N Laxman Rao & TV Prafulla Chandra (Eds).New Delhi, Vikas Publishers, 1995. pp. 406-422.

ELECTRONIC DOCUMENT DELIVERY SYSTEMS

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1. INTRODUCTION

The ever shrinking budgets of the libraries, the exponential growth of publications and their cost escalation have forced the libraries to provide comprehensive access to information rather than having comprehensive collections. For this purpose various technologies are being used at present. One of the major developments in recent times has been the increased emphasis on the online access to information from remotely-located databases using communication networks to provide the necessary information required by the users. A document or message sent through computer may contain text, graphics, images, speech as well as other types of information such as electronic spread-sheets.

Information services deal with the aspects of acquisition, storage, analysis, retrieval and dissemination of information to the users for whom the service is intended. The technologies which improve the efficiency and effectiveness are taken as inputs into the information system. These input technologies, mostly computer-based, have been increasing in number and are known by the generic term 'information technologies'. Some of these are available for libraries for many years, while a few are now emerging as important tools for overcoming the barriers in the access and dissemination of information.

The changes which resulted in the need for improving the information services are [1], (i) the ever increasing number of users of information, (ii) the large geographic distances that make information acquisition slower, (iii) the developments in the fields of electronics, computers, and telecommunications, (iv) the increasing role of information in shaping the economy of a society, and (v) the changing notion of the information from something to know to something to have as any other commodity.

Electronic document delivery does not require the sender and receiver of information available at the same time. These systems can offer a wide variety of options which include receiving, editing, transmitting, sorting, filing and retrieving the stored information when needed. Persons working on the same project spread over a large area in different hours can communicate with each other. Electronic transfer of information reduces preparation and delivery costs compared to the traditional services such as telex, letter or courier. The person who is sending information can transmit the message faster avoiding a lot of intermediary routines associated with traditional services.

2. ELECTRONIC DOCUMENT DELIVERY SYSTEMS

One of the important functions of an information system is to provide material requested by its users. When the required material is not available in-house, the system may try to obtain the same from other information centres or document supply centres (DSCs). An electronic document delivery system (EDDS) can provide immediate access of the needed information to the user provided that the system is connected to the DSC and the required information is stored in electronic media. Magnetic tape, video tape, videodisc and CD-ROM, etc can effectively be used in EDDS. This eliminates the inordinate delays in the supply of documents by conventional means. In online ordering, even when the required document is available, due to communication shortcomings and the time taken for supplying, it may take several days before the required document is received by the user. Though this can reduce the delay considerably over conventional ordering, it is not a match for EDDS which can provide instant access. Another feature of EDDS, apart from speed, is the convenience to access.

Four major steps involved in EDDS are inputting, storage, transmission, and output or delivery. In inputting stage, the information in print media is converted into digital form using a suitable method such as optical character recognition (OCR) devices or scanners. When the information is already in machine-readable form, through a conversion program, this can be digitised. Transmission of information is achieved by several means. Telefax or facsimile transmission can be used to transmit both textual and graphical material over telecommunication links. But satellites can offer a better transmission than telephone lines (for more information see [2]). The output can be chosen in one of the three forms, namely, hardcopy, microform or display on a

television screen or a VDU.

Specific mention is to be made here of the ADONIS (Advanced Document Over Network Information Services) project which is a Consortium of major European Publishers including Blackwell, Springer-Verlag, Pergamon, Elsevier, Academic and Wiley. The Consortium has undertaken discussions in Europe, USA, Japan and other governmental agencies and publishers, and DSCs like BLDSC with a view to set up a world-wide electronic document supply system. ADONIS aims to supply articles on demand from a database of about 5000 important journals supplemented by a five-year back-file provided by 200 publishers. The journals will be stored on optical videodiscs from original printed versions and transmitted to local centres where they will be printed and supplied for a fee [3]. Useful features of the system include

*dissemination of contents lists of S&T periodicals, books, monographs, etc,

* full-text of patents, standards, articles required,

* availability of a comprehensive range of documents from a single source,

* easy online document ordering and delivery,

*automatic document delivery ofpre-specified documents, such as documents on standing order, on regular basis,

* lists of current periodicals, and

* SDI.

The low level usage of EDDS, as of now, can be attributed to the high initial cost factor (compared to conventional services) and the not-so wider acceptance of the technology by the developing countries. It also needs deposit accounts to be maintained with the DSCs in advance, which means further cutting in the already dwindling library resources. The wide range of equipment and systems needed to establish the service initially are expensive and causes a frowning attitude in the library authorities. It can be seen that the majority of the users still wish to use traditional means to order and receive a document in need. Because, the user has very simple need to be satisfied; a service that can supply needful documents in a reasonable time, say a week or ten days, reliably and at an affordable price. There are some doubts about the long time effects of the EDDS on the traditionally printed journals. But at a time when the publication of printed journal becomes totally uneconomical due to the rising costs of input materials, processes and the ever diminishing subscriptions, publishing from totally electronic data on demand could become common. Usage of the broadcasting satellites would greatly enhance the quality of such systems while reducing the costs.

3. ELECTRONIC MAIL

Electronic mail (E-mail) is used to create and transmit messages electronically addressed to an individual or a specified group of individuals. With its origin in 1960s, it became an important means of sending information via a computer-based network between addressed computer workstations. Like facsimile, telex and other message systems, E-mail systems allow people to send messages to each other electronically. This can be taken as an extension of the traditional telex service with an exception that the sending and receiving points are not centralised as in the case of Telex Office [4]. Here any computer can communicate with a host computer. To send the mail, the user needs a modem to convert the computer signals into a form suitable for transmission and vice versa.

Based on the target group, E-mail can be conveniently grouped into four group, viz. one-to-one, one-to-many, many-to-one, and many-to-many. One-to-one mode is the most common of all and is useful to send communications from one user to another. In one-to-many, the mail is directed to many users, while many-to-one is exactly the opposite of this mode. Many-to-many is a mode which enables ‘posting’ a communication publicly, where others can read and leave their comments to be read by many. Buckland [5] discussed the applications of these four modes as ‘notes, broadcasts, comments, and bulletin boards’. Computer conferencing can be taken as a form of the fourth group.

Facilities provided by E-mail systems are categorised as follows [6]:

Message Preparation: Word processing, note book facilities, annotation of messages received prior to forwarding or filing.

Message Transmission: Timed delivery, directory services, multiple addressing, distribution lists, abbreviated addressing, message priorities, automatic route selection, message transfer information, links to other networks.

Message Receipt: Mail scanning, selection replying, forwarding, rerouting, filtering of messages, and notification of new messages.

Security and Reliability: System security, protection against message lost, encryption, security software and inhibiting hard copy.

Message Filing and Retrieval: Storage capacity, retrieval and archival facilities.

Message Logging: Accounting and management reports.

E-mail would look after the messages until the user wishes to access them at the time and place of his or her choice. A mail box can sort the mail into different categories, inform the urgent matters which needs immediate attention, help in dealing with messages, take care of filing, searching and retrieving of messages upon request, thus virtually becoming a sort of personal assistant. When individual codes, possibly with encryption or passwords are assigned, users could log-on from different locations while in trip, at any time of the day and send messages to others or retrieve messages accumulated since the previous log-on.

Another advantage of the E-mail is that the distribution lists can be stored in the system, which aids in selecting the recipients to receive a particular information or message and transmits simultaneously to all the recipients.

Three important benificial characters of E-mail are the speed, reliability of delivery and security and privacy of messages [7]. The potential uses include general correspondence, exchange of documents, teleconferencing, announcements, etc. On the library side, E-mail is being used heavily for transmitting interlibrary loan requests and document purchase orders. OCLC has a subsystem (OCLC ILL) connecting more than 700 libraries which is a dedicated interlibrary loan system. Of late, library professionals have also begun to use E-mail for communications among officers of professional associations. Reference queries that range from ready reference-type to problem solving questions can be greatly expedited by the use of E-mail. A record of the responses can also be kept. Both the sender and recipient can initiate the message or pick up the message when it is convenient for them. This applications list is by no means exhaustive. Many uses remain undiscovered.

E-mail is also used at present for informal communications between people separated by geographical distance and time zone differences. This benefits the users in saving time, reducing interruptions and improving communications. However these benefits are intangible, difficult to measure and do not make a direct impact on the profitability of an organisation.

E-mail is much cheaper than conventional telex for sending messages to outstations. Combined with its easy readability due to the mixed letter base (upper/lower case), it is a viable alternative to telex for institutions for international communications. The communication is faster through E-mail than telex or cable.

Many E-mail networks of universities, commercial agencies, etc are interconnected through major networks such as USENET, INTERNET, ALANET, JANET and BITNET, which in turn are interconnected through gateway machines. These interconnections between commercial networks are non-existant until recently. It is possible to send messages, documents from one network to another only when they are interconnected by means of gateways. Conformity of protocols, etc with the CCITT X.400 standard will allow the interconnectivity of different networks with each other. In this environment, one can send mail to anyone having a mailbox in any other system because of their connections to diverse communication media. Some E-mail systems have sophisticated features which make them extremely useful. E-mail can be sent to even fax machines, telex and remote printers. AT&T Mail is an example of such an advanced system [8].

Document supply centres like NTIS, University Microfilm International Article Clearinghouse, and British Library Document Supply Centre (BLDSC) have E-mail addresses, and accept orders through E-mail, thus speeding and facilitating the delivery of required documents. This feature is also available with most of

the online search services such as DIALMAIL of DIALOG, EasyPlex and InfoPlex of CompuServe network, and public packet-switched networks. These can forward the retrieved citations by E-mail to a DSC of the searcher's choice for onward transmission to the searcher.

Systems with E-mail features include OnTyme II, Envoy Post of Canada Telecom, Postcorp, E-COM (Electronic Computer Originated Mail) of EMCA (USA), DMAIL of Delphi, MCI Mail, Telemail, EasyLink, etc.

One main disadvantage of E-mail is that many of the current systems normally do not allow files of more than 100 kilobytes, whereas document files may be of the order of several megabytes. Charging by different E-mail systems is also not uniform. Bill Tuck has compared [9] the cost of sending a megabyte file over Telecom Gold of the British Telecom (80 pounds in peak time and 20 in off-peak time) and Integrated Digital Access, also available through British Telecom (13p or 4.4p!). Other factors include the high cost involved in the usage of E-mail, equipment and service overhead costs. Set-up costs of E-mail services can include training, documentation, monthly minimums of usage and telecommunications cost [10]. Inspite of these factors, E-mail is widely recognised as a convenient and cost-effective means of communication.

The main difference between E-mail and teletex is that in the case of former, messages can be held in the memory of the sender's computer and transferred to the receiving computers (as per the E-mail addresses). The received messages can be stored till they are retrieved by the recipient. In the teletex (or telefax) transmission is instantaneous and no intermediary storage is possible after transmission as these operate on point-to-point mode (i.e., from sending terminal to receiving terminal).

3.1 Electronic (Online) Ordering

To avoid delays taking place in the conventional ordering, many document supply centres (for example, BLDSC) and information retrieval services such as DIALOG and CAS have been offering electronic ordering facility for the users. BLDSC is accepting document supply requests over telex for quite sometime, and has been offering online ordering facility called ADRS since 1981. The prerequisite in this type of service is that the customer has to have an account with the DSC. The dial-order services of CAS introduced in 1982 has evoked good response with nearly 25,000 requests in the first months by more than 1,300 subscribers. Many prefer to use conventional post for ordering. Information retrieval services such as DIALOG and those linked with E-mail systems, and many major publishers and book vendors are accepting dial-order services or entertaining electronic ordering (for example, Baker & Taylor, Ingram, etc in USA). Many also maintain mail boxes with E-mail systems like DIALMAIL, ALANET, etc. Where possible, the requested document can also be delivered via an EDDS.

3.2 Voice Mail

This is the most sophisticated type of the E-mail. This does not require anyone to type or input a message to be sent. The recipient of the communication is to be named first and the message is dictated. The system transmits the message by digitising the analogue voice signals. At the receiver's end, the message is reconstructed.

In a voice mail system, the computer records the message, stores and then delivers the message as and when called for. Modems are used to convert the binary signal into an ac signal for transmission and the transmitted ac signal into binary signal upon receipt.

There are two methods of voice digitisation [11]. In the first method, speech can be digitised by vocoders. The vocoders analyse the pitch of the voice and vocoder filters divide the signal into different frequency ranges. The advantages of the system include the use of the transmission lines to a maximum efficiency, error control and correction, and data encryption. This is more compact than the analogue speech on a voice-grade line and uses the transmission medium to a lesser extent.

Second method is the waveform analysis. Here voice digitisation depends on the software used for digitisation. Pulse code modulation is a type of waveform analysis. The main advantage of this is its lower cost over the earlier method.

Voice mail system can do most of the things that an E-mail system does, i.e., messages can be read, printed, answered, filed, etc. Image mail system, where one can see the picture of the message sender actually speaking, is too expensive and is a luxury. As all these technologies have common basic features. Image, voice and text may converge in the future to give a comprehensive E-mail system.

4. TELEFAX

Well known as 'fax', telefax (or telefacsimile) is a popular type of E-mail. Faxing enables instantaneous transmission of documents on telephone lines. The low cost fax machines have been used for rapid transmission of information for quite sometime now. Like telex service this is also a point-to-point (or machine-to-machine) transmission. A wide variety of fax machines are available with many versatile features which include autodialling, record of calls, half-tone capability to reproduce pictures and figures, auto page numbering and timing the fax transmission to reduce the cost of transmission.

According to some estimate, in US alone 465,000 fax machines were sold in 1987 and 1.3 million machines were shipped from USA in 1989. This has increase manifold with many countries joining the race in manufacturing versatile fax machine. Many post offices in USA have already tried and install fax services in many places. In India also this service is being introduced in post offices. There are a lot of govenment, semi-government and private agencies employing fax services now in India.

The princple on which a fax machine works is very simple. When the feed motor moves the sheet of the document, a lense focuses the image on a special sensor, which looks at a very thin horizontal strip of the page as tiny dots (picture elements or pixels). In an A4 size page there will be approximately 1078 such strips or rows (~100 per inch) with each row consisting of 1728 individual dots (i.e., nearly two million pixels for each page). In higher resolution or fine mode, this will increase to ~200 rows per inch. The sensor views the page as a grid of dark and white dots, and converts each row into 1728 bits of information [13]. The resulting data is compressed and sent over telephone lines to the receiving unit which recomposes the data to the original level and recreates the whole page as a grid of white and dark points, producing a dot-matrix facsimile of the original.

Usually before the transmission starts, the machines at both the ends would 'query' each other to ensure if both are of the same group, and test the phone line quality if it can be used without many errors at 9600 baud rate. in case too many errors occur, automatically the transfer rate will be slowed. Unlike computers, fax machines cannot recognise a character; they only code, trasmit, and decode patterns of light and dark which configure a shape that we recognise as a document [14].

The facsimile machines have been grouped into four, based on CCITT recommendations. Group I (early 1970s) and Group II (1976) are analogue devices and take 6 and 3 minutes respectively, for transmitting a page. Group III (1980) machines are digital and take less than a minute. This is achieved by improving the transfer rate and data compression. Group IV (1986) machines which are also digital, will zap the page in less than three seconds. Group IV needs a dedicated high speed data line network and has an improved quality at higher transmission (upto 64 kilobytes) resolution and so are expensive. The British Library was one of the first organisations to set up a full Group IV service using 64 kbps connections between the Document Supply Centre at Boston Spa and the Bloomsbury Science Library at University College, London (UCL). This system has been running to provide an document delivery service between BLDSC and UCL [9]. This technology is out of reach of most libraries. Group III technology can communicate with each other regardless of brand, though slower, are fairly stable and popular.

Many studies were conducted by different libraries to find the applications of telefacsimile in library services [14]. Library networks and information centres were the early users of fax technology, where this technology is used for inter library loan dealings, document delivery systems from large supplying libraries to small units, reference services to send queries and answers swiftly between the central library and the branch library, etc. When a branch has no permanent collection of journals, rapid access to contents pages or journal articles can be provided using the telefacsimile service. Apart from need and speed, cost of the service and user satisfaction are the factors which determine whether or not to implement telefacsimile in the libraries.

Transmission speed of the machine used determines the cost of the service. The fixed costs include long distance telephone charges, stationery, maintenance and machinery. If there is a link between machines of two groups, say Group III and II, then the data is transferred at the speed of the lower group machine, i.e., Group II. Higher resolution machines have more data to be transmitted and so the costs are increased. But one way to reduce transmission costs is to send the material at a time when telephone charges are low, for example, in the nights when it is much cheaper, more convenient and much faster to fax. For this purpose, one can store the document in memory after scanning and the time of transmission can be programmed so that the fax machine automatically sends the document at the desired time.

User satisfaction depends upon the charges they have to bear and the quality of the copy received. The quality of the fax copies is not as good as the original or a photocopy. When the type size of the faxed material is small, the problem is compounded due to the distortion of the type that takes place even under the best transmission conditions. Telefacsimile only eliminates the transit time of postal services. Though this time saving is not noted by users, many do not feel it is of much importance to them. When delivery in a day (for example, speed post or courier service) is available, fax will be thought as an alternative only occasionally. But where information is of vital importance and needed urgently, fax is the only alternative.

There are a few points of concern, however. The fax machines scan single sheets only. So if the material is in a bound volume, the document is to be photocopied first before faxing. This also increases the cost of the service. Developments are underway to overcome this problem so that the bound documents can be scanned by fax machines, much the same way as the xeroxing machines. The thermal paper used by the fax machines is another point of concern. The paper is expensive, the print quality is not so good and sometimes causes jam. The advantages in using the thermal paper is that it doesn't need any printing ribbon or toner, etc. The plain paper fax machines are now available, of course, at a higher premium. A prerequisite before faxing a document is the knowledge about the fax number of the recipient. Though directories of telefax numbers are available in many countries (for example, Official Telefacsimile Users Directory, Ed. 2; Directory of Telefacsimile Sites in Libraries in the United States and Canada, Ed. 3 etc), many do not wish to have their fax numbers published for fear of receiving 'junk fax' or 'unwanted messages'. And these unwanted fax messages are more than a nuisance.

It is now possible to fax or receive a document sent by fax using IBM or Macintosh PCs. All that is needed extra is a special add-on equipment called fax card, which fits into the open slots in PCs. The fax card includes software for converting text and graphics into a suitable faxing format. These can only send files created and stored in computers, i.e., wordprocessed text only. The memory needed for this may reach a megabyte. The ROM software instructions will often do the conversion of the text and graphics into a fax file and then zap it via a modem to another machine [15]. In case printed material is to be faxed by these PCs, a scanner can be used for scanning the printed documents into the computer memory. On the receiving end, the copied pages faxed can be reproduced using laser printers or dot-matrix printers. As these fax cards are cheaper than the fax machines, the branch libraries of a network can make use of these fax cards while the central library can be provided with a fax machine.

A recent innovation is the fax editions of newspapers. *The Hindu* is being published by using telefacsimile technology. Many papers in USA and other countries announced fax versions. Fax machines have helped to achieve rapid dissemination of information wherever they are used. Their usage in online information retrieval systems is not yet tapped. This would greatly enhance the use of fax beyond office routines and would definitely prove a cost-effective and versatile applications of fax machines.

Though the performances of both E-mail and telefax match, the main difference between them is that the former may send the information contained in a document but not the exact reproduction of the document. But fax machines can do this, including figures and half tones. The receiving fax machine simply decodes the signals transmitted and the exact page layout is reconstructed as output is directly on paper.

5. TELETEX

Teletex is a high speed E-mail service designed to be compatible in exchange of information which allows transfer of text on memory-to-memory basis between communicating wordprocessors. Teletex was developed in West Germany in 1981 and international links were established with Canada and Australia in 1983. Acceptance of this service in Germany was not a success as was hoped at the time of its introduction. Lack of standardisation could be one of the causes for this and other causes may include the over estimation of dissatisfaction to telex. A teletex service (HERMES) was launched in 1982 in UK by the Department of Trade & Industry in collaboration with National Physical Research Laboratory and Printing Industry Research Association. Combined with digital facsimile, it was envisaged to transmit graphics and text. This project was later cancelled in 1984 due to a number of delays.

There are many differences between the functioning of telex and teletex. Advantages of teletex over over conventional telex include, transmission on a wider range of characters (309 to 57 for telex), speed (less than 10 seconds to more than three and a half minutes for telex for sending matter of an A4 size page), much cheaper and possesses memory for correspondence. While telex transmits page-by-page at a transmission rate of 110 bauds per second, teletex transfers memory-to-memory at 2400 bps. Advantages of telex include

its interactive exchanges and its reach to over 2 million subscribers all over the world through a number of networks which is not available with teletex (for a detailed discussion see Gurnsey [16]).The speeds of teletex are still inadequate for the size of files necessary for document delivery services.

6. VIDEOTEX

Videotex can be defined as a means of the delivery of text and graphics from a computer through electronic systems. Videotex is the generic term for the digital transmission of text and graphics to the home or office. Videotex is an online interactive information system where information is stored in 'pages' on central computers. Domestic TV can be used as a display terminal, which is connected to the host computer via conventional telephone lines or a cable TV (CCTV) network or a combination of both. A 'page of information may have one or more frames. Still frames are displayed on the TV set.

Two types of technologies, teletext and videotex are in use. While the former is a one way service, the latter is a two-way, interactive system where the user can communicate with the host computer. When the service is using a telephone line or a CCTV, the user can even search the menu and select those pages desired to be transmitted. The interactivity is limited to the prestored information, and highly structured inquiries or Boolean searches are not possible [17].

Like teletext, videotex technology also was developed in the UK. PRESTEL system was first demonstrated in 1977. By 1979 a pilot trial was in operation. Besides UK, many countries have introduced videotex services. These include France (Teletel), West Germany (Bilderschirmtext), Holland (Viditel), Belgium (Telematique), Sweden (DataVision), Finland (Telset), USA (KeyCom, Viewtron, Gateway, CompuServe, Quantum, GEnie, PC-Link, Southam, Comp-U-Card, etc. Societe Generale, France has also developed Logitel, a fee-based videotex banking product for private consumers.

Canadian government defined standards for videotex for transmitting over three communication modes, viz telephone, CCTV, and over-the-air broadcasting.

Videotex can reduce the need for a hard copy of the material which is in either teletext or videotext, and can be accessed in one's home or in a library.

While videotex was a success from the start in France, where the access was free and ther were many services covering every need, it was not so initially with many other countries including USA. Belgium too entered into this scene with a system accessible by different national terminals. Switzerland has committed itself for a public videotex service.

OCLC has experimented with videotex for a three-month period with a prototype system, called Channel 2000, which included selections from Academic American Encyclopedia, apart from material on library and information sciences. A survey of the users revealed that they were pleased with the library system and spent considerable time browsing the encyclopedia. This shows that if a reference tool like Encyclopedia Britannica is available on videotex then there is no need for a hard copy.

Most of the videotex services provide either information retrieval or transaction services. Banks have been particularly interested in providing videotex services to their customers due to the growing costs of paper-based transformations. Videotex offers request balance for a specific account at your bank, transfer funds from one account to another, pay a bank's credit card bill, purchase merchandise from an electronic catalog, database queries, including specific financial analyses, purchase of travel arrangements, news summaries from selected newspapers including sports news and statistics; weather reports; stock market reports, local and non-local and recent performance of selected stock, financial newsletters, jokes, and travel agent listings, available tours, cruises, schudules, prices, etc [11]. News, weather reports, stock prices and database queries all come under information retrieval heading. Many videotex services place major emphasis in providing entertainment — particularly games, puzzles and jokes. Other applications include bulletin boards and directories of local information. The advent of CCTV has reduced the user's cost of accessing to an extent and in turn helped in inreasing the usage of the videotex. The main advantage of videotex is its ability to provide pictures with the text and so is different from computerised databases. The combination of computers and videodiscs looks promising for transmitting high quality visual images with computer generated text.

Videotex is a serious contender for a major share of the information market with many potential applications. Once the service is accepted by the society and the resolution of television receivers increased, videotex is going to stay with us in the times to come [17].

7. TELETEXT

Teletext is a oneway communication of text and graphics which makes use of computers. Teletext is quite analogous to videotex but lacks the 'interactiveness' which the latter has. Here information is stored in the form of frames and pages and users wishing access can indicate the required pages by using a numerical key pad of a decoder. To overcome the slow response time due to the storage of information in 'libraries' of 100 pages, methods of artificially expanding the number of pages were tried. USA and France also tried similar experiments to reduce the response time.

At present teletext services carrying current awareness type of information—news, sports, travel information, weather, etc.—have high priority. Of late, advertising is entering in this area in which Oracle of IBA was a pioneer.

Many European countries including West Germany, Holland, Sweden, Austria and Switzerland have teletext services. As this service is cheaper than videotex and the users are more, teletext may become a tool for mass communication. Teletext offers the possibility of a good communication facility in regions where print media is not available or too costly to the end-user.

7.1 Intext

Intext (Teletext Doordarshan), is a joint telematics venture of Doordarshan and the National Informatics Centre (NIC). Intext intends to use the unutilised picture space in the television transmission for sending textual material in data communication form. The incoming signals can be decoded by using decoders and displayed on a television, using it as a computer monitor. Intext provides tourist information about airline and train arrivals departures and reservations, detailed weather information, latest events of the day from home and abroad, sports, stock exchange, etc which can be accessed page by page. As the information is provided under different headings and the pages are numbered, decoders can be used to access more information from all the 100 pages or on selected items. Without the decoders about 20 pages of information can be accessed. The latest developments have enabled decoders of the size of a card costing about Rs. 1000 which can be fixed inside a television set. This service is available on all days in the second channel of Doordarshan.

8. CONCLUSION

Quite a few number of libraries already are using the new technologies in many fields. Use of computers in house-keeping routines has been on the increase. So is the access to online databases through gateway packet-switching networks and DIALOG, etc, and the transmission of important and urgent documents through telefacsimile. Thanks to the breakthroughs and developments in electronics and related fields, the cost of these technologies is within the reach of many libraries and are finding their wide acceptance and usage in many libraries. Though electronic mail is a late comer to India, already some centres have the facility (for example, DESIDOC, INSDOC) to serve the users in an efficient way. E-mail will greatly improve the information delivery, particularly for document supply centres. The convergence of online information retrieval and E-mail (as is evident from the addition of E-mail features to the major online information retrieval systems), has already proven their acceptance. It is also envisaged that the E-mail networks would provide access to online information shortly.

Experiments with dial-for-data service by NICNET with public booths in cities like Hyderabad received good response and in the next five years the GISTNIC (General Information Systems Terminals of NIC) system will be providing information on various aspects relevant to public from any corner of the country. PCs, scanners, laser printers, fax, optical discs and dial-up telephones will be a part of the on-rushing communication technology [19].

Electronic publishing is half-way through with over 2000 CD-ROM products (databases, encyclopaedias, etc) and by the year 2000, about 50 per cent of abstracting services, 25 per cent of primary journals will be in electronic form [20] all the standard reference books will be on electronic form. This changed situation will result in electronic libraries, when any user can dial-up an electronic journal and can access to the contents or abstracts it he is a subscriber. In case any of the articles are of interest, the same will be downloaded on to the user's terminal. In this context, comuter-based document delivery systems will become an indispensible convenience to the libraries and information centres. It is time for adopting ourselves to the 'order of information society' which has great potential to enhance the economical growth of the nation.

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REFERENCES

1. Jones, Barry O. Social implications of information-based society: the role of libraries and librarians. *In* Meeting the Challenge of Technology, Proceedings of the VALA National Conference on Library Automation, Vol. 1. Melbourne. Victoria Association for Library Automation, 1982. pp. 3-4.

2. News, trends and comments. *Information Services & Use*, **1989, 9**(3), 177-188.

3. Lee, Peter W. Electronic document delivery: current European developments. *In* Beyond 1984: the futute of the library technical services, Peter Gellatly (Ed). New York: Haworth Press, 1983. pp. 233-239.

4. Bourne, Charles P. CD-ROM and other computer-based information tools for developing countries. *In*Bibliographic databases and networks, Proceedings of the International Conference, New Delhi, 22-25 February 1989, S.S. Murthy, Anuradha Ravi and A. Lakshmana Moorthy (Eds). New Delhi. Tata McGraw-Hill, 1990. pp. 1.75-1.83.

5. Buckland, Michael H. Combining electronic mail with online retrieval in a library context. *Information Technology and Libraries*, December 1987, 266-271.

6. Welch, J.A.and Wilson, P.A. *Electronic mail systems - a practical evaluation guide*. London, NCC/Wiley, 1981.

7. Trudell, Libby *et al*. *Options for electronic mail.* White Plains, Knowledge Industry, 1984, pp. 21.

8. Hawkins, Donald T. Information delivery-paper and E-mail. *Online*, **1990,14**(2) , 100-103.

9. Tuck, Bill . Using ISDN for document delivery. *Program*, 1988, **22**(4)), 360.

10. Whitaker, Becki. Electronic mail in library. *Library Trends*, 1989, 39(3) , 363.

11. Marney-Petix, Victoria C. Networking and data communications . Reston, Reston, 1986, 180 p.

12. Hawkins, Donald T. Information delivery—riding the fax wave. *Online*, 1990, 14(3) , 98-101.

13.Rindfuss, Robert . Information delivery and fax technology. *Online*, 14(4), 98-101.

14. Brown, Steven Allan. Telefacsimile in libraries: new deal in the1980s. *Library Trends*, 1989, 37(3) , 343-356.

15. Dewey, Patrick R. E-mail for libraries. London, Meckler, 1989, p. 41.

16. Gurnsey, John. The information profession in the electronic age. London, Clive Bingley, 1985. p. 152.

17. Dowlin, Kenneth E. The electronic library. New York. Neal- Schuman, 1984. pp. 94-95.

18. Seshagiri, N. Computers—the Indian scene III: the future of computer communications. *2001- Science Today*, September 1990, **24**(8), 61-63.

19. F. W. Lancaster, “The future of the library in the age of telecommunications. *In* Telecommunications and libraries: a primary for librarians and information managers, D. W. King *et al(*Ed). White Plains, Knowledge Industry Pubs, 1981.