MODERN TECHNOLOGICAL DEVELOPMENTS IN INFORMATION STORAGE AND RETRIEVAL AND THE NEED TO INCLUDE THEM IN LIBRARY SCIENCE CURRICULUM

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ABSTRACT

Demands on Library and Information Science have undergone significant changes over the last two decades as a result of the widespread availability of computers. Advent of sophisticated information storage media such as floppy disks, winchester disks, removable disk packs and optical disks has made it possible to store enormous amount of information on very small devices and to retrieve the required information within a fraction of a minute by establishing random access to the different pieces of information stored on such media. Rapid progress in the miniaturisation of electronic components has made it possible to have computer memory of many tens of kilobytes packed into small chips of a few cms in dimension. Apart from the size, cost of computers and storage media has also decreased at an exponential rate. These developments have made it possible for Libraries and Information Centres to afford electronic computers with adequate memory and storage capacity for information storage and retrieval. However, the curriculum followed by many of the educational institutions does not provide necessary computer literacy to library and information science professionals, and as such the use of these modern technological developments in libraries and information centres is not making as much progress as one would expect. This paper gives a general description of the recent developments in electronic computers and associated storage media and discusses the need to include these technologies in library and information science education in India.

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INTRODUCTION

Library science evolved at a time when technology related to information storage was limited to the use of paper as the only medium of storage. Science and technology constituted a very insignificant part of the total body of human knowledge. Humanities enjoyed a place of prominence in the intellectual make up of any learned individual. This is evident from the relative number of major subject categories that are assigned to science and technology out of the ten broad groups into which knowledge is divided in the Dewey system of classification and in the Universal Decimal Classification scheme. Alhough use of these systems of classification has resulted in dense clustering of classification numbers in certain areas, and a relatively sparse distribution of classification schemes around some of the major subject categories, the decimal classification system has been sufficient to provide unique classification numbers even to very narrow fields of science and technology. However, the emphasis on conventional methods of classification as a means to organise printed sources of information, and on the maintenance of handwritten or typewritten records of classification of different sources of information in a format with which information or sources of information can be easily retrieved are turning out to be inadequate to make the best use of the rapidly evolving information technology. Those librarians who have had inadequate exposure to these modern technologies are not in a position to exploit the enormous scope offered by modern developments for processing, storing and retrieving the exponentially increasing body of knowledge. Technologists responsible for developing the various devices and techniques having deep influence on information handling

very seldom possess good understanding of the principles of library and information science. Most of the developments in the areas of computer and electronic storage of information have wide ranging applications, and a technologist involved in the development of a new device or technique that could be useful in information processing rarely develops sufficient interest in this field as to apply his techniques to information storage and retrieval. On the other hand, the traditional library scientist or information scientist with much of his training concentrated on conventional subjects such as classification, cataloguing, comparative librarianship etc. does not have enough understanding of the new technologies to permit him to communicate with the computer technologists on the requirements of his job and on what the new technological developments can do to an information centre. What has to be realised is that if librarians fail to appreciate the changes that developments in technology permit in librarianship, then librarians and information scientists will cease to play any meaningful role in society. It is in this context that it is essential that professional librarians and information scientists should have a fairly good understanding of the new technological developments. This can be best achieved by introducing some of these technological developments with ramifications on information science and librarianship as a part of library and information science curriculum.

COMPUTER TECHNOLOGY

Although many a discussion on computer technology starts with a description of the historical development of computers and storage media, what is relevant in today's context is an understanding of the basic functioning of present day computers and the capabilities of currently available storage media, without bothering so much about the evolution of computers and computer peripherals. From the information scientist's or library manager's point of view, what matters is the fact that modern computers are capable of carrying out all the operations like addition, subtraction and comparison between two pieces of data to check whether they are identical or to establish a relationship of greater than or equal to between the two pieces of data. This specific capability of modern computers along with the ability for rapid transfer of information from storage media to

the computer memory make computers a very powerful tool in information handling. In order to profitably exploit these versatile capabilities of computers and information storage media, it is essential to have a general understanding of how computers and information storage media function so that the specific tasks in a library or information centre in which computers could be applied can be identified. Essentially, the point that is being made is that in order to exploit the capabilities of computers and computer peripherals, one should know what these capabilities are. The actual implementation of the computerisation activity, in the sense development of computer software, creation of an information data base etc., can be done, and will have to be done, with active involvement of computer professionals. Although computer professionals may not have an appreciation or understanding of the various jobs involved in the running of a library and information centre, once the information science professional identifies the task to be achieved, the computer professional will find it relatively easy to implement the job and to achieve the final objective. On the other hand, without a broad understanding of the capabilities of computers and peripheral hardware, the professional library and information scientist will not be able to identify and define the scope of jobs which computers can be made to do. It is in this context that one has to realise the need to give due prominence to a general grounding in computer technology to library and information science students. The purpose of the course has to be to inculcate computer literacy. Neither is it possible nor is it necessary to develop high level expertise in computer science or computer programming among the library and information science students. The expertise has to be of such a level as to permit the library manager or information scientist to intelligently interact with computer scientists in order to explain the job the computer scientist has to do for the library or information science professional.

The relevant points relating to the developments in computer technology that need to be emphasised are the rapid reduction in the size of computer components and in the cost of computer systems. Rapid reduction in the size of computer memory has resulted in making it possible to have small personal computers with more than 256 kilobytes of memory at a cost which can be afforded by most of the educational, scientific and certainly commercial organisations. It may be

relevant to point out that during the mid-sixties when relatively large size computers started becoming available in India, a memory size of 128 kilobytes was considered to be fairly large and such a computer used to occupy almost all the space in a fairly large room, whereas the modern personal computers with more or less comparable computing capability do not require more space than an ordinary typewriter. As far as storage media are concerned, during the sixties and the beginning of the seventies magnetic tapes used to be the most modern storage medium available in India and many parts of the world. Although by resorting to what is called "packing", the total amount of information that can be stored on a magnetic tape without much space between individual records is fairly large, magnetic tapes suffer from the disadvantage that access to information stored at any point on the tape cannot be established in a random fashion. Magnetic disks not only increased the capacity for information storage on a single device, but it made it possible to achieve random access to any piece of information stored on the storage device. The possibility of having random access considerably reduced the time required to locate any specific piece of information and then to transfer it to the computer memory for further processing. The advent of floppy disks, also known as diskettes, with a storage capacity of a million bytes or magabytes (MB) made it possible to store upto 500 typed pages of information on a single device of the size of a small musical record. This made it possible to label individual physical documents stored on magnetic media and to keep them for any desired type of manipulation using the computer.

A winchester disk, although cannot be removed and inserted as a floppy disk, can store more than 10,000 pages of typed information. Such a large capacity is sufficient to manage a library and information centre of relatively small size. Removable hard disk packs with capacities in the range of 300 to 600 MB, are capable of storing 150,000 to 300,000 pages of typed information and are capable of meeting the requirements of any type of library and information centre, no matter whatever be its size. The most recent, and so far the most revolutionary, development in information storage technology is the laser disk or optical disk, known popularly among computer professionals as CD-ROM which is the abbreviation for compact disk-read only memory. A CD-ROM which is about 20 cms in diameter

and 2 or 3 mm in thickness can store about one gigabyte (GB) of information which amounts to about 500,000 pages of typed information. These CD-ROMs, along with a personal computer, make it possible to have enormous amount of information available at the disposal of single individuals within a few cubic meters of storage space. From the cost point of view, a personal computer capable of making use of sophisticated computer software for information storage and retrieval is currently available for about Rs. 40,000. An year ago the cost was about Rs. 100,000. Though the cost may not decrease at the same rate, it is likely that for about Rs. 20,000 computers with fairly large memory size and storage capacity will be available in the near future.

In the international arena, a number of computer based databases are already available. MEDLAR dealing with medical sciences, AGRIS dealing with agricultural sciences, INIS dealing with nuclear sciences and technology, BIOSIS dealing with life sciences, INSPEC covering physics, electronics and electrical engineering are some of the well-known examples of internationally available databases. Most of the databases available on computer are at present very expensive in India. The main reason for the high cost is that technology for information storage that was available until the advent of CD-ROM was expensive. Besides, the computer programs which are required to make use of these databases and to retrieve desired information from them require relatively large memory size. This resulted in a situation where the initial investment on the computer and storage media capable of handling these databases became very high. Evidently this resulted in relatively large commercial organisations getting into the business of maintaining these databases on a large central computer facility and making them available to distributed group of users through telecommunication lines as a commercial service. However, the availability of small and relatively inexpensive computers with large memory size and powerful operating systems in conjunction with storage media such as CD-ROM will certainly change the situation. Both CD-ROM drive which will permit the transfer of information from the optical disk to the computer memory and prerecorded CD-ROM itself are likely to be available for a few thousand rupees once the demand for recorded CD-ROMs becomes fairly large so that the cost of recording can be distributed over a number of pieces that can be sold.

Many publications, especially those originating from the western world hint at the possibility of reaching a stage where storage and dissemination of information can be achieved without using paper at all. Achieving this goal, even if it is ever done, will take a long time - perhaps until the miniaturisation in electronics reaches a stage where one can reduce the size of a computer with the text stored inside and with a video screen to that of a normal book so that one can carry such a device while one goes to bed exactly the way one takes a book when one goes to sleep. It is not in eliminating the use of paper or in reaching a stage of totally paper independent publication that these modern techniques and developments play an important role. Basically the capability of electronic storage media and small personal computers, which means computers which are rather small in size but quite big in capability, is in the area of making a fairly large size reference library, storing both factual and bibliographic information, as a table top device. During the initial stages these electronic devices will be able to eliminate atleast all the indexing journals such as Chemical Abstracts, Index Medicus etc. and handbooks such as Mechanical Engineers' Handbook and Nuclear Engineering Handbook. Although these are fairly large sized publications, these can be stored easily on a very insignificant portion of a CD-ROM. The ease of retrieving the information from a CD-ROM using a personal computer is in obviating the need to turn the pages to locate the appropriate page as is being done now. In fact the technology is advancing so rapidly that it should be possible to have a single disk of about 20 cm diameter and 2 or 3 mm in thickness but holding the entire information that is contained in all the volumes of Encyclopaedia Britannica. With such devices, one can find out whatever is given in all the volumes of the Encyclopaedia without having to put one volume back in the shelf and taking another heavy one from the shelf. These developments are not futuristic projections of visionaries; they are conservative estimates made by those who look into the next five years after analysing the trends in the last five years. When the technology for storage and dissemination of information using electronic devices develops so rapidly it is essential that professional librarians who are expected to be custodians of knowledge should become familiar with these developments so that effective use of them can be made. In the absence of drastic and timely revision in the syllabus of library and information science curriculum, the bulk of professional

librarians and information scientists will be unaware of the potential capabilities of these electronic devices. This is likely to lead to a situation where professionals in various disciplines, who are in need of information, will develop sufficient expertise to locate and retrieve the required information without any assistance from professional information scientists. Basically this will result in a situation where professional librarians and information scientists become obselete.

CONCLUSION

The concept of librarian or information scientist being the person who classifies printed documents in a convenient format so that these documents are stored for easy retrieval of information related to any specific topic, is fast disappearing. No doubt, printed materials such as books, scientific journals, technical reports etc. will continue to play an important role in disseminating knowledge. Computers in conjunction with storage media are going to be the most important devices for storing and retrieving information. As the amount of total information being published on each narrow individual topic is increasing exponentially, without resorting to computers and computer peripheral devices, it becomes very difficult to retrieve the desired information before the need for it ceases to exist. As a matter of fact, in advanced countries, computer based information storage and retrieval is already well established with a history of about 25 years behind it. In a country like India, which is not very well developed in certain areas but is quite advanced in scientific research, if the professional librarian holds on to the concept about his role as a person who classifies, catalogues, shelves and issues books, and if the information scientist continues to believe that his job is to identify the source of any needed information, or to bring out publications such as Bibliography of Current Reports, or to render Selective Dissemination of Information (SDI) service, the working scientists, most of whom have fairly good expertise in the use of computers, will join together and devise their own ways of getting the information that they require, thereby reducing the role of a librarian to nothing but a storekeeper of a godown where books, reports etc. are stored. If this situation is to be avoided, there is no time to be wasted in improving the quality of education that is imparted to library and information scientists.

Yet another fact that has to be realised is that once the curriculum is revised and the course is made intellectually more demanding and satisfying, better students are likely to take up information science as their chosen field. This is particularly so in a country like India where a significant fraction of even those youngsters endowed with fairly good intellect do not find satisfying job opportunities owing to the fact that the availability of high calibre personnel is considerably higher than what can be effectively made use of with existing infrastructure. The peril involved in not introducing drastic changes at a rapid pace in information science curriculum is the gradual extinction of professional librarians and information scientists as a separate group of specialists altogether.

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