CHAPTER: IV

INFORMATION TECHNOLOGY AND USER EDUCATION

Information explosion, phenomena of the past few decades, resulted in the exponential growth of printed matter, which created problems of bibliographical control, storage and dissemination of information. This adversely affected the service to users who had by now become more conscious and appreciative of the value of information. Information is a vital resource for socio-economic development. It affects everybody and its role is so pervasive that it has become a common place in the present society. Due to the information explosion, its use becomes so wide spread and there is greater need of applying certain technology to information works and activities to accelerate its use. It enables the storage, processing, retrieval and dissemination of information quickly and easily. The earlier libraries were open to their clientele for consultation within their premises. They have undergone radical changes and expanded their services over the years. The modern libraries offer a variety of services like consultation of reading materials, reference services to users, local information services to their clients, getting reading material for the users from other libraries on inter library loan, on line information services at national and international level, etc. IT covers all activities and technologies that evolve the handling of information by electronic means i.e. information acquisition, storage, retrieval, processing, transmission and control. It has influenced simple business activity to high level research and development work. The quality of work and activities has been greatly changed by the present of application of IT. With the introduction of modern information technology in libraries, the
role of library and information science personnel is undergoing a qualitative change. It is becoming a vital component in the overall resource management of Library and Information Centre. The library environment has been leading towards digital and the concept of electronic library i.e. paperless documentation and information services has been taking place. ‘Library automation’ is use to refer the extensive use of mechanical, electronic or microelectronic equipments to perform the functions and activities associated with the libraries such as acquisition, serial control, cataloguing and circulation and also to library and information services and networking. The computers are of great significant with the advancement of telecommunication and reprography technologies facilitate information scanning and retrieval of details of micro and macro documents over vast distance in no time.

According to ALA Glossary, ‘Information technology is the application of computers and others to the acquisition, organization, storage, retrieval and dissemination of information.’ (Devi and Devi: 2005:29).

Now-a-days the current era is known as ‘Information era’, information industry and the information technology are the most widely known concepts in the scientific world. Information technology in its strict sense is the new science of collecting, storing, processing and transmitting information. On the other hand the meaning of IT is the product of fusion of ‘Information Science’ and ‘Technology’. Information technology is the study of processes especially computers, telecommunications, etc for storing, retrieval and sending information of all kinds. It covers all aspects of arts or science of processing data to produce information is the mainstay and life blood of both individual and organization.
IT can be used in libraries and information centers for the development of new information services and computerized library services. IT is useful for-

a) Improving productivity and efficiency of library services effectively i.e. acquisition, technical processing, and circulation.

b) Provision of quality information e.g. CAS, SDI, etc.

c) Saving the space using the electronic storage e.g. CDs and CDROM and faster accessing information.

d) Provision of the extensive information and maintenance, and

e) Improving of cooperation in sharing of resources e.g. shared acquisition, shared cataloguing, etc. (Devi and Devi: 2005:29)

IT has changed the sources of information, delivery of information and access to information. The role and function of a library and information professional in the changing environment can be described as; he must facilitate information use, negative knowledge systems and information sources. He should consult and advise on information problems and audit the optimal management of information resources. He must translate between the technical system and cultural resources and transform data and information flowing between systems. He should have the capability of offering information policy support for organizational strategies and provide resources for information literacy. The library
professional emerging role and function brings closer to the needs of the users and therefore should have the capacity to evaluate the precise requirements of the users besides having complete access to the world resources.

4.1 Concept of Digital Library

The idea of converting library materials into digital format for creating digital collections has advanced rapidly in the last few years, thus leading the concept of a virtual library or a library without walls. It is very difficult for a single library to acquire all these resources and provide the same to their users. The availability of software, hardware and networking technology, the advent of www, its ever increasing usages and highly evolved browsers have paved the way for creation of digital libraries.

Digital information resources include not only rapidly growing collection of electronic full text resources, but also emerges, video, sound and even objects of virtual reality.

The concept of digital library began with the emergence of electronic journals and networks. Digital library can be defined as a system of distribution of full text and multimedia databases accessible on computer networks. It has a number of machine readable publications and facilities for remote access to several databases. The Digital Library Federation (DLF) defines, the digital libraries as organizations that provide the resources, including the specialized staff to select, offer intellectual access to interpret, distribute, preserve the integrity of and ensure the persistence overtime of collections of digital works so
that they are readily and economically available for use by a defined community or set of community. (Swami: 2005:89)

For most of the users, a digital library is simply a collection of information stored in electronic format, which can be accessed by a large number of geographically distributed users.

It means the fundamental mission of libraries for the users are not changed i.e. easy access to knowledge and information but the processes, tools, techniques are totally changed. Digital libraries are viewed as systematic providing a community of users with coherent access to a large organized repository of information and knowledge. This organization of information is characterized by the absence of prior detailed knowledge of uses of the information. The ability of the use to access recognized and utilized this repository is enriched by the capabilities of digital technologies. Digital libraries are libraries extended and enhanced through digital technology. Important aspects of a library that may be extended and enhanced include:

- The collection of the library.
- The organization and management of the collection.
- Access to library items and the processing of the contained items.
- To communicate information.
Table 4.01 shows some differences between traditional library environment and digital library environment. (Raval: 2005:243)

Table 4.01 Difference between Traditional and Digital Library

<table>
<thead>
<tr>
<th>Knowledge transfer methods</th>
<th>In traditional library</th>
<th>In digital library</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between user</td>
<td>Personal meeting, users meet and discussion, conversation over telephone, fax, letters, etc.</td>
<td>Message, boards/discussion groups, e-mail, chat, alerts, electronic comments on resources, etc.</td>
</tr>
<tr>
<td>Between library staff and users</td>
<td>Library orientation programmes, seminars, reference services, letters, notice, CAS and SDI services, news letters, brochures, etc.</td>
<td>Online message, boards, e-mail, online alerts, online announcements, online news, online learning, etc.</td>
</tr>
<tr>
<td>Between library staff/ administrative</td>
<td>Letters, paper files, memos, notice, meeting</td>
<td>E-mail, alerts, schedulers, calendars, online address books, document clusters, etc.</td>
</tr>
</tbody>
</table>

4.2 Characteristics of Digital Library

Digital libraries, like traditional one select, acquire, store and make available their collections. A digital library contains digital representation of the objects found in it and will be accessible via internet, though not necessarily to every one. But the idea of digitization is perhaps the only characteristics of a digital library on which there is a universal agreement. Choudhury and Choudhury (2003) have identified the following characteristics of a digital library-
A) Information resources can vary from simple text to multimedia available at one or several locations; they may be available on different platforms and may have been created and/or organized differently.

B) Information may come from various sources – from electronic journals, producers or vendors to databases; from local digital libraries to remote digital libraries; and so on.

C) Digital material often forms part of a large collection that comprises print material.

D) Information may be coupled with complex metadata structure. Metadata is nothing but data about the data or information about the information. Metadata is structured information that describes retrieval or managing information resources.

E) User can locate anywhere and their nature, information needs, etc, may vary significantly.

F) There is no human intermediary and no physical collection, at least at the point of interaction.

G) A range of services, such as searching, filtering and downloading as well as current awareness and selective disseminations of information services may be provided.
H) There are many complex issues of information retrieval, access management, intellectual property rights, security, authentication, etc.

I) In any cases information is not owned; only right to access is provided.

J) There are several versions of the same information. (Nazim and Saraf: 2005:102)

4.3 Digital Collections and Academic Libraries

The most important component of a digital library is its digital collection. Viability and extent of usefulness of a digital library would depend upon the critical mass of its digital contents. The content of a digital library includes virtually any kind of electronic media (text, image, graphics, video, etc), licensed databases of journals, articles and abstracts and descriptions of physical collections. There is no limit to the types of contents that may be held by a library. But in practice, digital contents may be of three types:

a) Contents created and existing primarily in machine-readable format

b) Contents converted from the traditional format in to digital (e.g. print text, pamphlets, manuscripts, motion pictures and recorded sounds)

c) Access to external contents, not held in-house, by providing pointers to websites, publishers’ services, password to consortium or other collaboration from commercial organizations.
A library has a choice whether to acquire information contents created and existing primarily in machine-readable format or converting in to digital by scanning traditional format in-house or provide access to external resources.

Rusbridge (1998) has identified four types of contents to build a digital library.

a) **Legacy contents:** - Legacy contents are largely new digital contents including manuscripts, print, slides and maps, audio and video recordings. These are largely non digital contents. Attempts are being made to digitize these contents.

b) **Transition contents:** - Transition contents are primarily designed for another medium (mostly print). These are being or have been digitized, making the transition in to the digital world. The conversion in to digital form is just to ensure better access and to reduce dependency on physical libraries. They are either digital images or ways that are converted to list by the process of OCR.

c) **New digital content:** - These are either deliberately created as digital or are created in parallel to print. Publishers are increasingly moving to XML or SGML format.

d) **Future digital contents:** - These contents are electronic journals, electronic books, databases and data sets in many formats.
The acquisition of documents that are already available in digital format like CDROM databases is also possible. Now-a-days a large number of information products are available on CDROM like MEDLINE, COMPENDEX, METADEX, etc.

The libraries can subscribe to their databases (bibliography or full text) as an important input to digital library contents. All contents share intellectual, technical and cultural challenges. Authority, surrogate, creation, formats, intellectual property rights and cost of acquisition and maintenance are some of the issues for all digital library objects and different types of contents present different challenges. (Nazim and Saraf:2005:103)

The successes of digital library depend largely on the nature, content and quality of its collections. The basic requirements in creating a digital library will be the building of digital collections. The benefit of information collections in digital form for preservation, access and managing large quantities of information have been recognized by both library professional as well users. An academic library collection generally consists of the following-

a) Books (including reference source)

b) Journals

c) Thesis and reports

d) News papers and magazines

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e) In some cases manuscripts.

Today, digital resources have become a major field in the world of literature. Electronic publishing are those publications, which are found in electronic or digital media. The electronic documents are made available either on CD-ROMs or on the internet. The electronic documents, which are available on CD-ROM, are referred as offline documents while those on the internet are known as online documents. The digital resources in an academic library may be one of the following (Swami: 2005:91):

i) e-book(including e-reference sources)

ii) e-journals

iii) e-thesis/ e-research reports

iv) e-news papers

Digital libraries are well-tested and proven information technologies including the multimedia kit. Much of the work in digital libraries are achieved through e-mail services by participating in user net(s), by accessing the database or servers through network. Locally developed databases will contribute a lot to develop digital libraries. Some other components of digital libraries are-
1) **Data-technical data:** - This consists of books and journals stored in digital form in a computer disc store. The most common way of storing this information is to photograph a page and scan the image with a scanner. This form of storage is called a bit mapped form. It is the practical way of storing old manuscripts, texts and journals. The image of the page may be retrieved and displayed on the video screen of the computer.

2) **Numerical Data:** - It consists of tables of various types such as physical property data of various materials from experiments, astronomical tables, etc. Such numeric data stored digitally may be used by curve setting programmer spreadsheet programmes, etc.

3) **Graphic data:** - May be photographs, maps, drawings, etc. The simple way of storing such data is to scan the image and store it as a bit patterns. Data in this form should ease retrieval.

4) **Photographs:** - Colour and monochromes are stored in bit mapped form using comprehension algorithm to reduce storage space.

5) **Audio-Video Data:** - Audio-video data is digitized compressed using a commonly accepted standard comprehension algorithms and stored. Musical scores may also be coded and stored with audio-video data.
6) **Indexing:** - Indexing and interlinking multimedia data are extremely important for ease of retrieval. Keywords in textual documents are selected and linked to related words with logical links by appropriate software. This is called hypertext. For materials and other media also related elements are selected and linked in what is known as hypermedia.

7) **Linking:** - The information collection of the digital library will normally not be stored in one computer. It will be distributed in many computers known as servers. All this servers will be linked by high speed communication links. The fact that the information in the digital libraries distributed need not to be known to a user as it is not relevant from his/her point of view. A user gets easy access to the information based on his/her request regardless of its geographical location.

8) **User:** - Access the library from anywhere using a terminal or a computer connected to the network to which the information servers of the library are connected. (Bhalekar and Deshmukh:2005:200)

### 4.4 Storage Devices in Digital Form

The computer system include two types of digital information storage: internal storage, within the CPU and the backing (back up) storage on external devices such as discs or tapes. Different types of storage media differ according to a number of criteria such as
speed of operation, capacity, cost, reliabilities, the degree to which information is immediately accessible, etc.

1) **Internal Storage Device:** - Internal storage is also known as main, primary or (for historical reasons) core storage or memory. It used to hold those instructions and data required at any moment while a programme is running, which must be available instantaneously. Silicon semiconductor chips are now invariably used for internal storage. These are categorized as either RAM (Random Access Memory) or ROM (Read Only Memory) chips. ROMs are used for data which is never altered e.g. a computer's operating system instructions, while RAM is used for data which is liable to change often and instructions used in the execution of a programme.

2) **Back up Storage:** - Also termed as external storage, is used to hold programme and data which are read in to internal storage when required. The most common form now, as for the last thirty years, is magnetic storage media, either tape or disks. With both of these, data is recorded in to a plastic surface, coated with a varnish containing an oxide which can be magnetized in one or two directions; each magnetization representing one bit of data. Data is written or read with the help of read/write heads. Small electromagnets are close to the surface. (Raval: 2005: 246)

Magnetic tapes are very commonly used for storing large quantum of data for which rapid access is not necessary; especially for archival data back up, etc.
Tapes are cheap means of storing data but access is generally slow. Such cassette tapes of relatively low capacity are used with micro computers.

Magnetic disks are most widely used form of storage device, suitable for holding information required rapidly, for example, data for running programme. In the type of disk drive in large computer system, data is recorded on the flat surfaces of circular disks revolving on common spindle, with one read/write head for each disk. Access times typically 0.01 second, although much faster than tape, are rather slow by comparison with other computer operations and disks access times are one of the main limiting factors in the speed of operation of retrieval system with information stored on disk. Disk capacities have increased greatly, from original values of about 10MB to present units with 1GB which is one thousand million bytes. Small computer systems use Winchester disks, with a single hard disk in a sealed unit, floppy disks, which are compact, cheap and convenient for transfer of programme and data. They are limited in storage capacity, with relatively slow access time, and less movement than a hard disk in day to day use. Floppy disks are available in two sizes, 1.4MB and 1.2MB, but now-a day 1.2MB floppy are not used. Some important and popular external storage devices are shown in Table 4.02 with their capacity, size and features.
Table 4.02 Various Storage Devices

<table>
<thead>
<tr>
<th>Storage Device Type</th>
<th>Size/Capacity</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floppy</td>
<td>1.44MB</td>
<td>Very cheap, easily available and small data transfer, it is very useful.</td>
</tr>
<tr>
<td>CD Drive</td>
<td>700MB/80Min, 52xCombo Drive</td>
<td>CD Drive provide only reading facility</td>
</tr>
<tr>
<td>CD Writer(D+R+W)</td>
<td>52 x internal and external</td>
<td>Back up and restore 8 times faster than tape, drag and drop files</td>
</tr>
<tr>
<td></td>
<td>writer</td>
<td></td>
</tr>
<tr>
<td>DVD</td>
<td>USB 2.0 interface built</td>
<td>Digital multimedia information, larger storage capacity for audio visual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>content</td>
</tr>
<tr>
<td>Pen Drive</td>
<td>10GB</td>
<td>High quality</td>
</tr>
<tr>
<td>USB Memory Key</td>
<td>64MB to 256MB</td>
<td>High quality portable storage drive</td>
</tr>
<tr>
<td>AIT Drives</td>
<td>70GB to 200GB</td>
<td>One of the fastest tape formats in terms of data retrieval and also more</td>
</tr>
<tr>
<td></td>
<td></td>
<td>reliable and lower cost</td>
</tr>
<tr>
<td>Zip Drive</td>
<td>100MB to 250MB (internal and</td>
<td>More speedy capacity wise best rather than floppy</td>
</tr>
<tr>
<td></td>
<td>external drive)</td>
<td></td>
</tr>
<tr>
<td>Ultrim Cartridge</td>
<td>200GB to 400GB</td>
<td>Per tape is exhaustively qualified for better use</td>
</tr>
</tbody>
</table>

4.5 Digital Library Service

Digital libraries have been engaged in providing different types of reference and referrals services (e.g. ready reference, exhaustive search, selective dissemination of information), instructional services (e.g. bibliographic instructions, database searching), added value services (e.g. literacy and freedom of expression). A few services provided by digital libraries are given below. (Nazim and Saraf: 2005:104)
1) **Search service:** - The most basic access service is a search of a library's collection. Online catalogue have been provided author, title and limited subjects access to local holdings (and more recently to union holdings across multiple libraries). The expectation for digital collections is that catalogue should seamlessly link to the digital collection itself so that remotely located users can find and display not only bibliographic information but also primary information contents. The most common search mechanism, to search digital library contents, is query line or form that allows users to enter term or terms as a query. Depending on the type of indexing the library uses, ranked list or exact -matched set of results is returned to the users. There is a rich history of query based searching from information retrieval research community and online service industry that digital libraries may build upon.

2) **Reference and question-answering services:** - Although digital libraries may provide communication channels (e.g. chat rooms, internet 'news' groups) in which people may interact to answer each other's questions, many users come to libraries for answers to questions. Librarians may provide answers, reference to literature that may contain the answers or referrals to others people or services. These reference services are essential part of most libraries, and an important questions is how such services will evolved as result of technology. Internet is the solution of the entire problems. Users can ask questions from experts by sending their query through internet and get answer. Internet is an important component of digital library services. There are three ways that reference services are provided in digital libraries.
i. Frequently asked question (FAQ) services are the most basic reference service. FAQ service anticipates common questions and provides answers so that users can go to the FAQ service before requesting human assistance. These services are particularly popular for system related questions that new users might have.

ii. Second one is the exchange of thoughts between users and librarians or content experts through e-mail. Electronic mail requests allow users to reach reference services more conveniently. These online reference services are logical extensions of traditional reference services that respond to written requests and facilitate multiple iterations over times convenient to users and librarians. The ability of digital assistance tends to increase the volume of request and the expectations of requestor.

iii. Third reference service in digital libraries is the combination of automated and human services. When FAQ service fail the user, the request is forwarded to an appropriate automated service or human experts where user gets answers in response to his/her query.

3) **SDI (Selective Dissemination of Information)**:- A service that is particularly important in special libraries is selective dissemination of information. In this service two types of profiles are prepared. One is user profile and another is document profile (interest profile). Both files are compared after regular intervals. The relevant items later send to the notice of the user.
4) **Instructional service**: Digital libraries are providing more close integration among formal, informal and professional learning processes. Digital libraries offer new opportunity to break down classroom walls and allow people to learn wherever they are and whenever they want. Many digital library projects seek to bring multimedia resources to teachers and students on demand.

In addition to providing the contents to enrich learning, libraries help users to acquire information seeking skill (traditionally known as bibliographic instruction), which have become more essential in the information society. Digital libraries have the potential to support collaborative distance learning and to provide intermediation services to add participants in shaping questions, findings relevant materials and interpreting and using information. These intermediations will surely require new type of human support services augmented by computational tools.

### 4.6 Online User Education

During the last two decades computers are increasingly being used for information activities. This has resulted in rapid growth of computer based online information retrieval systems. Many organizations are produced databases and computer stored information file. These databases are now widely accessible for information searching from local terminals which are linked to the central computer via a telecommunication network. Such efforts have resulted in the development of a number of online information retrieval systems. The use of these systems depends on the education of users and the availability and functioning of this method of information retrieval.
According to Dhiman and Sinha (2002), the online education may be divided into two components—orientation and instruction. Orientation is concerned with enabling the user to learn the existence of computer-based information retrieval and the services available. On the other hand, instruction is concerned with enabling the user to learn in detail how to carry out computerized information retrieval.

The ultimate aim of online instruction is to be able to carry out online information searches. Therefore it is essential to practice on a real system. This forms part of ‘learning by doing’ concept, which is also important in other forms of library user education.

Education and training can be thought of as an extension to the communication process: they are a means of informing people in more detail of how changes will affect them and of teaching them to cope with these changes. They are, in turn, a logical way of overcoming fears and misconceptions. Thorough training is of great importance. To a large extent the effectiveness of a system will depend on those who use it and adequate training is needed in order to exploit the system’s capabilities. Well-trained staff is generally confident in handling the computer, a confidence which transmits itself to the user, conversely, a poor people or insufficient instruction creates bad relation between people and the computer which can lead to feelings of stress.

The ultimate beneficiaries of a new automated library system should be the library’s users. Training the users is partly realized through contact with the staff and partly through good publicity. It is to be hoped that well-trained employees communicate their positive
feelings for the system to the readers. Timely publicity and information also prepares them for information.

According to Clarke (1985) when enrolling new members into the library, both VDU operator users sit down together at the terminal. The use can then see what details are being put on to the computer and correct them as necessary. This helps to accustom the user to the machine, is beneficial for public relations, and helps to reduce any feelings of anxiety the user may have towards 'secrete data' being kept about him. When dealing with any reader query it is useful for VDUs to be mounted on swivel stands or angled so that assistant and user can view the screen alike without either straining to see, but it is important not to allow other reader in the queue to be able to read details about the reader at the desk.

The OPAC is where the library user will come in to closest contact with the computer. As Bichteler (1987) points out, most users lack understanding of the way in which information is organized and accessed. They are happy when they retrieve something, but are unaware of what they fail to find. They may believe that the computer has all the answers or alternatively, may be discouraged by a failure to retrieve an item they believe to be in the system. They tend to incorrect Boolean logic and spelling errors are common. Bichteler argues that it is therefore necessary to instruct readers in the principles of searching and the construction of bibliographic records, not just in how to input search. (Sehgal: 1998:315)

Depending upon the type of library and on staff availability, a variety of training methods may be used. The most common is to provide a notice and/or leaflet giving brief details about the system and how to use it effectively. These may be supplemented by a
manual for more serious searchers. Education sessions may also incorporate something on
the use of the computer system and in some libraries, one to one point of need training may
be appropriate. Bichteler suggests the use of search logs to monitor errors and to adjust the
instruction accordingly.