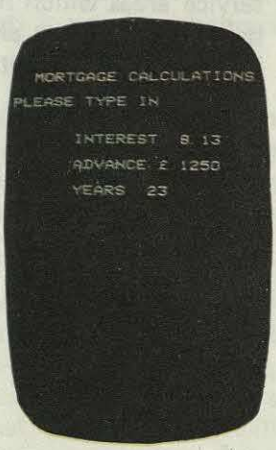
1 Calculation services

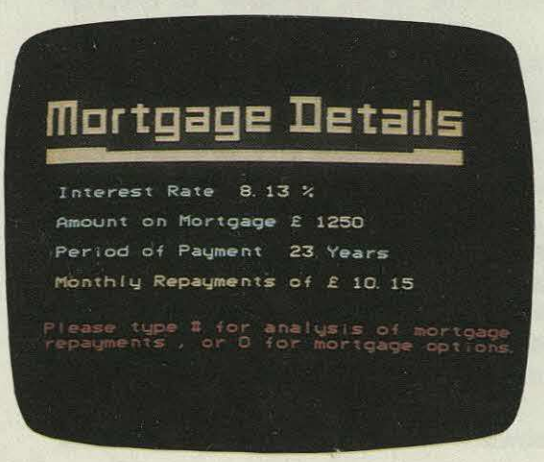
The Viewdata calculation service seeks to fill a gap in the market which the Post Office sees between simple hand held calculators and expensive specialised computer bureaux. So it is aimed primarily at small businesses, students and professional people with a problem to solve which is perhaps too onerous for a pocket calculator but which does not really justify a full computer service.

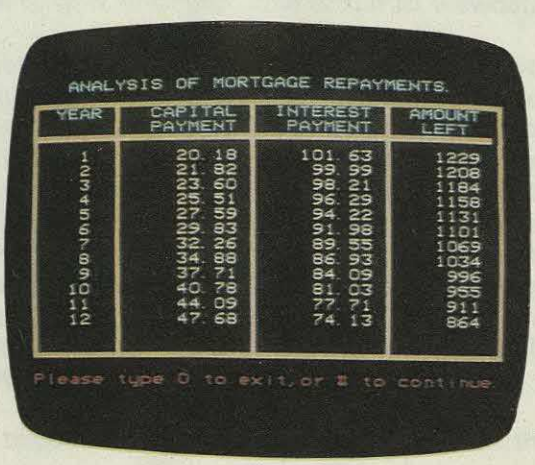
As in the case of user-to-user messages, Viewdata will offer a repertoire of pre-formatted equations for solving common problems, and it will also offer those with an alphanumeric keypad or keyboard the opportunity to enter their own equations. The following mortgage calculation illustrates the solution of a common problem: given an interest rate, the size of the advance and the repayment period, what are the monthly repayments? Notice the use of yes/no type choices – a choice of just two of the ten possible choices on a level.











2 **Education, social and leisure services**

Education services through Viewdata will be interactive, featuring prompting, self testing and self monitoring. A wide variety of educational and instructive games are also possible, such as pattern recognition, logical thinking, tournaments and so on.

Viewdata could also be used for a variety of social and instructive services. One which has received some publicity because it is often chosen as an illustration at Viewdata demonstrations is concerned with eligibility for adopting a child. Another example is in assessing eligibility for claiming social entitlements: there is little question that a carefully constructed and researched guide to entitlements would be of inestimable social value. Other services could include legal and taxation issues, and home medical aid.

D Personal And In-House Services

The idea of a personal service on Viewdata is based on the feeling that users may wish to store their own private information on the system for their own personal use, or use by a restricted number of nominees (as in car insurance). The sort of personal information which might be stored includes diary dates such as appointments, dates and telephone numbers, and other information such as forwarding addresses, vaccination records, blood group, and recent medical history. Viewdata would offer a reasonable degree of security for this kind of information though absolute privacy is not an objective of the public Viewdata service.

Just as many businesses have internal telephone systems which can be connected to the public network when necessary, so the Post Office plans to offer private mini-Viewdata systems to businesses, connectable to the public service. In-house mini-Viewdata systems could offer greater security than the public service, and presumably better economics. Although the Post Office's thinking in this area is, hardly surprisingly, less well developed than in the other service areas which have already been described, the fact that in-house Viewdata systems are being promoted at all raises questions such as the portability of Viewdata software, and more importantly, the Post Office's monopoly role.

III. USING THE SERVICES: ATTRACTIONS, WEAKNESSES AND ECONOMICS

At first sight Viewdata offers the three main attractions of convenience, immediacy and low cost. In this section we examine the realities of these attractions, describing them first in a general way, and then discussing the economics of Viewdata operation from both an IP's and a user's point of view.

A Attractions and Weaknesses

Here we examine from a user's point of view Viewdata's attractions and weaknesses under three headings: becoming a user, the display format and access to the database.

1 Becoming a user

Virtually all businesses have telephones, and so do some 55% of homes in the UK (the figure is 75% in London, and the Post Office's target for 1985 is 85% nationally). The penetration of TV sets in UK homes is even higher: over 80%. There are nearly 20 million TV sets in use throughout the country, and the market for new sets is running at about 2 million each year – most of them replacements for old sets.

Although meaningful figures are not available, the penetration of TV sets into business, on the other hand, is probably very small. Some prestige sets have found their way into executive offices,and a few Teletext receivers have recently been introduced. Nonetheless the sheer ubiquity of the telephone and the TV set are such as to greatly simplify the problem of acquiring and installing Viewdata receivers.

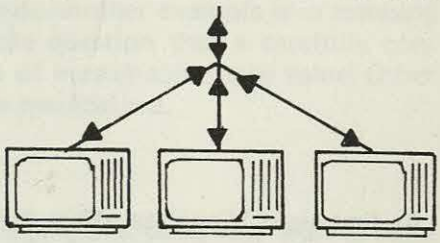
The Post Office's policy is that receivers should normally be acquired (purchase or rental) from and installed by established TV dealers. The dealer will notify the Viewdata centre of the acquisition, and the latter will issue a Viewdata user number to be built into the set, involving a quick adjustment by the dealer. The normal Post Office telephone engineers will install a phone jack plug at the position chosen for the terminal, and the dealer will then install the set, connect it to the jack plug, and notify the local Viewdata centre of the terminal's availability for acceptance testing, to be carried out remotely. All the user needs to do is to switch on the set and press a button to gain automatic connection to Viewdata.

Servicing, too, will remain the responsibility of the dealer. However, the added complexity of Viewdata terminals does raise questions about their reliability and the competence of dealers to service them in the event of a failure, but in reality there is no reason why the additional circuitry should not be as reliable in service as that of, say, a pocket calculator. The Post Office does not expect to become involved unless of course problems arise with the telephone network up to the jack plug. The Post Office's own terminal design, called the Viewdataphone because it contains an integral telephone, will be an exception to the foregoing description because it will almost certainly be installed and serviced entirely by the Post Office. Because the Post Office will need to develop a new expertise to install and service Viewdataphones, it is possible that users of other types of Viewdata receiver will want to negotiate similar support from the Post Office.

When a receiver is in use for Viewdata, the telephone line is effectively engaged. In the

domestic environment the effect in terms of the availability of the telephone for normal use is hardly likely to be significant. The average domestic line is only used for some ten minutes every 24 hours as it is, and for the most part the use of the telephone for Viewdata will be in addition to its normal use. In business though at least a proportion of the telephone usage for Viewdata will substitute for its normal use.

Businesses making heavy use of Viewdata terminals may accommodate the receivers without the need to install more lines. Indeed several terminals can be clustered on to one line working in a multiplexing mode, with the signals for the individual receivers interleaved. During a normal session at a Viewdata terminal the information only passes back and forwards along the telephone line intermittently, with pauses for the user to digest the material.



2 The display format

A major attraction of Viewdata is the seven colours which are available: red, green, yellow, blue, magenta, cyan (light blue) and white. Domestic Viewdata receivers will all initially be based on colour receivers. On the other hand, business receivers are likely to be monochrome. For aesthetic reasons it is inadvisable to use more than about three colours on a page; monochrome receivers may not lose much in terms of readability compared with the more expensive colour receivers.

The display character set contains 93 characters: 26 upper case letters, 26 lower case letters and 41 symbols. They can be displayed in single or double height, and there is room to extend the alphabet to accommodate other languages.

The screen display is 24 lines (called rows, to avoid confusion with TV scan lines) each of 40 characters, giving a maximum theoretical capacity of 960 characters per frame. In practice though the capacity is less than this:

- the top row (row 1) is reserved for the IP's identity, price code, and page number
- the bottom row (row 24) is reserved for control messages from the computer
- roughly 10% of the remaining capacity (880 characters) is used to accommodate control characters.

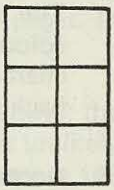
So in practice the maximum number of characters per frame is about 750; this does allow for left and right hand margins because about 10% of the screen width is pre-allocated to margins in the Teletext standard.

The characters themselves are formed from a dot matrix, and the spacing of characters and blanks is constant, as on a normal typewriter. In general the typographic range and flexibility of the Viewdata display is severely limited compared with, for example, the characters on this page. On the other hand, Viewdata's ability to use graphics and colour is a valuable compensation.

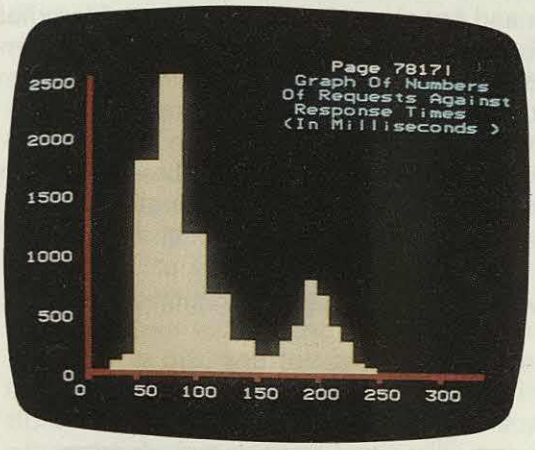
A frequent criticism of the UK Teletext standard is that the resulting characters are too small, and the lines too close, for comfortable reading as continuous text from the normal viewing distance. This effect can be avoided by coming closer to the screen, but in practice many domestic users of Viewdata are likely to want to view it with the aid of remote control selectors from their normal viewing position which is geared to watching broadcast programmes. To some extent the page designer can get over this problem by using lower case characters, by careful attention to detail design, and by reducing the density of text per page. The Post Office recommends a density of not more than 50% (380 characters including blanks) for routing pages, and 75% (570 characters including blanks) for infor-

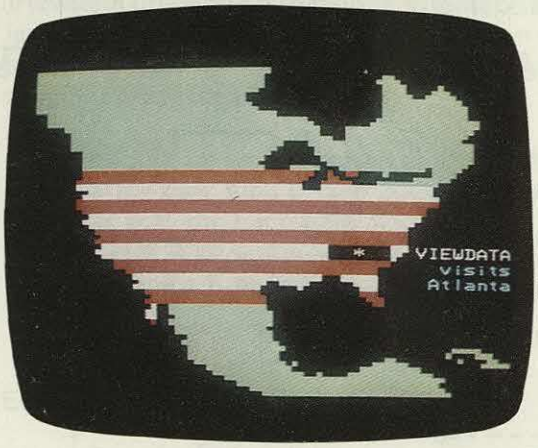
mation pages. By comparison a full page of typeset text in this report contains about 3500 characters including blanks. Viewdata messages must be kept short and succinct.

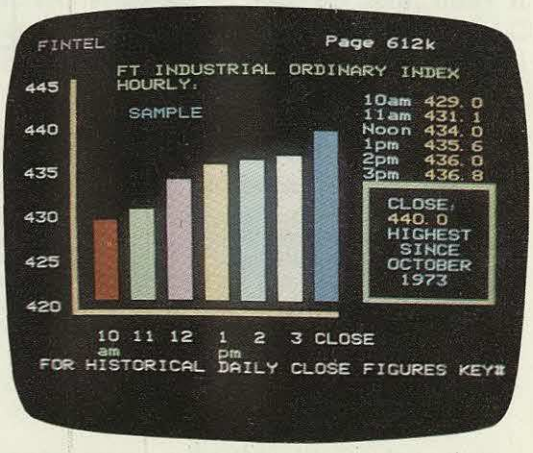
The criticism of small characters and close lines will apply less in the business environment where receivers will normally be placed for optimum viewing of Viewdata and not for off-air (broadcast) pictures.



In addition to its character set, Viewdata can display a limited range of graphics. The base unit of the graphics display is a rectangular box equal in height to a line space and in width to a character, containing six cells. The cells in a box can be set on or off in any combination. The 'on' state is one of the seven colours — only one colour can be used at a time within a box — and the 'off' state is the background colour (i.e. invisible). The consequence is that resolution is somewhat limited and shapes are restricted to vertical and horizontal lines — diagonals and curves are not possible. However, it is possible to produce some fairly useful images such as graphs, histograms, block diagrams and silhouette maps.







In addition to forming images Viewdata graphics can be used to create a graphic typeface for headlining and emphasis. The Post Office has developed such an alphagraphics typeface which is software generated: the individual graphic characters and the spaces between them in a word are generated by a program, eliminating the chore of coding individual graphic units. But the typeface uses a lot of space: a row of Post Office alphagraphics occupies three ordinary Viewdata rows, and the number of characters in a row is usually less than 15. Notice that the character spacing is variable unlike normal text which is fixed.

Some IPs have chosen to develop their own alphagraphics and a simple example is shown here.

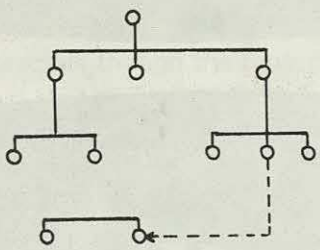
A recent specification amendment allows Viewdata graphics to be either contiguous or broken, though this is not yet widely implemented. The result is a kind of 'ghosted' outline which can be useful for backgrounds.

The display features we have described so far are the character set, display capacity, colours and graphics. Other display features which Viewdata offers are flashing (blinking) characters and a choice of any of the colours as a background rather than the normal black background.

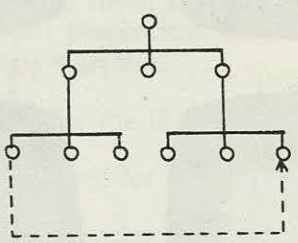
3 Accessing the database

The tree structure form of routing and information presentation is simple and appropriate for a great deal of information in both public and private use, particularly where selecting a choice is a natural corollary of the enquiry — as in timetable enquiries or medical self-diagnosis. But cross referencing both within and between IP databases can add immeasurably to the general convenience of information retrieval. An IP may want to bring attention to special offers by cross referencing near the database entry point. Again, an IP may wish to link related subjects within a single database, such as DIY house painting hints and where to buy a ladder. And undoubtedly the success of many IPs with the medium will depend on the adequacy of entry points to their databases from databases belonging to other IPs. This will be a matter of major concern, and one which will require a great deal of co-operation amongst the IPs through their liaison groups and through the Post Office.

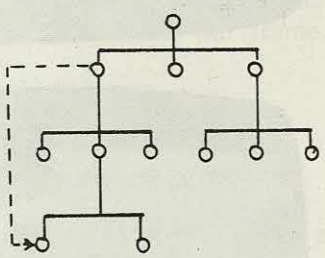
The diagrams below illustrate some of the ways in which cross referencing can be arranged:



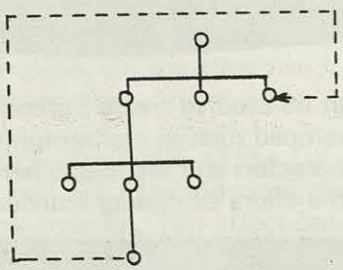
alternative routing (with equal logic)



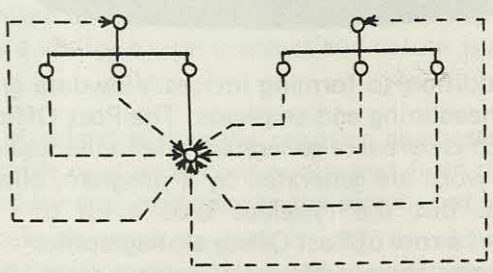
services provided by the same IP elsewhere in the Viewdatabase eg news marketplace



to give quick access (eg special offer), or to highlight



prompting to a related area



roundabout, via single common prompt page to further related areas.

Although theoretically there is virtually no limit to the size of the database, the problem in practice for the average user will become one of assessing beforehand whether the desired information is likely to be there, and if it is, how to find it quickly. Frustrated attempts to find hidden or non-existent information will quickly lead to irritation and eventually to abandonment. The Post Office and the IPs are well aware of this danger. The Post Office is determined to ensure high standards of routing page design, and is adamant that its page charge to IPs will apply for routing as well as information pages – both to discourage IPs from using too many, and to increase its own revenue. IPs can respond by offering routing pages free of charge to users if they wish, recouping the loss on information pages. In addition IPs have agreed to supply users with a printed index of topics.

When an information page is found, its contents can of course be up to the minute; the potential for timeliness is one of Viewdata's attractions. In practice though, it is unlikely that more than just a small proportion of the information will need updating more frequently than daily, and some less than this. Highly topical items such as national news and sports results are in general more appropriate for Teletext transmission, as we explain in Section IV. Although not topical as such, some pages, particularly main index pages and IP database entry pages, are going to be much more frequently accessed than others, which raises the question of queueing delays. The Post Office's target is to match the service demand with enough ports into a local Viewdata centre to ensure that the queueing time to gain access to a page will only exceed two seconds once in every hundred occasions on average.

A Viewdata page display is built up on the screen working from left to right along the rows, one row at a time, starting at the top. An average page of 500 characters takes about 5 seconds to build, and a good deal longer to read and assimilate. An infrequent user should expect to take around one to two minutes to work through say four levels in the tree structure to find and absorb the desired information. Certainly the keypad is simple and easy to use, and the procedure is consistent; it is largely repetitive and progressive in both the information retrieval and the interactive modes. There are no separate instructions for use other than those which appear on the screen, and no training is necessary other than a few minutes familiarity as with a new TV set. The initial phone connection to Viewdata preceding a session is automatic and fast. Nonetheless, for most domestic users at least the cost of the telephone connection and frame access charges – described in B and C below – together with the display limitations which we have already referred to, will strongly discourage browsing.

Messages built up on the screen with the alphanumeric keypad will also be time consuming. The average user would take about four minutes to enter this sentence, for example. The reason is that the hand-held alphanumeric keypad is not only awkward to use but its transmission rate is severely curtailed if it is acoustically coupled to the terminal. And without cassette storage fitted to the terminal, a user must stay connected all the time.

B Economics for IPs

Organisations wishing to become IPs are entitled to enter into a contract with the Post Office for a prescribed period, currently twelve months. For the market trial the Post Office has settled on a fixed service charge payable in advance of £250 p.a. to each IP, plus a fixed charge of £1 per frame p.a. bookable in minimum blocks of one hundred. Moreover, it levies a charge to each IP for every frame accessed by a user. At the time of writing this charge has not been finally settled for the market trial, but it is likely to be in the range 0.3 to 0.5 pence per access.

In their turn, IPs can price accesses to their frames in one of two ways: either on the basis of each frame accessed, or through subscription to a CUG.

In the first case, the IP must adhere to a scale of prices agreed jointly by all the IPs in association with the Post Office. The policy is still very very flexible, but one approach might be to

fix say six prices for the market trial identified as A to F. A would be free. B to F would be fixed at levels such as 1p, 2p and so on rising to a maximum of as much as 20p for exceptionally valuable material. Whatever the scales finally agreed, each frame will show the price code adjacent to the page number, and each choice on a frame will also show the corresponding price code. Thus users will know the price as well as the choice options confronting them.

In return for the Post Office charge per frame access, IPs are relieved of what could otherwise be a huge and unwelcome task – that of collecting the revenue from the users. This is done for them by the Post Office as part of its record keeping responsibility. The Post Office collects the money from users (see C below) and passes it on to the IPs, less the frame access charge.

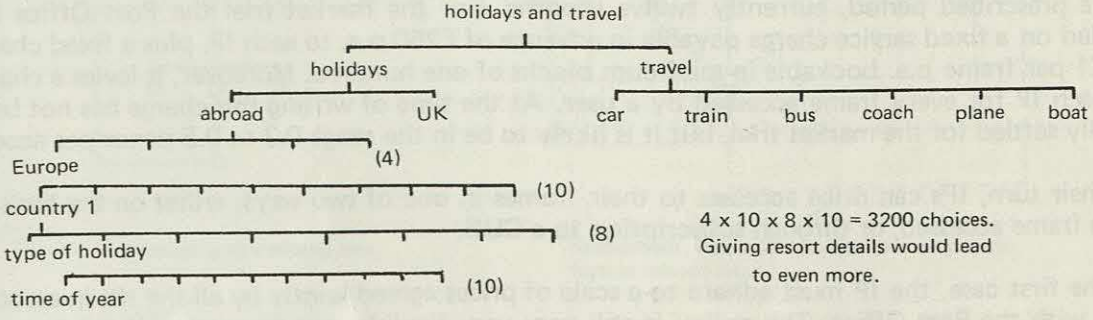
IPs organising subscription charges for CUGs will face a dilemma in trying to determine the rate. They must not only assess the price elasticity of demand for their product, but also ensure that the Post Office's charge per frame is covered. Where the value of information is not compromised in any way by allowing unrestricted access to it, IPs may be tempted to sell it simultaneously on a subscription and on a per frame basis – the former to heavy users and the latter to infrequent users. Because of the problems with password access to CUG frames, the way to arrange this will probably have to be by record duplication. Even so an IP will have to take account of a further consideration in setting the subscription rate – that of ensuring that the effective per frame price to subscribers is lower than the scale price. IPs are, of course, responsible for collecting subscription payments themselves and the Post Office bills them for frame accesses.

Once having entered into contract with the Post Office, IPs are entirely free to decide their own commercial and editorial policy consistent with the technical constraints of the system and the legal constraints governing publishing such as the trade descriptions act, libel and obscenity laws. It is not the Post Office's intention to lay down any selective rules or regulations about who may or may not put what types of information on to Viewdata.

We have described briefly the charge and price constraints which confront an IP. What about the cost of frame creation and maintenance, and the revenues an IP might expect to get in return? To answer this question a brief discussion of what is involved is necessary. First, frame creation and maintenance. Disregarding for the moment organisational questions such as responsibility and integration with other services, and the major area of promotion, this immediately requires attention in four areas:

- the overall design of the database tree structure, routing and cross referencing
- the design of individual frames
- the procedure for creating and amending frames on the system
- record keeping

The tree structure design is critical, and involves striking a balance between a number of conflicting pressures. Many variables are closely interrelated: the price for each page (they can all be different); the number of choices in a routing page; the ratio of routing pages to information pages; the number of levels in the hierarchy; the extent of cross referencing and so on. Users who pay to access each frame will be highly sensitive to factors such as these.



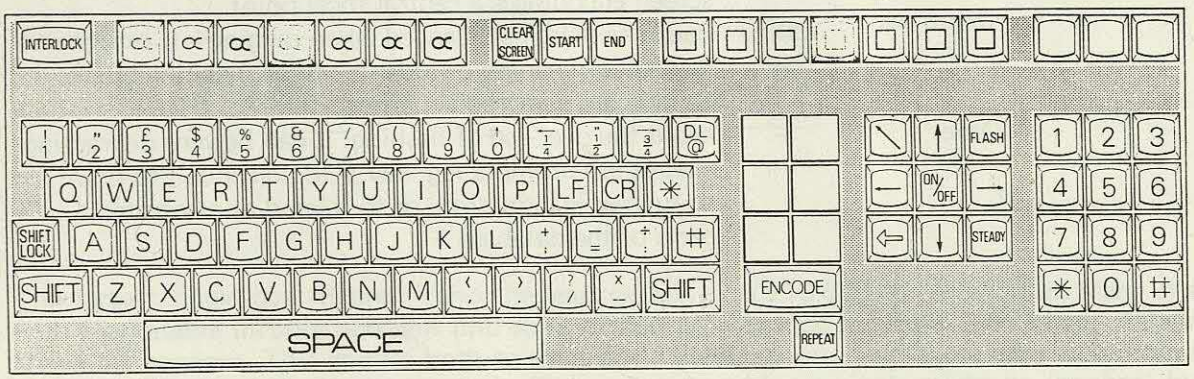
The design of individual frames is an art in itself. To illustrate the ramifications we have picked out just some of the factors involved in the exhibit shown on page 22.

The procedure for creating and amending frames revolves around the coding specification developed by the Post Office, and the use of the editing terminal, the device by which the computer records can be altered. Five change modes are allowed:

- enter, which permits the creation of new frames subject to certain constraints
- delete, which permits the deletion of a frame, subject to certain constraints
- amend, which permits the alteration of a frame but not its choices
- overwrite, which permits the alteration of both contents and choices
- copy, which permits the copying of a frame to another part of the database, and invites alterations to choices at the same time.

The Post Office can supply precise coding instructions for carrying out these changes, and IPs are able to enter the changes into the Viewdata system through an editing terminal. These are available for use free of charge at the Post Office Headquarters in Lutyens House, London. Alternatively the Post Office will rent them to IPs for £400 p.a. The terminal consists of a colour Viewdata terminal and an editing keyboard. It has to be used on line to the Viewdata computer, and IPs have complained about the poor characteristics of the keyboard and the lack of a verification mode — all changes need to be checked by recalling the results from the computer and displaying them on the terminal screen. However, improved intelligent editing terminals with local storage, and probably a higher price tag, are under development.

The editing keyboard



An alternative and highly convenient way of entering changes is by a direct computer-to-computer interface. Some IPs are developing the means of extracting information from their existing computer systems in the Viewdata format, and passing this in magnetic form to the Post Office for free transfer to the Viewdata computer. The transfer can be over the telephone lines in synchronous or asynchronous mode. At least one proprietary package is under development, with the backing of the Post Office, to help generate Viewdata page formats in the form of a tree structure from computer data files.

Frame Design – the key aspects

		Aims and Requirements
Content	Brevity	– keep messages short and clear – limit the text density to 50% for routing pages, and 75% for information pages – use symbols wherever possible (eg %) – avoid excessive punctuation (eg USA not U.S.A.)
Presentation	Colour	– avoid red and blue – they are hard to read – avoid clashes – remember only white can be used for the first character position in a row – select the background colour with care (NB usually black, but a recent specification enhancement allows one of the seven standard colours to be used) – remember that yellow is usually easiest to read, and that white and cyan can be indistinguishable on some sets – ensure that the colours also display effectively in monochrome (NB the 'hold' instruction now allows colour changes on adjacent characters in a row)
	Typography/ Graphics	– use upper case sparingly – remember that the Post Office alphagraphics typeface uses 3 rows, and is limited to about 15 char/row – use graphics charts where possible – use graphics as a background feature to improve aesthetics (NB the frame copy facility helps to reduce the chore of coding graphics)
	Layout	– consider centering the information: the curved screen encourages a central focal point – keep the margins balanced when ranging left or right – use colour changes or indents rather than line breaks to indicate paragraph changes
	Other	– avoid the over-use of flashing: it can be very distracting – always use prompts (eg 'key # to continue') to point to further information, or to related or associated parts of the database

The last of the four areas requiring IP's attention is record keeping. Although the Post Office undertakes to secure the database records of each IP, it is the responsibility of individual IPs to ensure that adequate records of changes are maintained for queries and credit purposes. This entails keeping the coding forms used by operators at the editing terminals, plus the supporting documentation.

Having described briefly what is involved in record creation and maintenance we can turn our attention to the likely costs. In practice they are going to vary greatly from one IP to the next, but the simple example which follows should be representative of the norm. Let us assume that an IP is servicing the public with 1000 frames on one database. 500 of these are static routing pages, and 500 are information pages which have to be updated once per week after their creation – i.e. a total of 100 per day, occupying one full time staff. There is no separate Post Office charge for frame maintenance and IPs pay only the local call telephone charge rate for access to the Viewdatabase.

The following table shows some broad cost estimates appropriate for the market trial, both for creating the frames during the course of a year and for maintaining them thereafter:

	creation		maintenance p.a.	
	£	*comments*	£	*comments*
use of terminal	400		400	
PO service charge	250	*fixed charge*	250	*fixed charge*
	1,000	*pages are bookable in advance*	1,000	*£1 per frame*
telephone charge	50	*say 5p per frame on average*	750	*say 3p per frame for update and review, 100 frames per day*
staff and overheads	4,800	*less than one full time staff on average during creation period*	7,000	*one full time staff when all the pages have been created*
promotion	–	*see below*	10,600	*see below*
	£6,500		£20,000	

The largest single cost figure – and the least certain – is £10,600 for promotion. Many IPs with marketable information will find some difficulty in making potential users aware of their Viewdata services. This applies both to users with Viewdata sets, and those who would have one if they knew about the services. Those already with terminals might be 'hooked' by cross referencing and by subtle advertising in the high level routing pages. Many IPs will be tempted to set zero prices for these high level pages, and in any case they have agreed to organise printed directories of the main topics, as mentioned earlier. These directories might well be issued free, with the cost borne by the contributing IPs.

What level of return might an IP expect? This is even harder to generalise about than costs, but continuing with the example tabulated above, and assuming that this IP prices his average frame at 1p net of the Post Office charge, it is clear that two million frame accesses are needed

per annum to cover the maintenance costs alone. For 1000 frames, this is an average of 2000 accesses per frame. Assuming a total population of 100,000 Viewdata users, that is 1 frame per 50 users per annum. Most IPs would agree that this is not an unreasonable expectation.

However, when a public service is established the number of users which the Post Office expects per Viewdata centre will be closer to 10,000 than 100,000 in order to preserve the average access time. An IP wishing to service a user population of 100,000 will probably require his pages to be duplicated across several databases. In this case the Post Office may want to increase the frame charge beyond the basic one pound per frame, particularly if the pages are duplicated at more than one Viewdata centre. The precise charging structure for duplicated records is still being discussed.

Furthermore the return in the example above does not allow for profit, nor for paying back the deficit of £6,000 incurred to create the frames in the first place, and the annual deficits incurred on maintenance up to the break even point with 100,000 users. If we assume that three years elapse before a population of 100,000 users is reached, the deficit in the period will rise to around £40,000 to £50,000. This is the real measure of the up-front risk which the IP in our example runs.

IPs confident of their information products can almost certainly reduce the risk by establishing CUG subscription services.

C Economics for Users

In the preceding subsection we have described the economics of Viewdata from the point of view of the IP. Here we turn our attention to the user, who can be either a businessman or a private individual.

The first cost to the user is the Viewdata terminal itself. The present day price of a fully featured 26" colour combined Viewdata and Teletext terminal is about £1,100 (about £400 more than a Teletext receiver alone). Current projections indicate that the additional price for the combined Viewdata and Teletext facility might fall below £100 in about five years from now, so a fully featured 26" combined terminal could sell at about £450 at today's prices, and a small monochrome business terminal with just Viewdata at about £200.

For the market trial, the Post Office has decided jointly with the TV suppliers and the IPs to peg the rental prices for fully featured colour domestic Viewdata terminals at around £18 per month, and for monochrome business terminals at about £10-12 per month. Users will also have to pay for phone connections at the local rate, which for the 3p charge unit gives two minutes at peak times, three minutes at standard times and twelve minutes at other times. The Post Office plans to use the local call charge basis for Viewdata initially, regardless of the location of users in the UK.

In addition, users will have to pay a price per frame access according to a scale as described earlier and averaging perhaps 1.5p, or alternatively subscribe to a CUG with limited access to a defined part of the database. There is still uncertainty about the pricing of public frames when special conditions apply such as frames with reception errors, multi-frame pages, and multiple accesses to a single frame (eg a main index) during one session.

Even with a printed index, the average domestic user seeking information is likely to access at least four pages in one session over a period of perhaps one or two minutes, for which the total charge including the telephone call would be perhaps 9p. This raises the question of how frequently a user might use the service. In its formative years, when Viewdata is still in restricted use like colour TV in the early 60s, it is likely to appeal to a relatively rich sector of the domestic market able to afford it and to want it either for status or for genuine service reasons. For people like this an average access rate of twenty frames per day — say four or five average sessions — is probably reasonable. Certainly the average access rate by non-CUG business users is likely to be at least as high as this. Again, assuming 100,000 users as in the IP

example, the total daily number of frame accesses would be 2 million – or 730 million per year (yielding a gross revenue for the Post Office approaching £500,000 from frame access charges at 0.5 pence per frame). If we assume as before that each frame is accessed an average of 2,000 times in the course of one year, the total number of frames needs to be some 365,000 – or roughly four frames per user. This is entirely within the bounds of possibility.

The cost of accessing twenty frames per day at an average 1.5p each works out at some £2 per week allowing for the telephone connections – not excessive for pertinent and timely information, but certainly more than the mass market could support at current levels of disposable income.

Unless they subscribe to a CUG, users of Viewdata will be charged by the Post Office. The telephone call charges will be added to the telephone account and billed in the normal way, with no indication of the split between Viewdata and voice telephone calls. The initial plan is to bill frame access charges separately from an accounting centre at Cambridge; full details of each access are most unlikely to be shown because of the extra expense and effort involved in so doing. These bills should not take users by surprise. In addition to the price code shown on each page every user will be allocated a statistics page which can be accessed probably free of charge, showing the cost of the current session and of charges accumulated to date. It is possible – even likely – that the Post Office itself will encourage the use of the settlement procedure described earlier (Section IIB); slow payers could be sent a printed reminder.

IV. COMPLEMENTARY AND COMPETING SYSTEMS, AND PROBABLE APPLICATIONS

In Section II we described the main services which Viewdata has been designed to offer, and in Section III its main attractions and weaknesses, and its economics from the IPs' and users' point of view. Here we are concerned with the way in which Viewdata is likely to be used in practice, beginning with a description of some complementary and competing developments.

A Passive Systems Including Teletext

The development of Viewdata began in 1970 at the British Post Office Research Centre when it was located at Dollis Hill, and has continued since then at Martlesham Heath. A number of other systems designed to use either the telephone network, TV receivers, or both, have their roots at about the same time. They can be categorised as either *passive* or *interactive*; the former without a return channel to the data source, and the latter with one.

Here we describe the first category under two headings: precursors and pioneers, and Teletext.

1 Precursors and pioneers

One of the forerunners of present generation teletext systems was Homefax, devised in the RAC Laboratories in New Jersey in the mid 1960s. It was designed to transmit text into the home for output on a hard copy facsimile printer in support of a current TV programme. The analogue facsimile image was modulated onto one of the spare TV scanning lines, and it took 10 seconds to transmit one complete page of 600 lines. Because lines were captured on pages one at a time, there was no need for a memory at the receiving end. As the cost of memory and digital circuitry dropped in the early 70s, Homefax quickly became obsolete and was dropped.

A digital system developed some time after Homefax was the HRI Add-on System from Hazeltine Research Inc., which used spare capacity in a little-used frequency band of the active (visible) part of the TV picture transmission in such a way that virtually no trace was left on the picture. The HRI Add-on system has seen some use for captioning, news headlines and similar applications.

An alternative to the HRI Add-on is NBS's TV-Time system which uses one spare broadcast TV scan line to transmit digital information at the rate of 600 words per minute, and is now fairly widely used in the US, chiefly for providing captions for the deaf on TV programmes.

In Japan the NHK (Japanese Broadcasting Corporation) has developed a system which is similar to Teletext. Unlike the HRI Add-on and NBS TV-Time systems which transmit coded data to be decoded at the receiver, the NHK system transmits the dot elements of a black and white picture. Each picture consists of 200 lines, and the dots in each line are carried in one spare scan line. In this way it is possible to build up a display with a fine enough resolution to show a useful amount of text in the Japanese language. No decoder or character generator is needed, but a comparatively large memory is required because all the dots have to be stored before the full picture is displayed: with 332 dots per line and 200 lines, this amounts to nearly 70,000 bits.

Besides these broadcast systems, several cable TV systems have been developed particularly in the US and Canada. In general they work in a similar way to Teletext: the textual information is digitally encoded and transmitted as a stream of pulses, to be decoded and displayed via a character generator at the TV receiver. Where the whole of the bandwidth (capacity) of a cable is available, these systems can transmit data very rapidly. Reuter's IDR system for example can carry over 650 full pages of 768 characters each in one second on the 525 line standard – enough to handle over 10,000 Viewdata size pages with an average access time of about 10 seconds.

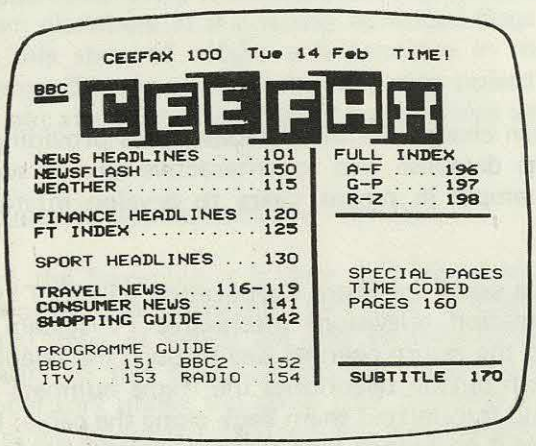
2 Teletext

The development of UK Teletext dates back to research work done by both the BBC and IBA in 1969, but it was not until their separate development paths were unified following a standard agreed by a BREMA (British Radio Equipment Manufacturers' Association) committee in 1974 that real progress was made. Both the BBC's Ceefax and IBA's Oracle are now operational – apart from a dispute which has caused the recent suspension of Oracle – and receivers for purchase or rental are now becoming fairly commonplace.

Teletext pages are transmitted sequentially at the rate of about four pages per second in the form of digital pulses superimposed on the normal transmission signal. However the transmission is not continuous. Only the short interval between complete field transmissions is used, called the field flyback or vertical blanking interval, and it separates the two fields each of a nominal 312.5 lines which are interlaced to make up the 625 line raster of the familiar TV picture. Two scan lines are used to carry the Teletext data in this interval and each line holds enough to build a 40 character row. To build all 24 rows therefore requires 12 vertical blanking intervals, and because each interval occurs every one-fiftieth of a second (one twenty-fifth of a second to transmit a complete two frame interlaced TV picture) a complete Teletext page takes twelve-fiftieths or about one quarter of a second to transmit.

A Teletext user identifies the page number he wants through an index page or from his memory, and enters it into the receiver with a Viewdata-like keypad. The receiver waits for the frame to be transmitted, stores it, decodes it from storage and generates the corresponding characters for display, continually refreshing the display from storage until requested to terminate, for example by the selection of another page.

The maximum waiting time thought to be tolerable is about twenty-five seconds, which is equivalent to some 100 pages (at present the times to transmit a full and a less-than-full page are the same, though Teletext's line address facility could obviate the need to transmit blank lines). Unlike the telephone though, with Teletext there is a certainty of ultimate success. Although 80 pages is adequate for a good deal of topical information such as news, sports results, weather and stock market prices, its capacity is soon exhausted. Unfortunately there is little scope for improvement by raising the transmission rate: at 10 bits (pulses) per character and 40 characters per row, 400 bits must be transmitted in the time it takes one picture line to scan across the display, and there are 625 of these in one twenty-fifth of a second. The bit rate is therefore 400 x 625 x 25 or approximately 7 million bits (7 Megabits) per second allowing for control bits, which is close to the maximum bandwidth of the colour TV channel.



The obvious alternative is to use more lines in the vertical blanking interval. In fact it is

possible to use as many as 8 or 9 lines without introducing any visible effect on the TV picture near the top of the screen. Another way of increasing the effective page capacity of Teletext is by transmitting multiple frames on the same page number at intervals of a minute or two to allow time for comprehension. Several frames can be cycled round one page number in this way. 'Bulletin' pages are an extension of the same idea, where each frame is identified by the hour and minute of transmission as well as the page number. Sixty frames can be transmitted under one page in an hour this way, and the receiver can be set to 'grab' the right one beforehand. These techniques are achievable with the present Teletext standard, raising its capacity to several hundred pages at least.

Much greater advances are possible by using the full capacity of a dedicated TV channel. With one row of text superimposed on one scan line, and 625 scan lines in one twenty-fifth of a second, the capacity becomes approximately 650 pages per second – about 160 times as great as present Teletext. In fact the full channel capacity could be made available during lulls between TV programmes, or instead of test card transmissions, or when TV broadcasting is off the air. Pages could be captured one at a time and transferred (not at the 7 Megabit data rate of course) to high capacity low speed cassette storage for subsequent printout or display. This way the effective page capacity of a Teletext system could be raised to many thousands of pages, still with the advantage of being able to cater for a user loading of 100%. If the printing of newspapers is ever to be done in the home, it is likely to be done this way, not with Viewdata.

At present domestic Teletext receivers cost about £650 to buy, or about £15 per month to rent after the deposit. Alternatively adaptors which plug into the aerial socket of an existing set cost about £400, though with this arrangement it is not possible to display Teletext over background pictures. The transmission service itself is inexpensive to operate and currently comes free, though it is possible that a small increment on the license fee will be introduced later to pay for Ceefax (a few pence on everyone's license would pay for it) and limited advertising will pay for Oracle.

At present the Post Office does not regard Teletext as a competitor to Viewdata. Rather it sees the two as suited to complementary applications, which we discuss later in this section of the report. Teletext has little financial muscle compared with Viewdata, and the TV set manufacturers regard it as an interesting new feature for receivers rather than a development to alter fundamentally the whole concept of TV. But it is important to Viewdata. It is stimulating interest in the idea of selectable text display; much of its circuitry is common to Viewdata; and its transmission code and display format, which Viewdata has borrowed, may become the basis for a European standard.

B Interactive Systems

Interactive systems are characterised by a return channel to the database, thus providing the potential for selecting information from a larger database, and for interactive services such as message sending. There have been several attempts in recent years to develop interactive systems for the public.

In the Reston experiment conducted in Virginia using the Mitre Corporation's TICCIT (time-shared, interactive, computer-controlled information television) interactive TV system, the channel into the terminals was a TV cable, and the return channel was through the telephone network. Users indicated by means of their push button telephones the frame numbers they wished to see; a computer selected the frames and transmitted them back along the cable. Each receiver detected the correct frame, and recorded it on a video tape recorder for playback onto the screen. The channel capacity was 60 frames per second; assuming an average per-frame viewing time of 10 seconds, the system could support 600 simultaneous users.

In 1973 a service called In-Touch was launched in Seattle using push button telephones to send instructions to the computer, and voice response back again through the telephone. The system was apparently both limited in application, and hard to use.

A system called DIALS using the same principle as In-Touch – push button telephone instructions and voice response – was initiated in 1971 in Japan by NTT (Nippon Telegraph and Telephone) as a calculation service, able to provide some quite sophisticated capabilities including trigonometric and logarithmic functions and algebraic expressions using arguments input by the users. Arithmetical operations and functions had to be encoded from key combinations on the push button telephone pad, and a removable template was provided to assist with this.

At last year's SICOB exhibition the French PTT demonstrated a system called TIC TAC which linked the telephone to an unadapted TV via a simple box which plugged into the aerial socket. It appeared to be substantially incompatible with Viewdata; it was rather slow (less than 200 bits per second compared with Viewdata's 1200), with a limited display format and monochrome only. We understand that TIC TAC has been dropped.

Another French system which has been getting a good deal of publicity recently is called Antiope, standing for L'Acquisition numerique et télévisualisation d'images organisées en pages d'écriture. It has been developed by the French CCETT, the joint centre for research into TV and telecommunications run by the French PTT and TDF (broadcasting authority). Strictly speaking Antiope is a passive system designed for broadcast or point-to-point transmission. To this extent it rivals Teletext. However an interactive version called TITAN exists using the same transmission code and display features. Both French systems offer comprehensive data and graphics with a more free form data structure than Teletext, and Antiope can use any part of, or all, the TV raster. However, both Antiope and TITAN appear to be more complex than Teletext and Viewdata inside the terminal – they require more circuits and storage. At this stage there must be some doubt about the willingness of the semi-conductor and TV suppliers to risk embarking on the development of such complex circuitry for domestic consumption, particularly in view of the fact that no pilot trial has yet been undertaken.

Last August the Federal German Bundespost elected to buy the Viewdata software and know-how from the Post Office in order to conduct a three year experiment with the system. Under the terms of the contract technical information is restricted for use only in Germany during this period, and German firms are unable to compete with British ones in third country markets until after March 1980 (which they can hardly feel to be a great imposition). The Germans have implemented trials of the system – called Bildschirmtext – but do not appear to have made a great deal of progress as yet.

In conclusion there is little doubt that Viewdata is ahead of its rivals. There is no equivalent system elsewhere at a similarly advanced stage of development. There is no reason to believe that this state of affairs will continue in the future, but for the present Viewdata is not threatened by an equivalent alternative poised to engulf it. In the last part of this section we turn our attention to evaluating applications which are suited to it.

C Suitable Applications for Viewdata

From the foregoing it is clear that Viewdata is a new kind of medium, without any obvious equivalent. Nonetheless it will have to compete for attention with a variety of alternative media, most of which are well established and widely used. How does it compare? To seek answers to this question we will examine its strengths and weaknesses compared with its competitors under the same four headings as in Section II: providing information, sending messages, interactive services, and personal and in-house services.

1 Providing Information

Information comes in different forms – for example fact, opinion, comment; and in different ways – voice, text, data and static and moving image, each with its own advantages and disadvantages. Viewdata is restricted to text and data with some limited capacity for static image communication, so from this point of view it compares more naturally with printed matter and Teletext than with moving image services, eg TV, or

voice services such as the phone or radio. However the phone *is* used widely as a means of obtaining information from another party; Viewdata is a self-help system – it does not depend on the availability of another party with the required knowledge at the end of the telephone line.

We can use four criteria of effectiveness to compare Viewdata with printed matter and Teletext: immediacy (how quickly information can be disseminated to recipients), comprehensiveness, convenience and cost.

For immediacy both Viewdata and Teletext are vastly superior to printed matter. Technically Viewdata can be just as immediate as Teletext. In practice though Teletext is likely to attract information which is highly topical, and therefore apparently more immediate to the eyes of users.

Comprehensiveness embraces both scope and level of detail. Clearly Viewdata's scope is enormous – vastly greater than Teletext at present – though in terms of level of detail it cannot compete with printed matter. For convenience both Viewdata and Teletext have a high potential because of the ubiquity of TV (and the telephone in the case of Viewdata), will be more costly to the user than Teletext and might often compare unfavourably with print.

In summary, Teletext is appropriate for *topical* information with a high demand and short life (eg news, election results, sports results). Viewdata is appropriate for essentially factual reference information of the generally short term variety such as 'what's on', and its convenience and its ability to provide a ready link between related subjects will be major advantages.

Longer term reference information, opinions, comments, information of the sort requiring high quality visual images and so on will all continue to be handled better by printed matter. However, Viewdata is well placed to complement printed material; indeed several IPs plan to link their existing publications with more immediate factual information on Viewdata.

2 Sending messages

In business Viewdata is a potential threat to the telephone, to physical mail, and to electronic mail systems such as telex, facsimile and communicating word processors. In the home it is an alternative to the telephone and the physical mail. To what extent is it likely to displace these other services?

First, in the home. Compared with the telephone Viewdata will be a good deal less convenient for all but the most cursory messages. However its ability to *store* messages will be important, and will add to its attraction for short messages. It is unlikely to have a significant impact on letters because most people will find writing more convenient than using a keypad or even a keyboard. But it could well displace the use of cards for simple factual messages – not for greetings or salutations – and certainly the use of telegrams for the same purpose.

In business the Viewdata message service may become an important adjunct to telex because of its convenience and ease of use. And it is likely to find a continuing niche in providing a convenient way of distributing standard messages simultaneously to a number of recipients – salesmen in the field for example. Perhaps more importantly though it has the ability to provide simple electronic mail with the enormous advantage, compared with communicating word processors, of Post Office approval for inter company services. This raises the inevitable question of whether the Post Office will lift its monopoly restriction in this area. If so Viewdata could find itself competing in the message service area with communicating word processors. It could be that both will co-exist, Viewdata providing a useful readily-available medium for simple messages, and communicating word processors the medium for lengthier letters and texts created on them in the first place.

Unlike in the home, Viewdata's use in business could substitute to some extent for the use of the telephone because of its store and forward capability and its convenience for messages of a short, factual nature.

3 Interactive services

In Section II we described interactive services as calculation, education, social and leisure services. It is tempting to describe the calculation service as one which could find really significant support particularly amongst the nation's many small businesses for routine tasks such as VAT calculations, accounting (in conjunction with rented storage on the database), the preparation of performance ratios and so on. It is more likely though that hand-held and desk-top calculators will be developed to the point where they can offer this type of service at a more competitive price than Viewdata, though many might still find the Viewdata service attractive for occasional use.

The educational, social and leisure services, on the other hand, may well find widespread use. For example people could use Viewdata to assess the interest of a new educational subject, possibly going on to purchase cassettes containing more detail for playback on their TVs. In the leisure field Viewdata will have an unparalleled ability to provide a variety of in-house entertainments – and research seems to indicate that, with the current generation of TV games on sale in the US, interest does not persist: the value of the game is its novelty.

In all these cases Viewdata's pay-as-you-use price basis will be an important contribution to its success.

4 Personal and in-house services

The success of this final area of Viewdata's potential application is somewhat dependent on its success in other areas. If the private message service becomes widely used then people will be tempted to use the personal service as well, though it is unlikely ever to become more than a small proportion of Viewdata's total use.

Again, if Viewdata becomes as pervasive as its protagonists hope then in-house services may well become quite popular too – in small businesses as a substitute for computer services using conventional terminals, and in big businesses as a complement to them.

In this section we describe how Viewdata works: the computer network including its connection to the telephone system, the transmission code and character set, and the TV terminals and attachments.

A The Computer Configuration

The type of computer in use for the pilot trial, and planned for use at least for the initial public service, is the GEC 4080. At the start of the market trial each 4080 will be configured with four 70 Mbyte disc stores each and up to 200 access ports. Beyond this the 70 Mbyte discs can be replaced by one 300 Mbyte disc, six of which can be attached to each computer if necessary.

Each port is expected to support about fifty domestic users or five to ten business users. The Post Office has conducted simulations which indicate that with 200 ports fully loaded, and with the users on each port accessing a page every 12 seconds on average, a maximum response time of 2 seconds can be achieved on 99% occasions. At this loading the computer should be disc-access bound; the CPU is still only 10% utilised.

Assuming 200 available ports per computer, 50 domestic or 5 business users per port and twice as many domestic as business users, each computer will be able to support about 2500 terminals.

However, not all the user interactions will be for information retrieval of course. Message sending and interactive services will demand a good deal more CPU processing. At this stage it is too early to judge whether information retrieval will set the limit on the number of users per computer – which is what the Post Office expects – or whether interactive services will. A lot depends on timing. For example, the distribution of messages could be done overnight at off-peak times.

Apart from these services housekeeping will account for perhaps another 25%-30% of CPU time, eg statistics, billing, logging, archiving and so on.

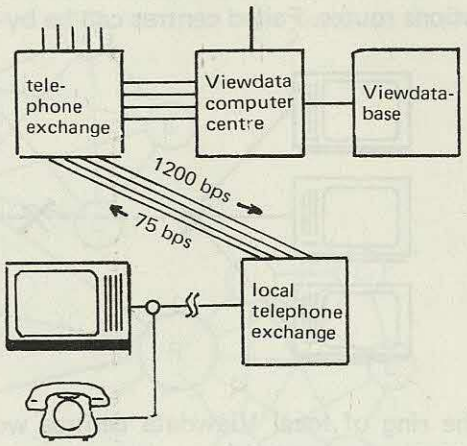
One Mbyte of disc storage is approximately equal to one thousand frames, so a 70 Mbyte disc can hold approximately 70,000 frames of information. Of the 200 ports per computer, only about half will be allocated to users during the market trial, the remainder being for IPs and for the Post Office. After the market trial the ratio of user ports to other ports will grow substantially. Each user will be allocated at least one personal statistics frame so a computer with 100 user ports and 50 users per port will require 5 Mbytes of disc space allocated for this purpose. User message areas will be additional; at present there is no specified limit to the size of an individual's message area.

In fact a local Viewdata centre will consist of two identical computer systems, both of which will be available to users through the dial-up network on a single telephone number, with the

outlets interleaved so as to ensure, as far as possible, even loading of the two machines. The dual computer configuration, together with the network described below, should ensure data security and allow continuous 24 hour unmanned operation.

B Viewdata Networks

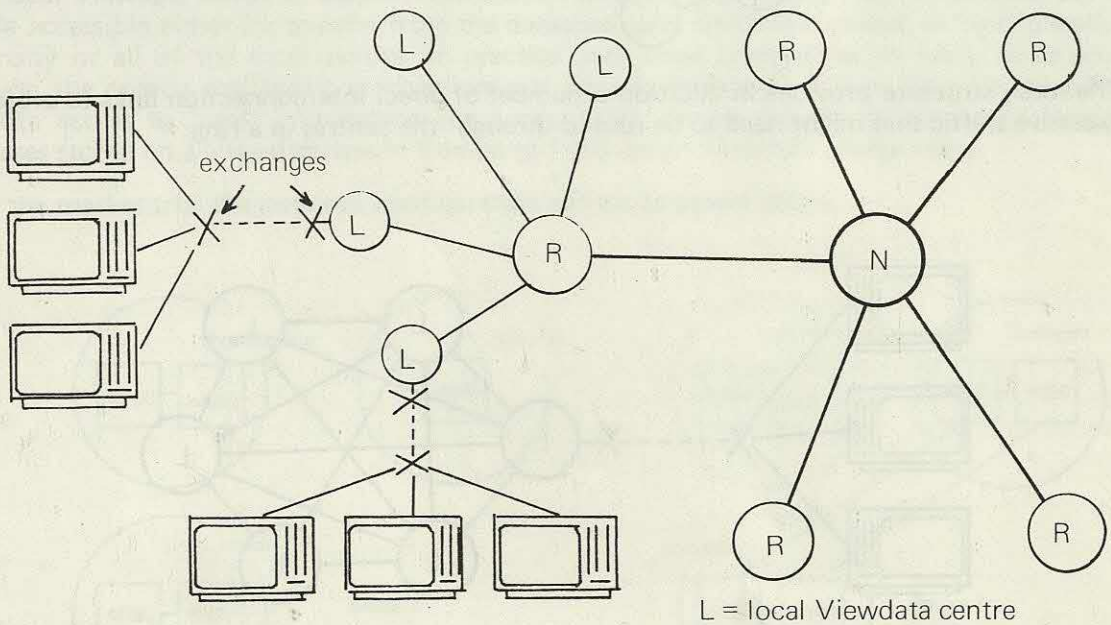
In a fully developed Viewdata service, local and national information will be stored on computers located at Viewdata centres around the country, linked to form a national network.



Users' terminals will be connected via the local public telephone network to local Viewdata centres. The Post Office's initial plan was to develop a hierarchy of star networks. Local Viewdata centres would be connected in turn to a regional centre, and regional centres to a national centre. The links between the Viewdata centres would be permanent high quality data links operating at 2400 bits per second and above. They could even be integrated with the new public packet switching data network the Post Office plans to supercede the now defunct EPSS experimental service.

This proposed hierarchy of Viewdata centres is illustrated below and was designed to meet these objectives:

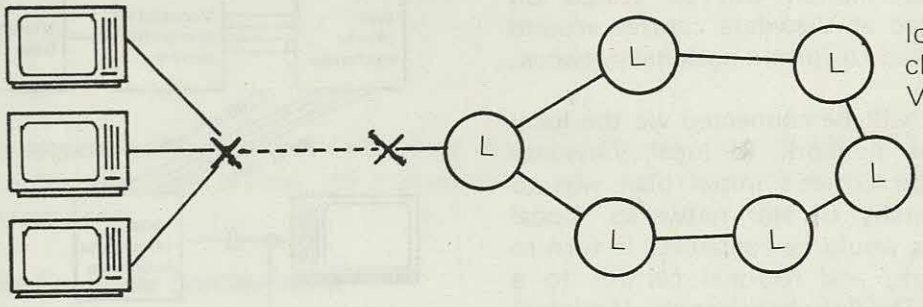
- The administrative control and monitoring of the national operation from a single centre
- The acceptance and distribution of data, including frame alterations, to all or to several local centres
- The maintenance and enhancement of software for the whole system
- The archiving of all the databases
- The gathering of statistics and production of customer accounts.



L = local Viewdata centre
R = regional Viewdata centre
N = national Viewdata centre

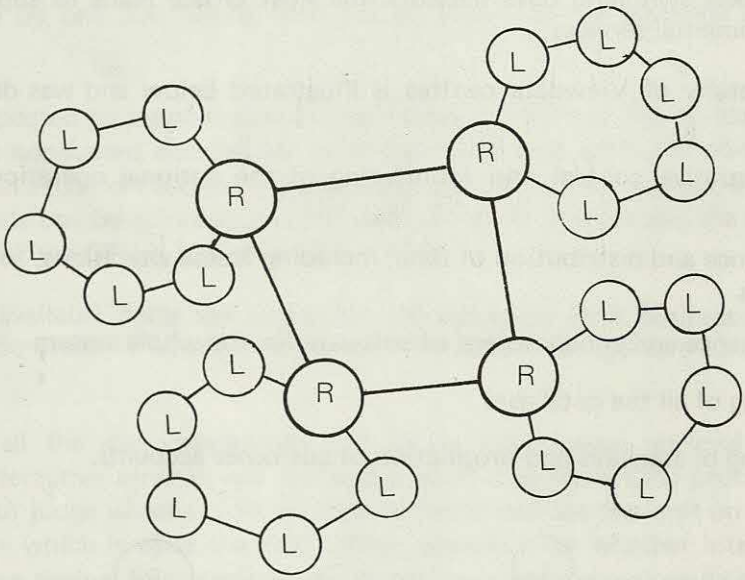
However the Post Office is concerned to reduce costs by designing the whole network for unmanned operation, and has been considering alternatives to the star hierarchy just described. Two of these are the ring structure, and the mesh structure.

The ring structure has a number of advantages over the star structure. It avoids placing an excessive reliance on the few star points of the star network by providing alternative communications routes. Failed centres can be by-passed:

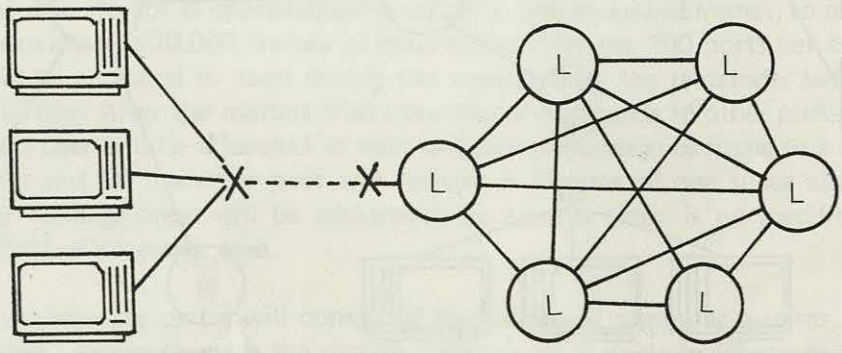


local ring cluster of Viewdata centres

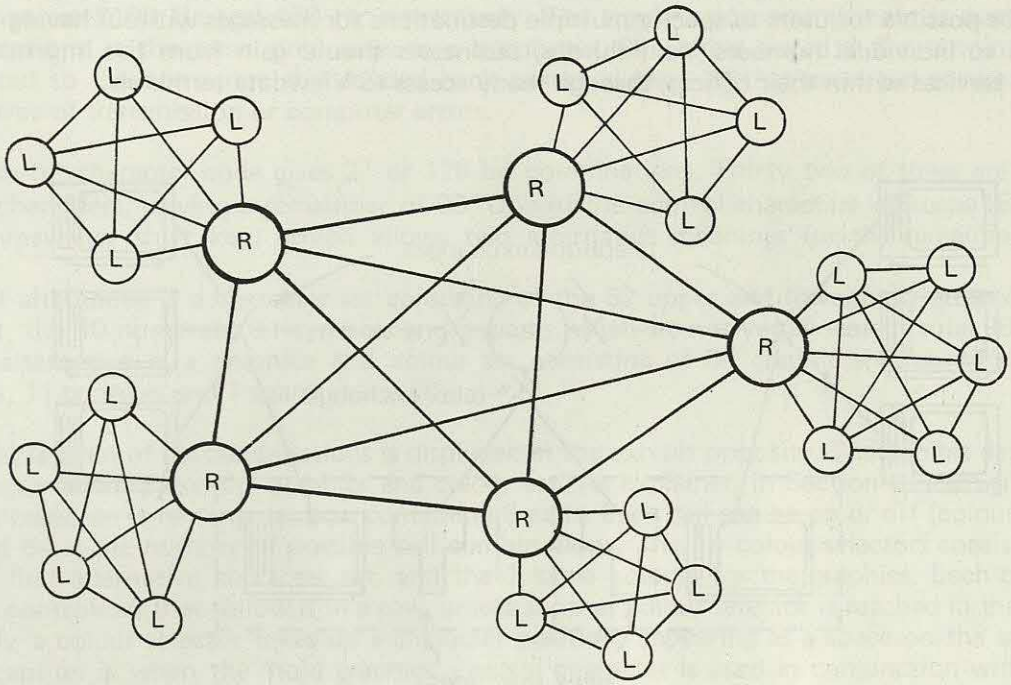
The ring of local Viewdata centres would be connected into a higher level ring of regional centres, also arranged in a ring.



The mesh structure provides in addition a number of direct interconnection links to avoid the excessive traffic that might need to be routed through the centres in a ring:



As for the ring of local Viewdata centres, the mesh of local Viewdata centres would be connected into a higher level of mesh of regional centres, also arranged in a mesh:

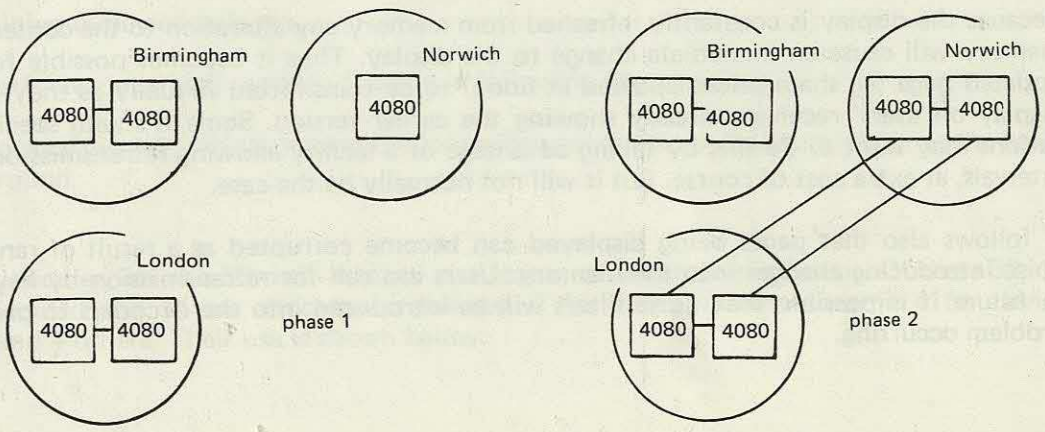


Research to date seems to indicate that the mesh network scores well against both the star and the ring network even where communications links in the mesh are unduplicated, provided the number of centres in a cluster is not higher than about six. Above this costs increase very rapidly.

In all three proposals it is assumed that the majority of accesses by users will be for information and messages stored in the local Viewdata centre or cluster.

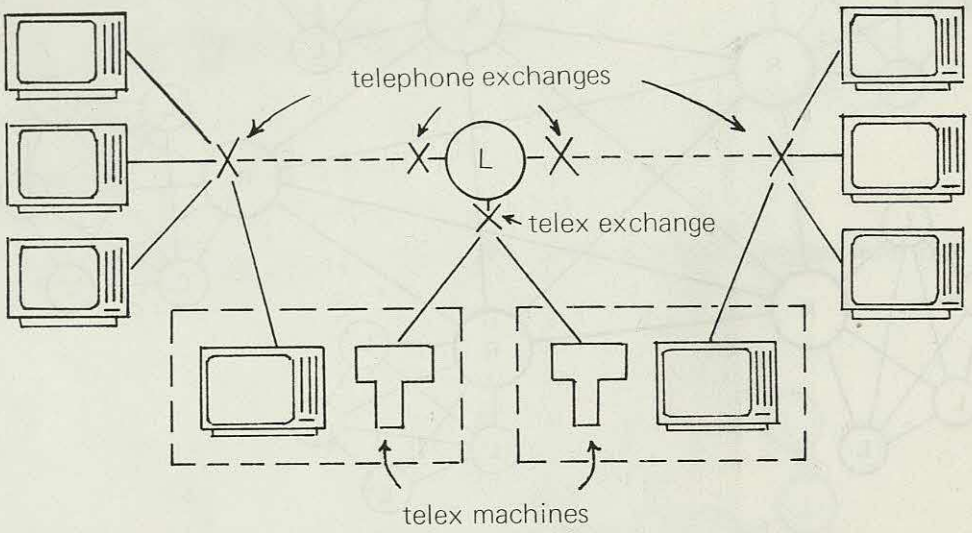
Information of local interest only (eg current events in a country town) will only be stored at the local Viewdata centre or cluster. Information of wider interest (eg flight timetables) can be made accessible either by transfer from the database upon which it is stored, or by duplication at many or all of the local centres. In practice both these alternatives are likely to be used, though the criteria and tariffs involved are not clear at this stage. It does seem however that remote access to 'rare' information (eg access from Portsmouth to details about tropical diseases stored on a Viewdatabase in Edinburgh) will entail trunk call charge rates.

For the market trial the network configuration will be as shown below.



Phase 2 will see the development of a simple ring of four computers; all four databases will be identical and updated simultaneously.

Finally, the Post Office plans to link telex exchanges onto local Viewdata centres, resulting in some important benefits. First, the telex service will gain a store and forward capability, eliminating the redialling which can occur on the present point to point system. Second, it will be possible for users to specify multiple destinations for messages without having to repeat them to individual numbers. And thirdly, businesses should gain from the improvement in telex services within their offices, through ready access to Viewdata terminals.



C Transmission Code and Character Set

Viewdata uses the same transmission code and character set as Teletext. Both use ISO-7 which is a subset of international ASCII allowing for the substitution of national characters such as the £ sign. There is a total of 10 bits per character made up from a 7 bit character code, a start bit and stop bit for asynchronous operation, and an even parity bit.

The transmission speed from computer to terminal is at the widely used standard 1200 bits per second, equivalent to 3 rows each of 40 characters per second, or a full 24 row page in 8 seconds. But a cursor can be positioned on the screen under remote control to point to the position of the next character for display, so a less than full page takes less than 8 seconds to build on the screen – say 5 seconds on average.

Users can flip through pages – another time saving feature. A page can be rejected before it is fully displayed and another page or frame called up.

Because the display is constantly refreshed from memory any alteration to the contents of the memory will cause an immediate change to the display. Thus it becomes possible for an IP's updated page (eg share prices updated at noon) to be transmitted virtually as they occur for display on users' receivers already showing the earlier version. Some IPs with specific applications may want to do this by taking advantage of a facility allowing retransmission at fixed intervals, at extra cost of course. But it will not normally be the case.

It follows also that pages being displayed can become corrupted as a result of random line noise introducing changes into the memory. Users can call for retransmission by keying *00. In future it is possible that noise filters will be introduced into the decoders to prevent the problem occurring.

The return speed from terminal to computer is 75 bits per second, equivalent to seven and a half characters per second or a full row in about 5 seconds, which is quite fast enough for most keyboard operating. The forward and return channels are modulated onto a voice frequency carrier within the speech band by a modem integral with the terminal and able to operate simultaneously in both directions. When no data is being sent the forward (to terminal) transmission frequency is 1300 Hz, and the return is 390 Hz. Both are binary 1 frequencies; binary 0 frequencies are 2100 Hz and 450 Hz respectively. The transmission arrangement is duplex – both directions at the same time as with a telephone. Characters keyed at the terminal are transmitted to the computer and echoed back before display so that users can ensure their input is free of transmission or computer errors.

The seven bit character code gives 2^7 or 128 bit combinations. Thirty two of these are main control characters, leaving a remainder of 96. One of the control characters is Escape (ESC – like a typewriter shift key) which allows two alternative meanings for the remaining 96.

The first alternative is a character set consisting of the 52 upper and lower case letters of the alphabet, the 10 numerals, 31 symbols and 3 spares which are not yet allocated: total 96. The second alternative is a graphics and colour set consisting of 64 graphic shapes, 14 colour selectors, 11 controls and 7 spares: total 96.

The complete set of bit combinations is displayed in the exhibit opposite. The exhibit deserves some explanation. First, the graphics and colour set. As explained in Section III each graphic shape is based on a rectangular box containing 6 cells. Each cell can be on or off (coloured or not) and 64 is the number of possible cell combinations. The 14 colour selectors consist of 7 for the first alternative character set, and the 7 same colours for the graphics. Each colour selector controls all that follow it in a row, unless another colour selector is reached in the row. Normally a colour selector takes up a character position, appearing as a space on the screen. The exception is when the 'hold graphics' control character is used in conjunction with one of the graphics colour selectors, to allow a colour change between adjacent graphics boxes. Besides the colour selectors, the other control characters in the graphics and colour set also require display as a space – thereby adhering to the Teletext 'intervening space' convention. This convention also requires each new row to start off in the steady, alphanumeric, white condition. Consequently a row beginning for example with a graphic or a non-white colour must have a blank in the first position.

As mentioned above there are eleven control characters in the graphics and colour set. Eight of these, including hold graphics, have only been introduced relatively recently and are not yet widely implemented. They are

- hold/release graphics, the purpose of which has been explained above
- contiguous/separated graphics, which was explained on page 18
- black/new colour background, with which the new colour background is taken to be the same as the display character obtaining immediately before
- normal/double height, which applies to following alphanumerics in the row

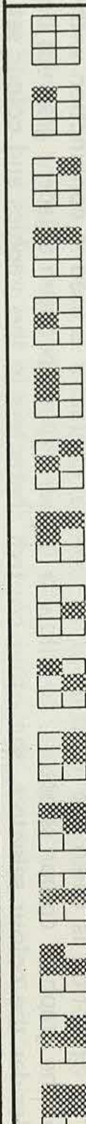
The remaining three controls are

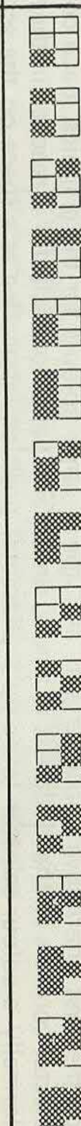
- flash/steady, which controls flashing in following row positions
- conceal display, which renders the following row positions the same colour as the background.

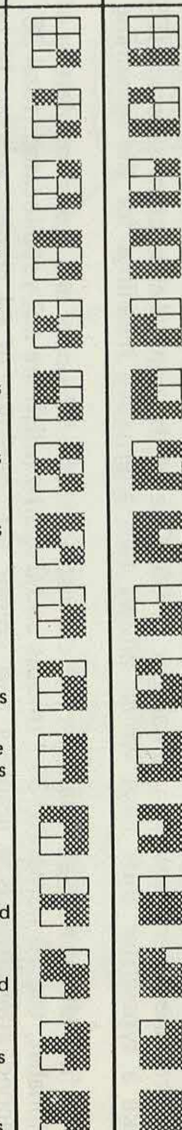
We mentioned earlier the 32 main control characters, of which one is Escape. Of these 32, 17 are unallocated and 14 are allocated as follows: 7 for cursor remote control, 4 for device control, and 4 others. Their use is shown below:

The transmission codes

b7 b6 b5 →		0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
4 3 2 1		0	1	2	3	4	5	6	7	2a	3a	4a	5a	6a	7a
0 0 0 0	0	NUL			0		P	—	p						
0 0 0 1	1		DC1	!	1	A	Q	a	q			Alpha red	Graphics red		
0 0 1 0	2		DC2	"	2	B	R	b	r			Alpha green	Graphics green		
0 0 1 1	3		DC3	£	3	C	S	c	s			Alpha yellow	Graphics yellow		
0 1 0 0	4		DC4	$	4	D	T	d	t			Alpha blue	Graphics blue		
0 1 0 1	5	ENQ		%	5	E	U	e	u			Alpha magenta	Graphics magenta		
0 1 1 0	6			&	6	F	V	f	v			Alpha cyan	Graphics cyan		
0 1 1 1	7			'	7	G	W	g	w			Alpha white	Graphics white		
1 0 0 0	8	Cursor ← BS	CAN	(	8	H	X	h	x			Flash	Conceal display		
1 0 0 1	9	Cursor → HT		)	9	I	Y	i	y			Steady	Contig graphics		
1 0 1 0	10	Cursor ↓ LF		*	:	J	Z	j	z				Separate graphics		
1 0 1 1	11	Cursor ↑ VT	ESC	+	;	K	←	k	¼			Normal height			
1 1 0 0	12	Cursor Home & Clear FF		,	<	L	½	l	‖			Double height	black b'ground		
1 1 0 1	13	Cursor ← CR		–	=	M	→	m	¾				new b'ground		
1 1 1 0	14		CURSOR RS Home	.	>	N	↑	n	÷				hold graphics		
1 1 1 1	15			/	?	O	#	o	■				release graphics		







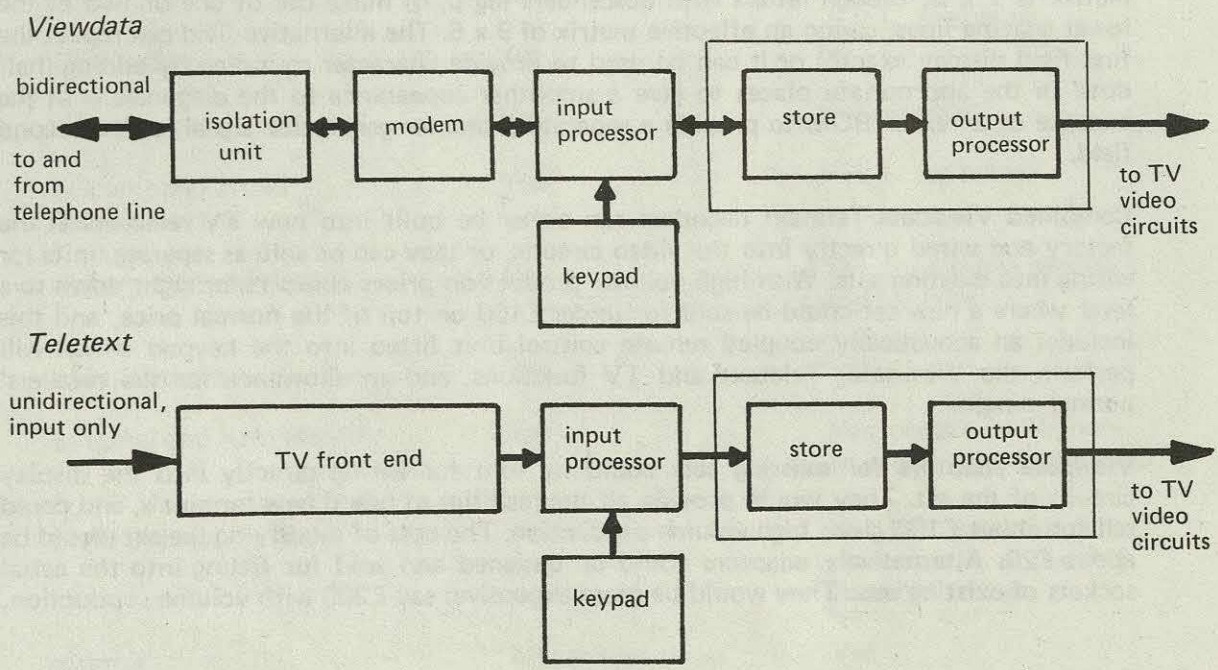
7 cursor controls	BS —	Back space — moves cursor one position left
	HT —	Horizontal tab — moves cursor one position right
	LF I	Line feed — moves cursor one line down
	VT I	Vertical tab — moves cursor one line up
	FF	Form feed — clears screen and moves cursor to home position (top left corner)
	CR —	Carriage return — moves cursor to first position on same line
	IS2	Home — moves cursor to home position (top left corner)
4 device controls	DC1	Device control 1) Combinations will be
	DC2	Device control 2) used for remote control
	DC3	Device control 3) of attachments, e.g.
	DC4	Device control 4) printer, cassette recorder
4 others	NUL	Used for timing purposes
	ENQ	Initiates automatic terminal identification
	CAN	Cancel — used from terminal to computer to delete a line
	ESC	Escape — to change from one alternative character set to the other.

D Terminals And Attachments

Here we describe the Viewdata decoder, the range of terminals now under development, and some of the attachments which will become available.

1 The Viewdata decoder

A Viewdata decoder can be considered to consist of six parts: a line isolation unit, a modem, a keypad, an input processor, a store, and an output processor. These are shown on the diagram below, which also shows the main parts of a teletext decoder. Apart from additional minor interconnections the store and output processor — both substantial components — are common to both Viewdata and Teletext.



- The isolation unit ensures that voltages originating from the terminal are limited to safe values before entering the telephone network.

- The modem extracts the digital signal from the carrier waves with incoming signals, and modulates outgoing signals onto the voice frequency carriers.

- The input processor accepts the demodulated data in serial form, checks the parity, decodes the data into characters and routes the characters to their correct storage addresses. It also generates and encodes keypad-initiated responses.

- The memory stores the characters.

- The output processor generates line and frame synchronous signals for the TV raster, decodes the special display control characters, generates the alphanumeric and graphic symbols, and ensures that the memory can be accessed simultaneously with the input which is by its nature asynchronous and random.

- The keypad has already been explained.

Several semiconductor manufacturers are now engaged in the development of specially designed LSI chip sets for Viewdata decoders including GEC Semiconductors, Texas Instruments, GIM (General Instrument Microelectronics) and Mullard. All of them appear to be already able, or about to be able, to deliver chip sets. Most of the TV receivers delivered for the market trial will be equipped with decoders based on early versions of chip set designs using MOS (metal oxide semiconductor) or I^2L (integrated injection logic). Later versions should be ready to follow on after the market trial.

About 70% by value of the Viewdata decoder is common to Teletext, so it is not surprising that the Post Office's decoder specification requires it to be able to handle Teletext as well.

A row of characters consists of ten lines in each TV frame (or twenty lines taking account of the two fields which are interlaced together to make up a 625 line TV picture). Normally 7 of these are display lines and 3 are spacing lines. Each character space in the horizontal direction is 8 dots — 5 display dots and 3 space dots. So the normal character matrix is 7 x 5, though letters with descenders (eg p, q) make use of one or two of the lower spacing lines, giving an effective matrix of 9 x 5. The alternative field can repeat the first field display exactly or it can be used to provide character rounding by adding 'half dots' in the appropriate places to give a smoother appearance to the diagonals — at the expense of an extra ROM to provide a separate character generation signal for the second field.

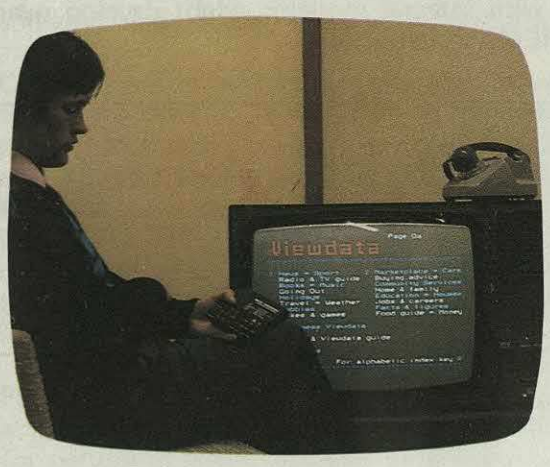
Combined Viewdata/Teletext decoders can either be built into new TV receivers at the factory and wired directly into the video circuits, or they can be sold as separate units for wiring into existing sets. With high volume production prices could be brought down to a level where a new set could be sold for under £100 on top of the normal price, and this includes an acoustically coupled remote control unit fitted into the keypad which will perform the Viewdata, Teletext and TV functions, and an allowance for the retailers' normal margin.

Viewdata adaptors for existing sets could be sold for wiring directly into the display circuits of the set. They would provide all the facilities of brand new terminals, and could sell for about £100 given high volume production. The cost of modifying the set would be about £20. Alternatively adaptors could be designed and sold for fitting into the aerial sockets of existing sets. They would be more expensive: say £200 with volume production.

2 Terminals

The only terminals built for the pilot trial and planned for the market trial tend to be of

two types: large fully featured colour domestic sets, and small cheap monochrome business sets. Both are able to house the relatively bulky decoder circuit boards being built at present — the colour receivers because they have enough spare room in their cabinets, and the business sets because their enclosures can be specially designed. Later, when decoder chips are in production, the physical volume of a decoder might be reduced to about the same as a tea cup and a wider range of terminals will become available.



A typical domestic set

A typical domestic set

The chart below highlights the main differences between these two types of TV terminal:

Feature	Domestic terminal	Business terminal
Colour	Yes	No) see below
large screen	Yes	No)
remote control	Yes	Not necessary
Teletext and broadcast pictures	Yes	Yes — see below
alphanumeric keyboard	No	Yes, for sending messages and for telex
built in modem	Yes	Yes
autodial and auto-identify	Yes	Yes, possibly with more than one Viewdata number
slave display	No	Yes, by connection into video circuit, or possibly via aerial socket
printer	Not at first	Yes
recorder	Not at first	Yes

Notice that business sets will have small screens, designed for close up viewing, for example on a desk. They will be monochrome to keep the cost down. A sharp monochrome Viewdata display may be less attractive than colour, but it loses very little in terms of information. The monochrome colours are likely to be black and white in order to meet the Post Office requirements, although the admittedly somewhat inconclusive eye strain tests conducted so far seem to indicate that green on grey is a more satisfactory combination.

The following table is a consensus view from the UK TV manufacturing industry of how the prices and volumes of new receivers with integral modems might develop over the years, based on a recent (January 1978) BREMA investigation:

(starting with 0 at the commencement of the market trial	1	2	3	4	5	6	7
sets sold (000s)	10	20	60	155	275	375	470
additional price for a Viewdata/Teletext capability ignoring inflation (£)	350	250	200	150	90	70	50

From the nature of the investigation we judge these figures to be somewhat cautious.

The business terminals will have to be designed to show off-air pictures in order to satisfy the Post Office requirements for connection directly to the telephone network. In practice the off-air capability on most business sets is unlikely to be used. They will probably lack aerials, so will be unable to show Teletext even though the decoders will be common. They will probably require loudspeakers though to satisfy the Post Office requirement and to make the auto dialler work.

Both the large domestic terminal and the small monochrome business terminal of the types described here will match the main needs of the market trial and the early public service, but later the demand will grow for a *range* of both domestic terminals (as with normal TV sets) and business terminals. In addition to this, the requirement will grow for other types of terminal, including public pay terminals, special terminals for IPs, and portable terminals.

Of these other types, probably the most urgent need is for public pay terminals, for use in places such as shops, shopping arcades, libraries, schools, post offices, railway stations and airport buildings. They are most likely to be small monochrome terminals not dissimilar to business sets, and they will need to be built in a way which renders them vandal proof – for example by mounting them behind bullet proof glass, and equipping them with touch keys. As a result the enclosure is likely to be more costly than the terminal itself and it may be that the extra cost of colour in the terminal – small in comparison – will justify its use. They would probably have a coin collection mechanism similar to a pay phone, or magnetic card readers to allow transfer charge arrangements say to a CUG. Alternatively they may be designed to be free of charge so the pay mechanism can be deleted, able only to access a limited part of the database – a kind of inverse closed user group – in the same way that some free public telephones can only access taxis or hotels.

The Post Office has declared its policy to supply Viewdataphones (terminals with telephones attached) though it has not implemented this policy yet. It has demonstrated an early design based on a portable twelve inch black and white TV but we understand that it has not yet negotiated a production contract with industry.

IP terminals would be designed with the editing keyboards attached, local storage and colour displays.

Portable terminals will be designed with a coupler to allow them to be plugged into telephone sets, acoustically or otherwise. Even portable radio terminals might some day be possible.

3 Terminal attachments

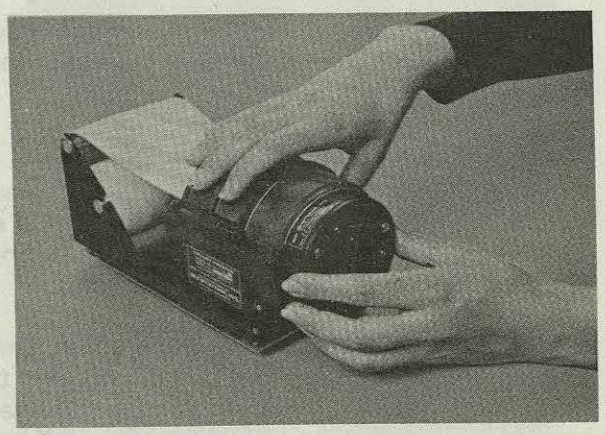
Two main types of attachment are currently under development other than the keypads and keyboards already described: cassette storage devices and printers.

Clearly cassette storage devices can be very similar to standard audio systems because they only need to record data at low speed — 1200 bits per second. They are not comparable with video cassette recorders (VCRs) which have to record a moving video picture and a sound track. The Post Office has issued specifications for a chip decoder with an interface to a cassette recorder, and the announcement of compatible products from industry is imminent. The average frame will take up to 5 seconds of tape; a C60 cassette could hold over 700 frames. Cassette storage devices could be remotely controlled from the Viewdata computer, or controlled at the terminal. The second stereo track could be used for an index.

Paradoxically their potential to reduce users' bills is probably somewhat limited. A user accessing new information for the first time might store it on the cassette in a few seconds for perusal at leisure another time — which could save on telephone charges, but the need to access and follow the routing pages will remain unchanged. Also, because of the volatile nature of most of the information likely to be stored on the Viewdatabase, it is improbable that much purpose will be served by storing information frames against the possibility that they may prove useful in the future.

The Post Office has been involved with industry in the development of a low cost printer based on thermal printing technology found in certain types of printing calculators, and it could be marketed within the next two years at a price below £100. An office type is also likely to be developed, with a print quality equivalent to an office typewriter, and a price to match — at least £1,000.

This illustration shows a typical low cost printer which might become the basis of a device suitable for Viewdata — the SCI Systems model 1100 from Peripheral Hardware. It can print above 2000 characters per second on electro-sensitive paper. It measures 4" x 5" x 9" and weighs 3 pounds.



The availability of both storage devices and printers will raise the question of IP's protection against copyright infringements. It might seem that many potential IPs would feel deterred by the relative ease with which their information could be copied. In practice IPs are unlikely to feel threatened; they will ensure protection through the *nature* of the information, for example in terms of volatility, rather than through restrictive practices or legislation.

VI. PRESENT STATUS AND PLANS FOR DEVELOPMENT

In this section we describe the current status of Viewdata and the plans for phased development in the UK as announced by the Post Office in Autumn 1977. We also describe the international outlook for Viewdata and summarise some of the developments which are likely to occur in the allied fields of domestic TV and business information systems.

A Phased Developments In The UK

At present Viewdata is nearing the end of a pilot trial which began in January 1976. The aim has been to determine the range of information for which it is suitable and to assess the nature of demand for its services. It can be seen as a product development stage. By the end of 1977 all the major UK TV set manufacturers were actively involved, and about one hundred IPs had some 7000 pages stored on the database on the development 4080 computer at Martlesham. About two thirds of the IPs were concerned with the domestic market and the rest with business (see Exhibit).

The final stages of the pilot trial are being devoted to preparing for the market trial, due to begin in the summer. The Post Office announced its plans for this in May 1977 when £3.7 million were earmarked for its support. The purpose will be to test public reaction both to Viewdata itself and to its charging structure. The plan calls for about 1200 terminals to be placed with a variety of users selected from the business and domestic communities. Of these, some 700 will be householders and 500 business people in hotels, shops, offices, factories and education establishments. For comparison, more than 10,000 Teletext receivers are already installed in the UK.

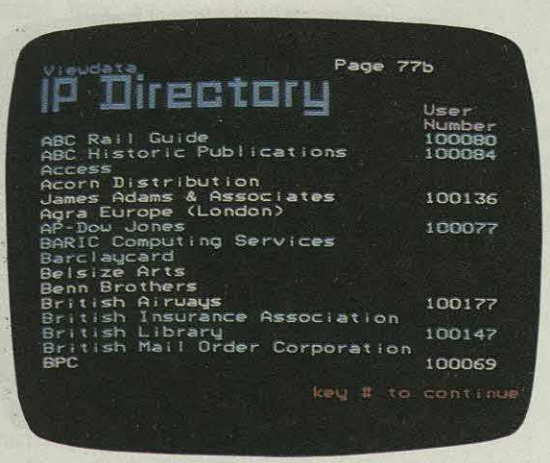
Presumably the figures of 700 and 500 represent the Post Office's expectation for the proportion of domestic to business users, at least in the early years.

The householders will be based on a sample supplied by the TV receiver manufacturers of existing viewers preparing to buy or rent colour TV. The IPs will supply the Post Office with details of potential business participants, and a few non-commercial organisations serving the general public will also be chosen — including libraries, community centres, citizens advise bureaux, railway stations and Post Offices.

The trial will be conducted in three areas: London, Birmingham and Norwich. About half the user terminals will be placed in London, and the balance split equally between the other two locations. By January this year a total of some 140 IPs were signed up or about to sign for the market trial, and over 100,000 pages were booked on the databases. Surprisingly CUGs will not operate during the market trial. Businesses interested in aiming their products at CUGs must simulate the response by carefully adjusting their per-frame prices and actively encouraging businesses in the trial to access their pages.

Users' terminals will cost them about a third more than normal TVs (see Section III C) — a price which will be uneconomic to the suppliers, but one they have agreed to accept. The original agreement called for a minimum of one hundred sets from each participating supplier by October 1, though this has since been somewhat relaxed. Each user will be allowed an

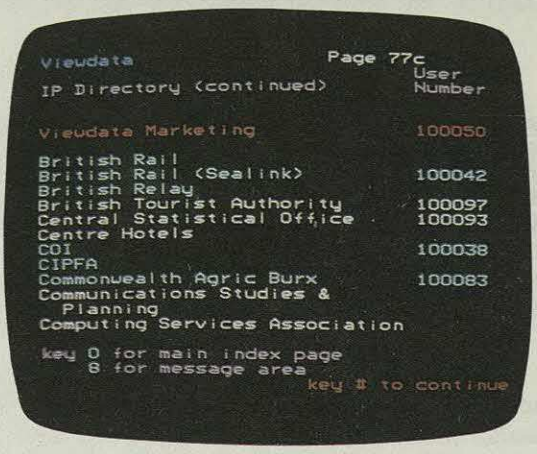
Current information providers (as at the end of 1977)


Viewdata Page 77b

IP Directory

	User Number
ABC Rail Guide	100080
ABC Historic Publications	100084
Access	
Acorn Distribution	
James Adams & Associates	100136
Agra Europe (London)	
AP-Dow Jones	100077
BARIC Computing Services	
Barclaycard	
Belsize Arts	
Benn Brothers	
British Airways	100177
British Insurance Association	
British Library	100147
British Mail Order Corporation	
BPC	100069

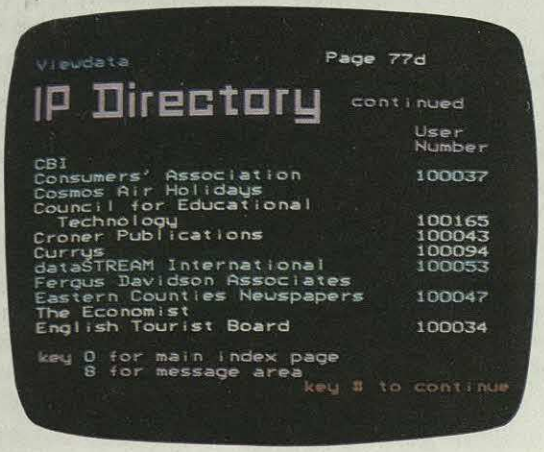
key # to continue


Viewdata Page 77c

IP Directory (continued)

	User Number
Viewdata Marketing	100050
British Rail	
British Rail (Sealink)	100042
British Relay	
British Tourist Authority	100097
Central Statistical Office	100093
Centre Hotels	
COI	100038
CIPFA	
Commonwealth Agric Burx	100083
Communications Studies & Planning	
Computing Services Association	

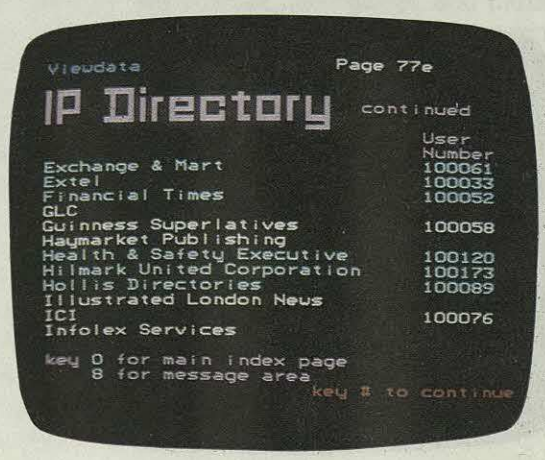
key 0 for main index page
8 for message area
key # to continue


Viewdata Page 77d

IP Directory continued

	User Number
CBI	
Consumers' Association	100037
Cosmos Air Holidays	
Council for Educational Technology	100165
Croner Publications	100043
Currys	100094
dataSTREAM International	100053
Fergus Davidson Associates	
Eastern Counties Newspapers	100047
The Economist	
English Tourist Board	100034

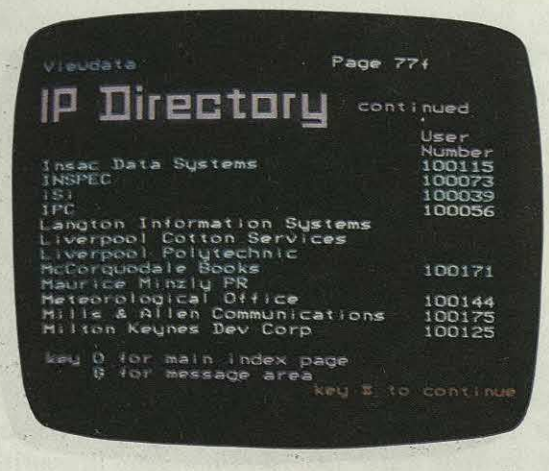
key 0 for main index page
8 for message area
key # to continue


Viewdata Page 77e

IP Directory continued

	User Number
Exchange & Mart	100061
Extel	100033
Financial Times	100052
GLC	
Guinness Superlatives	100058
Haymarket Publishing	
Health & Safety Executive	100120
Hilmark United Corporation	100173
Hollis Directories	100089
Illustrated London News	
ICI	100076
Infolex Services	

key 0 for main index page
8 for message area
key # to continue


Viewdata Page 77f

IP Directory continued

	User Number
Insac Data Systems	100115
INSPEC	100073
ISI	100039
IPC	100056
Langton Information Systems	
Liverpool Cotton Services	
Liverpool Polytechnic	
McCorquodale Books	100171
Maurice Minzly PR	
Meteorological Office	100144
Mills & Allen Communications	100175
Milton Keynes Dev Corp	100125

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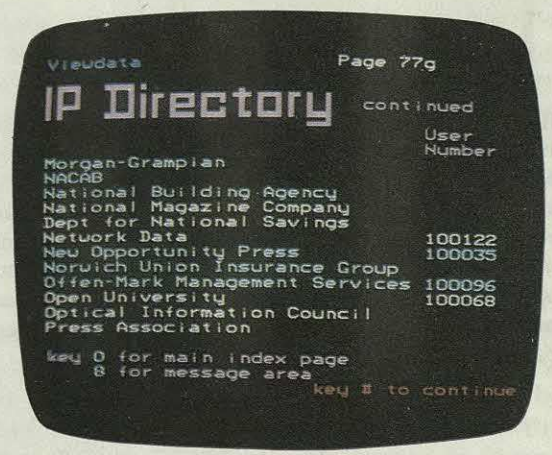
8 for message area
key # to continue


Viewdata Page 77g

IP Directory continued

	User Number
Morgan-Grampian	
NACAB	
National Building Agency	
National Magazine Company	
Dept for National Savings	
Network Data	100122
New Opportunity Press	100035
Norwich Union Insurance Group	
Offen-Mark Management Services	100096
Open University	100068
Optical Information Council	
Press Association	

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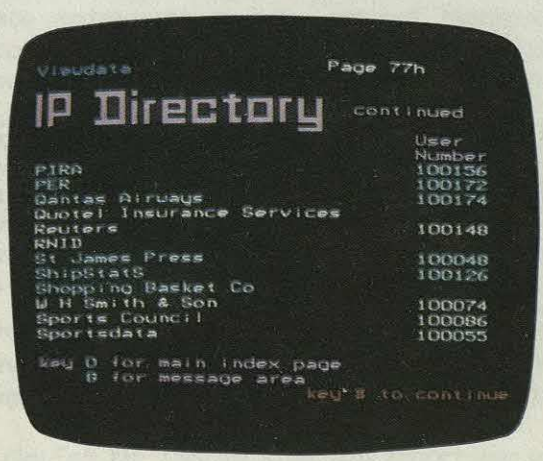
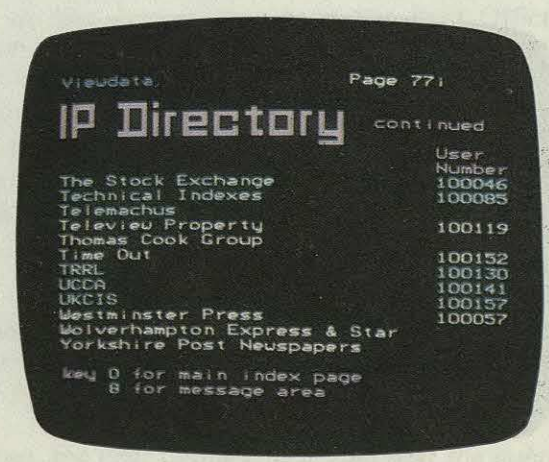
8 for message area
key # to continue


Viewdata Page 77h

IP Directory continued

	User Number
PIRA	100156
PER	100172
Qantas Airways	100174
Quotel Insurance Services	
Reuters	100148
RNID	
St James Press	100048
ShipStatS	100126
Shopping Basket Co	
W H Smith & Son	100074
Sports Council	100086
Sportsdata	100055

key 0 for main index page
8 for message area
key # to continue


Viewdata Page 77i

IP Directory continued

	User Number
The Stock Exchange	100046
Technical Indexes	100085
Telemachus	
Teleview Property	100119
Thomas Cook Group	
Time Out	100152
TRRL	100130
UCCA	100141
UKCIS	100157
Westminster Press	100057
Wolverhampton Express & Star	
Yorkshire Post Newspapers	

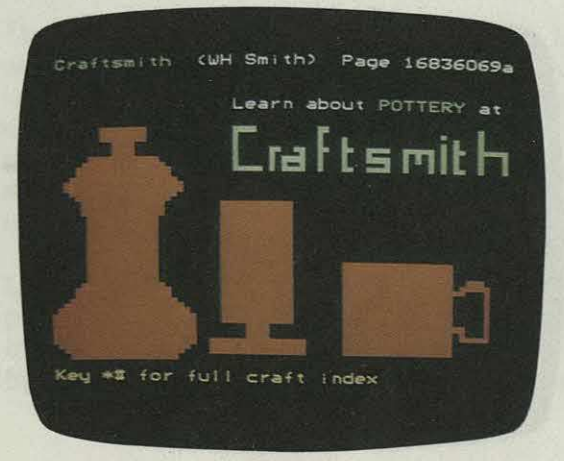
key 0 for main index page
8 for message area

Why four businesses have become IPs

Exchange and Mart is a national weekly advertising magazine with a readership of 2½ million. The management regards Viewdata as an opportunity to reach new markets, to reach current markets in a new way, and to offer both advertisers and readers a better service than now. They are planning a free service to users, recovering their costs by charging advertisers.

The New Opportunity Press are specialist publishers of careers and courses media for school leavers, graduates and work experienced job changers. Their interest in Viewdata is as a complement to the publications, able to show up to date job vacancies and career opportunities. They plan to supply terminals to universities themselves. Later, their expectation is that many schools will acquire their own terminals, and public terminals in places such as reference libraries and post offices will come into widespread use for retrieving information such as theirs.

St James Press publish a series of reference books for the travel trade. They are interested in using Viewdata to provide overseas holiday information for the general public, and also in a CUG application for the travel trade. Their publications are currently updated on and printed from a computer database. They expect to continue printing relatively static information as now, but to transfer the variable information directly into the Viewdatabase.



W H Smith sees Viewdata as an alternative method of providing a variety of current services: as a new advertising medium for shop products and services; for introducing new members to the mail order clubs, helping them to make a choice and pay their invoices; as a method of inter-branch communication; and as a new way of selling published information.

initial few weeks of free page access to allow for novelty during the learning period though they will have to pay the rates set by the IPs.

The Post Office has planned to start the market trial on June 1, but it may be forced to delay this by some weeks; the target number of priced and completed pages on the system is unlikely to have reached the target figure of 60,000 by then, partly because of a shortage of editing terminals. And whether the Post Office will really gain a true assessment of the market as a result of the trial must be open to doubt; the sample can hardly be representative, and the selection of information on the database insufficiently broad. As with the telephone the success of Viewdata will depend to a great extent on its penetration. Any test based on a small sample cannot be conclusive.

The plan has been to follow the market trial, assuming a favourable response to it, by a smooth transition into a restricted public service in the same areas towards the end of 1979, followed by a gradual geographical expansion in key cities such as Manchester, Edinburgh, and Cardiff in accordance with demand. However, it is likely that the Post Office will soon reveal a more ambitious plan which recognises the shortcomings of the market trial as a means of assessing the public's response to Viewdata. Rather it will probably announce its commitment to a public service *before* the start of the market trial, regarding the trial as a system test and a learning period for the parties involved. The public service itself is likely to start earlier than originally planned — perhaps by early summer 1979.*

The pilot and market trials together constitute what the Post Office refers to as Phase 1 in the development of Viewdata — the trials phase. It is already envisaging three following phases, 2, 3 and 4. Phase 2 will encompass the period of public service beginning after the market trial, exploiting the present level of technology. It is likely to continue for at least five years, and could see a geographical spread right across the country. The Post Office hopes for at least 100,000 users within two years of the start of Phase 2 and perhaps one million or more by the end (compare these figures with BREMA's shown in the table on page 42).

Much will depend on the price of the TV terminals, particularly in the domestic market. This will depend on manufacturers' costs which in turn will be a function of their production volumes. The means of resolving this chicken and egg situation lies largely in the hands of the suppliers themselves; the manufacturers, and how they set their pricing policies in the early styles for recouping their investment, and the rental companies, whose involvement will be highly significant. The relatively high rental base for TV in the UK (over 60%) created the right conditions for rapid colour penetration, and it could do the same again both for Teletext and Viewdata.

Phase 2 will see the introduction into public service of the features of Viewdata described in the earlier sections of this report, including message sending and interactive services, and the network and terminal developments described in Section V. It should also see the establishment of private in-house systems, connectable to the main public service. The Post Office has stated that rival companies will be free to start their own Viewdata-type services with a different telephone number from that of the Post Office. This may well happen in Phase 2 once entrepreneurs have assured themselves of the market, based on the Post Office's experience, though the investment required to compete on a national scale would be enormous and presumably the Post Office's advantage of local call telephone charge rates would not apply. Apparently companies wanting to set up in competition with the Post Office's Viewdata service will have to develop their own software — it is not available for sale or license in the UK at present. Moreover the Post Office insists that a competitive *message service* would be contrary to their monopoly and would not be allowed.

Phase 2 will be followed by Phase 3 perhaps about the mid 1980s. This will be characterised, says the Post Office, by a major change in terminal design aimed at compatibility with the higher resolution 80 character wide display of the business community; the standard VDU

** On Feb 28, shortly after this report was written, the Post Office announced that the public service will start in early 1979 accompanied by an initial investment of some £23 million — see postscript.*

display size used in data processing is 80 characters wide by 24 rows, but the latest display word processors with 80 x 24 screens are offering horizontal scrolling to cope with even wider documents.

Increasing the resolution of monochrome Viewdata terminals to handle an 80 x 24 format could be achieved relatively easily, though the problems raised with colour would be considerable. Compatibility with both Teletext and Viewdata stored information would be lost. Nonetheless the Post Office sees the higher resolution terminals in Phase 3 as offering improved graphics as well as VDU compatibility, and also features such as high quality printers and fax-like telewriters and receivers for communicating signatures and logo-types for example. The idea clearly is to open the market for business electronic mail.

To support the anticipated demand for electronic mail the speed of Viewdata will have to be raised by improvements in the public switched network, to perhaps 7200 bits per second.

The most advanced phase envisaged by the Post Office at present is Phase 4, commencing around the end of the 1980s. Here the main focus of attention will be on transmission. Speeds will again be raised, hopefully up to 64 kilobits per second over local digital networks, thanks to PCM (pulse code modulation) and the Post Offices' System X switching systems, able to switch both analogue and digital signals.

B The International Outlook For Viewdata

The Post Office claims a world lead with Viewdata of some two or three years. Why are the US and Japan, the two pacemakers in electronics, lagging behind?

A number of political and commercial obstacles, such as common carrier regulations and particularly AT&T's consent decree of 1954, have tended to slow down progress in the US. So also has the relatively high penetration of cable TV, which is now around 40%. This tends to encourage high bandwidth passive systems of the sort described in Section IV. Japan apparently has fewer political and commercial difficulties, but the language alphabet militates against the use of a digital system.

The Post Office wants to sell the Viewdata know-how and software abroad to help recoup some of the development costs, and also to encourage standardisation within Europe so as to benefit from cheaper TV terminal circuits as a result of the larger market, and to encourage the spread of international Viewdata connections as with the telephone. It is selling actively in Europe, particularly in Switzerland, Austria and Sweden. In West Germany it has already been successful. On August 23 last year the Bundespost signed a contract allowing them to use the know-how and software during a three year development period, and GEC delivered the first 4080 computer shortly afterwards. The West German experience with their Teletext system has illustrated the sort of difficulties which can arise, quite apart from the technical ones: the press and broadcasters are still in conflict over who should be responsible. Their PTT wants a tight control over their Bildschirmtext whatever the outcome of the teletext wrangle, and a major purpose in acquiring Viewdata was to help to bring the political situation to a head.

For the Post Office the real significance of the West German sale is that it could lead to a move for standardisation in Europe. A danger is that, as with the PAL/SECAM colour TV debacle of the 1950s, France may wish to go her own way. But she is willing to talk, and the UK and French PTTs have been holding discussions recently with a view to reconciling the differences in the standards upon which their respective systems are based. Whatever the outcome, it is very likely that there will be at least some international interchange of information on Viewdata systems in the future, and Viewdata computers are very likely to serve as gateways into third party databases through international networks such as Euronet.

These developments will raise a number of questions which go beyond the conventional communications issues, and which the Post Office is already addressing. For example will access prices be based on local calls and weighted page access charges, or some other com-

bination? How will charges be collected and bad debts handled? In addition to these questions there are a number of political and legal implications of information transfer across national boundaries. They include national requirements for data regulation which are becoming increasingly important in the light of emerging national privacy registration, and national legislation on the responsibility for information handling.

None of these difficulties need be insuperable; undoubtedly they can be solved in time.

C Developments In Allied Fields

It is important to consider the Post Office's plans for developing Viewdata in the context of likely developments in the domestic market to the nature and use of TV; and in the business market, to screen-based office information systems.

1 The domestic market

Viewdata is just one of a number of new TV features which seem likely in the next few years to alter the established relationship between set and user, and to transform the shape of the whole TV industry.

Many of the new features are already beginning to appear. Some are merely cosmetic, such as simultaneous display of a second channel picture in a corner of the screen, displayed (or even spoken) channel numbers, and programmed channel selection by preselection and the use of an interval timer. VCRs have of course been available for some time, but there are indications that they will be the subject of a major marketing drive in the near future as technological advances and competition lead to rapidly falling prices. In the US local industry experts have forecast sales of over one million VCRs this year. Prices are already under $1,000 and could drop to half this in the forseeable future particularly if standardisation can be achieved, though their precision mechanical components must mean a minimum production cost considerably above that of Viewdata decoders. VCRs will be the first of a family of video products including home video (telecine) cameras, and cheap video recordings of films and programmes ranging from TV specials to home education, and DIY to recipes.

These products will allow the domestic TV set to be used for other than broadcast pictures. And the trend will grow as features are offered which are less to do with moving pictures. They will include sophisticated built-in games, devices to display colour transparencies, and home calculators and computers. With a keyboard and printer attached, a TV could become the basis of a display word processor for typing at home. These more sophisticated developments will encourage a major change in the established relationship between set and user. People will become active users rather than passive viewers. The function of TV sets as off-air receivers will begin to diminish in importance. They will be regarded more as terminals rather than mere passive receivers.

The key to these changes lies in LSI, which holds the promise of very low prices once the mass market has been penetrated. The problem for the average user will be to avoid total confusion from the various products competing for his attention. The problem confronting the set manufacturers at this relatively early stage will lie in deciding which horse to back, and in estimating the rate at which the market might grow. Here the manufacturers have a choice. Either they can try to anticipate the features which will become market winners and make provision for them in the design of their sets and circuits with a service life of several years in mind. Or, and this is more likely, they will adopt the style of modular design which the hi-fi companies popularised a few years ago, and produce 'unit video' systems. The central unit in one of these systems would be the video transducer – the screen itself. Attached to it by a standard interface could be one or more of a number of devices to suit the needs of individual users, for off-air reception including Teletext, video recording, keyboard entry, printing, Viewdata connection to the telephone and so on.

A further complication might well arise from changes in the off-air TV picture standards.

There may be a drive to adopt a new 1000 line standard in Europe and the US. There may also be a drive to adopt digital rather than analogue TV. In the US for example, the standard 525 line, 60 field per second, 4.2 MHz pictures have been transmitted digitally via a geosynchronous satellite in a series of experiments at data rates as low as 33 Mbits per second, occupying only a 20 MHz bandwidth using 4-phase-shift-keying modulation. Some experimental transmissions have taken place in the UK using the 625 line 50 field per second standard, at 60 Mbits per second.

Against this background of change the average domestic user will regard Viewdata as being just one of several TV options. What will be of key importance in influencing a purchaser's decision, besides his perception of value, will be price. The current extra-price projections for basic Viewdata in the next few years are around £100, but the price projections for the cosmetic features described earlier are much less, and for VCRs they are only marginally more. The confused purchaser will find all those options competing for his limited disposable income. To him Viewdata will be just one of several ways of spending his money.

2 The Business Market

In the immediate future a variety of new information processing systems, based on the ubiquitous microprocessor, will emerge to have a major impact on business offices. The nature of these devices has been described in Report Series No 4.

The basis will be a multi-function workstation with display screen and keyboard, and facilities for storage, copying and printing as well. These workstations will be able to handle information in text, numeric and graphic form, and ultimately in voice form as well. They will be connected to each other and to computers both locally through PABX (private automatic branch exchange) switches, and remotely over private telephone lines or over the public data networks which are being planned in many countries now.

Businesses will be able to use devices like these for a variety of tasks such as calculations, typing letters, making copies, sending and receiving messages and mail in electronic form, and filing and retrieving also in electronic form. The technology to do all this exists today. It can only be a matter of time before the major companies in the computer and office products businesses begin to attack the market in earnest.

These developments are bound to have some impact on Viewdata's prospects, though Viewdata will have three major advantages. The terminals will be cheaper because the components will be made for a mass market. It will be much more convenient for public reference information. And it will provide businesses with the opportunity for sending electronic mail over the public network — which they currently cannot do because of the Post Office's monopoly regulations applying to communicating word processors.

As a result the public Viewdata service will be used by both big and small businesses in a variety of ways, but it is unlikely to find itself often in competition with the more sophisticated workstation devices. Rather, their uses will be complementary. Viewdata will be appropriate for small businesses, for small CUGs, and for retrieving public information which is in regular demand in a big business. It will be used for a certain amount of inter-company electronic mail. But it is unlikely to displace on a large scale the sales of data processing terminals and multifunction workstations, because it will lack their flexibility and their compatibility both with computer systems and with business letters.

VII. PREDICTING THE IMPACT OF VIEWDATA

In this final section we describe the key influences which will govern Viewdata's success or failure in the market.

A The Key Influences

Viewdata has been designed as a mass market medium, appealing to the general public. Like the telephone its usage will be a function of market penetration. The more users the higher the demand for services, leading to more users still. But the problem is how to generate the mass market in the first place. Recognising this difficulty the Post Office has set more emphasis recently on business application, and has been encouraged by the response. Nonetheless the success of Viewdata is not a foregone conclusion. In this section we summarise the risks and encouragements which confront the Post Office and the other involved parties and draw some conclusions about the probable outcome.

1 Risks

There are risks, both at the level of the suppliers, and the market. The print unions could very well create difficulties with the IPs. The postal unions might become concerned about the potential of the message service. The Teletext/Viewdata transmission and display standard might not be accepted as a European Standard. The TV set manufacturers may overprice the terminals when the market trial is over in an effort to recoup rapidly their investments; or they may even decline to risk the investments required for large scale production. The technology may become obsolete as a result of more recent developments.

By proceeding at a cautious pace the Post Office may fail entirely to accelerate the market up to the critical mass at which its growth will become self-generating. In an endeavour to pursue the goal of profitability the Post Office may make the mistake of pricing itself out of the market. Its requirement for TV reception in Viewdata terminals means they will be more expensive than they need be, yet cheapness is what really matters. On the other hand if the Post Office were to allow an interconnect policy similar to that operating in the US since Carterphone the implications would be very considerable.

These are some of the risks at the supplier level, and they are real ones. But just as realistic are the risks the suppliers themselves can see at the market level. Viewdata is most unlikely to benefit from an immediate mass demand springing from the grass roots, for several reasons. In the minds of the buying public there may be some confusion with Teletext which will be seen to offer a similar service, adequate for topical items such as news and sport and much cheaper. There will be other attractive opportunities for spending on TV extras, such as VCRs. The general public may be unaware of, or unconvinced of the need for, a comprehensive information retrieval system in the home.

2 Encouragements

But as well as the risks there are encouragements. The Post Office will have invested over £5 million by the end of the market trial, and the TV set manufacturers and IPs at least as much as that. Investments as high as these will help insulate Viewdata against failure, and against competition — it will be *made* to work. Businesses are showing a great deal of

interest in the CUG idea and in-house Viewdata, and the message service may become as important as CUGs through its inter-connection with telex, which could provide the multiplier effect needed to make it worthwhile at a relatively early stage. And the Post Office has said that any company would be free to start a rival Viewdata service, which must give some heart to the TV set manufacturers and the IPs.

At the domestic level, the likelihood is that a small market will become established in the first year of the public service, as a limited number of sophisticated users discover the value and status assets of Viewdata. From this beginning the domestic market will begin to grow at a rate which will be influenced probably quite significantly by the attitude of the rental companies, and the availability of adaptors for existing sets. Viewdata's benefits will be more widely appreciated and sought after particularly as they become more affordable. Its convenience will be recognised for getting at information which is otherwise hard to access, and for which the cost becomes a minor consideration as in the second-hand house or car market; for information which is highly volatile as in job vacancies; and for information which fulfils an instant need such as in home medicare. And its value for communicating with other users through the message service at local call charges will be recognised as soon as there is a sufficient number of users to make the service worthwhile.

Overall we predict that the baby will become a healthy child. But at this stage it is too early to divine how it will fare when it reaches maturity perhaps in the mid to late '80s, when the TV will have become a home electronic centre and a great variety of display workstations are in use in offices.

Viewdata might prove to be the means by which the display screen will become a new universal means of communication, accepted as part of the everyday scene, requiring no training – just like the telephone. Perhaps its uses will turn out to be quite different from the ones we anticipate, rather as they did after the plain paper copier was first launched about twenty years ago. Viewdata might *just* prove to be the means, though perhaps not the best means, by which computing power is brought to the front office and the home.

B Conclusion

Although they may not be fully convinced of its merits or its capacity for long term survival, most businesses would be ill-advised to ignore the advent of Viewdata. Those who choose simply to maintain a watching brief should endeavour to stay in touch with developments through frequent contact with the Post Office Telecommunications, and by monitoring the success of the market trial.

Those who prefer to pursue in greater detail the opportunities for exploiting Viewdata immediately should get in touch with the Marketing Department at the Post Office Telecommunications Headquarters in Lutyens House, London.

Postscript

On February 28 the Post Office announced that the public service would start earlier than planned. The following text is taken from a speech two days later in Zurich by Roy Bright, Head of Viewdata International Marketing, to an audience of senior business delegates from thirteen countries.

"We plan to set up 10 Viewdata centres in the first quarter of 1979. Several of these will be located in London, but a number of them will be located in our provincial cities. That will represent an immediate investment, which has already been made, of £5 million. A further £18 million has been put aside for an extension of those initial installations and further centres to be established during the remainder of 1979. So in total the investment programme for the year of 1979 by the British Post Office is £23 million.

After that we will respond in the light of demand. But we have set aside in total, up to 1985, a budget of £100 million to develop Viewdata and to extend it to become a nationwide service in the United Kingdom.

The first range of services that will be offered in 1979 will be mainly concentrated on information retrieval, with a limited selection of interactive services which will consist mainly of the 'enquiry response' facility. That interactive feature will be available on day one of the public service, but messages and one or two of the other services will come perhaps later in 1979.

The other important feature of a public service is the ability to bill the customer. Clearly, even for the market trial where we were planning to invoke a charging structure, we had already identified the need for such a facility within the Viewdata service, so naturally we will be operating a fully billed and accountable service for the users even during the market trial. This will be applied thereafter into the public service, although we have warned our market trial interests that we may adjust the tariffs.

We are no longer talking about an experiment: we are talking about a significant, serious public service commitment. I stress again that this applies not just to the Post Office, but to the other partners in this enterprise — the television industry and the information industry. I think that it is worth noting that we have at this moment about 104,000 pages on order, contractually committed by the information industry for the start of the market trial. The capacity in terms of numbers of pages intended for the opening of the public service is 250,000 pages. They will not all physically be on, on day one; that will take time simply because of the logistics. But the commitment will be there contractually."

Abstract

Report Series No 6

Viewdata

by Roger Woolfe
March 1978

Viewdata is the name of a new service linking the telephone and TV to provide cheap and easy-to-use information retrieval and interactive computing in British homes and offices.

It is working today. A pilot trial has been in operation for more than two years and a market trial with over one thousand TV terminals begins in key cities in the next few weeks. Over 100,000 frames (screensfull) of information are already allocated to more than one hundred independent businesses wanting to bring them to the attention of other businesses or to the general public. The information ranges from flight time tables to share prices, from job vacancies to second hand cars.

Viewdata's interactive features open the door to a variety of applications, such as calculation services, shopping by TV and sending messages to other Viewdata users or (in a few years time) to telex subscribers.

All the UK TV manufacturers are involved developing new designs of colour domestic sets and small monochrome business sets with integral keypads and built-in decoders and modems.

The Post Office has made the original development effort and the major investment – over £5 million so far. The system has been sold to the W German PTT and the Post Office is actively involved in negotiations with several other European countries.

Compared with conventional media and services, Viewdata offers a combination of features which are both attractive and unique. But there are alternatives in existence or under development aimed at providing similar services. How does Viewdata compare in terms of convenience, security, cost and capacity? What are its weaknesses and limitations? It is designed to be simple and rugged but as a consequence is it too slow and restrictive? And are more advanced and sophisticated alternatives likely to emerge which could obsolete it in the near future?

This report helps to answer questions like these by examining Viewdata in some detail. It has been written both for managers directing external business strategy and for those concerned with the planning of internal information systems.

The Butler Cox Foundation

The Butler Cox Foundation is a research group which examines major developments in its field – computers, telecommunications, and office automation – on behalf of subscribing members. It provides a set of 'eyes and ears' on the world for the systems departments of some of Europe's largest concerns.

The Foundation collects its information in Europe and the US, where it has offices through its associated company. It transmits its findings to members in three main ways.

- as regular *written reports,* giving detailed findings and substantiating evidence.

- through *management conferences,* stressing the policy implications of the subjects studied for management services directors and their senior colleagues.

- through *professional and technical seminars,* where the members' own specialist managers and technicians can meet with the Foundation research teams to review their findings in depth.

The Foundation is controlled by a Management Board upon which the members are represented. Its responsibilities include the selection of topics for research, and approval of the Foundation's annual report and accounts, showing how the subscribed research funds have been employed.

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