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DIGITAL LIBRARIES: UPGRADING LIBRARY AND INFORMATION SERVICES IN INDIA

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ABSTRACT

The world has seen an extraordinary growth of information in the last few decades. This information explosion and advancements in science and technology have occasioned the transformation of our society into a knowledge society. The traditional libraries have performed roles acting as the intermediaries between authors and information generators and the users. The traditional system is now changing because of transformation of material form print to the digital material. Digital libraries provide access to an intellectual store of information which is scattered in the society through electronic environment. Technically speaking, as the libraries are evolving with the fast changes in information technology it is a possibility that the libraries of the future will be digital only. This is so because, print publishing is gradually transforming into the digital publishing. Despite the progress we have made till date in the direction of digital environment, still our digital libraries are at the early stage of development and their practice for scholarly research and communication. The challenges of their usage and needs of users need to be understood by the researchers to make digital libraries more erudite, more practical and more compatible to be used in association to other applications of internet.

KEYWORDS: *Digital Libraries, information technology, digital publishing, information explosion, electronic environment, Library and Information Services.*

1.INTRODUCTION :

The world has seen an extraordinary growth of information in the last few decades. This information explosion and advancements in science and technology have occasioned the transformation of our society into a knowledge society. The traditional libraries have performed roles acting as the intermediaries between authors and information generators and the users. Libraries exclusively focus on the end users. Libraries perform various services such as cataloguing, classification, indexing, document delivery services etc. These services include the selective filtering of information based on user demands. Consequently, traditional libraries have been facing many problems in course of providing information to the users. Some of these problems are storage problems due to limited space, price hike for materials such as books and journals, low budget, incapability is purchasing multiple copies of documents etc. Most important problem being faced by libraries is the inefficiency in access and retrieval of stored information. The compulsion to overcome these problems has made the use of new technology in libraries unavoidable.

The traditional system is now changing because of transformation of material form print to the digital material. Most of the publishers prefer publishing of

journals in both print form and digital form. Sometimes, digital forms of documents are generated by the process of digitization of their print forms. There is high possibility that within next few years most of the scientific and professional journals will be available in the digital versions only(Mackenzie Owen, 1998).

2. DIGITAL LIBRARIES

Wikipedia defines the Digital Library as "A special library with a focused collection of digital objects that can include text, visual material, audio material, video material, stored as electronic media formats (as opposed to print, microform, or other media), along with means for organizing, storing, and retrieving the files and media contained in the library collection."

The Digital Library Federation defines digital libraries as "Organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily available for use by a defined community or set of communities" (Shiri, 2003).

Digital means, in technical words, is in the form of bits. A bit is the smallest unit of storage in a computer. So it can be said that in a digital library, material is stored in the form of bits. Unlike traditional libraries, digital library content may be of any format such as audio, video and audio-visual etc. But a digital library can perform functions similar to traditional libraries such as storage, indexing, technical processing and methods of information retrieval.

A Digital Library is not a library in traditional sense i.e. it does not have a physical infrastructure such as walls, furniture and shelves etc. It is often an organisation of people related to creation of information such as scientists and scholars who use computer and communication technology to create and disseminate the information and this information could be research results, survey collection or pre-publication results from current research. It provides a global infrastructure for creating a network of authors of information for information creation and dissemination.

There can be an incalculable diversification of digital libraries in terms of size and scope. Where management of digital libraries is concerned these can be managed by individuals, organizations. These can also be affiliated to the institutions. A major issue concerned with the digital libraries is the storage and access of the digital content. Digital documents can be stored locally or remotely and access can be provided through the network. In this way, digital libraries act as Information Retrieval Systems.

Digital Libraries are the product of the Information Technology (IT) Revolution which started in decade of 1960s. Building of digital collections for mini and mainframe computers was started in early 1970s for providing online access, search and retrieval services to the users with the help of computer technology existing at that time. Erudite systems were built during 1980s for information storage and retrieval using database management systems. To overcome the issues of the traditional storage systems document digitization systems were developed in early 1980s which used computer technologies to convert documents into digital formats by scanning and storing and which could story text only information.

The term "Digital Libraries" was first used by National Science Foundation (NSF), United States of America (USA). It sponsored workshops for bringing digital libraries to reality. It started a Digital Library Initiative (DLI) in 1994. Digital Library Initiative was a result of discussion among researchers for many years. NSF played a very critical role in establishment of digital libraries as a field of research and development during 1990s. Though there was hundreds of millions of dollars were invested on many projects all over the world but there was no visible progress before DLI program. The epoch of 1990s conveyed the true meaning of digital libraries revolution.

2.1 Key Factors in Development of Digital Libraries

The Information Technology and the Internet has brought many innovations which stimulate the digitized information dissemination. Digital libraries are briskly taking over the traditional libraries. Some of the factors which are stimulating this encroachment of digital libraries over traditional libraries are discussed here below:

• The Information Explosion has created an information overload which in turn has made is difficult for

information managers in traditional libraries to manage such a huge amount of information and data.
• Another factor which inspired the use of technological innovations in traditional libraries for digitization is the problem faced by users in searching the documents stored in libraries. Catalogue cards were used to locate the documents in the libraries which created problems for naïve users.
• One important factor that has stimulated the change from traditional to the digital libraries is low priced technologies. New advancements in affordable storage technologies have facilitated storage of large amount of digital information at very low costs. When compared with the traditional libraries, storage capacity of digital documents and their maintenance is much easy at much more lower price (Savanur & Nagaraj, 2004).
• Internet and web technologies have appeared as the new approaches for information dissemination and access. The Internet permits quick and easy access to an extensive range of networked information resources providing a user friendly interface for a wide range of multimedia resources at a single site.
• New applications of information technology such as web browsers have become crucial for end users. Current innovative web browsers not only act as interface for users to provide access to information but also act as local as well as remote file directories for information management.
• Environmental factor also have a crucial importance in this transformation. Use of digital libraries is one of the cleanest technologies. The slogan "Burn a CD-ROM and save a tree" is rightly fulfilled by digital libraries since use of paper is reduced after technologies are being used in libraries (Mohan, 2002).

2.2 Characteristics of Digital Libraries

• Digital libraries are established using the digital technologies. Sources of Information are developed (Born Digital) or converted from print format to the digital format (Trivedi, 2010).
• Documents can be compressed in size which takes less space while storing in databases.
• Information of any type such as textual, numeric, audio, video,graphics form can be stored.
• Digital libraries save time and efforts of the users. Digital Libraries expedite the access and retrieval of information by just clicking of a button.
• Digital libraries make searching and retrieval of information easy with the help of computerised searching programs.
• Digital library is not a single body. Instead, it is connected to multiple digital libraries for providing information to its users. It can provide access to digital resources outside its boundaries through hyperlinking facility.
• Digital libraries eliminate the physical boundaries of information. With the aid of network communication, information can be accessed from any part of the world which makes the whole world as a single site for information.
• Digital library use a structured approach for providing access to information i.e. to access a piece of information user first access a catalogue, then moves to the required book, then to particular chapter and at last to the required piece of information.
• Digital libraries also provide multiple access facility. Multiple users can access the same resource at same time.
• Digital libraries also provide the on demand and subject interest based User Alert Services (Jange & Angadi, 2001).
• Digital libraries can provide all those services and features that are offered by traditional libraries although these all these features and services have to be brushed up for the digital environment.
• Documents can be stored permanently in the digital library collection. The digital environment will enable quick handling and/or ephemeral information.
• Digital libraries are the solution to the problem of limited space in traditional libraries. Digital libraries have a great potential for storage of much more information than the traditional libraries as digital contents needs very small space for storage.
• Contents of digital libraries can be preserved easily. Unlike traditional resources, digital contents can be easily multiplied without degrading the quality.
• Digital libraries can be more economical than the traditional libraries. Additional costs such as staff salaries, maintenance cost of books, rent and cost for additional copies of books can be narrowed down.

2.3 Architecture of Digital Libraries

The main modules of digital libraries are shown in the following figure.

2.3.1 User Interface

There are two types of user interfaces i.e. one dedicated to the users of the library and other for the managers of the library. Users can interact with the library through network by using internet browser on their systems. It acts as an interface for actual user interaction. A browser works on the Client-Server Model of internetworking. User device which is connected with interface of the browser is called as the Client System. The browser connects to client services, which act as an intermediary between the browser and the other parts of the system. The client services which are provided in digital library environment assist the library users in search and retrieval of documents; they interpret the structured digital objects to get information; they negotiate terms and conditions, manage relationships between digital objects, remember the state of the interaction, and convert among the protocols used by the various parts of the system(Arms, Blanchi, & Overly, 1997).

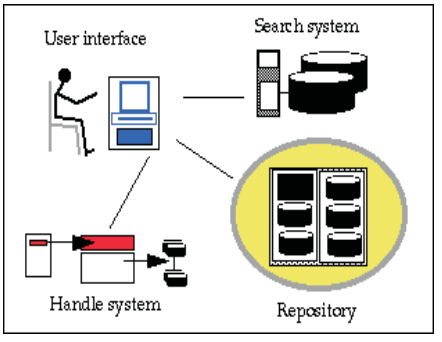

Figure 1: Major System Components
(Arms et al., 1997)

2.3.2 Repository

Repositories are the store house of the digital libraries. These perform the functions of storage and management of the digital information objects. There are different types of repositories such as modern repositories, inheritance databases and web servers. User interface of repository is called as the Repository Access Protocol (RAP). RAP performs various functions. It performs user authentication by validating the user details. It also performs authorization function i.e. it grants access rights and permissions to the different users based on their role in the library. Users of administrative level and management level have different access rights from the other users of the library. It helps in dissemination of digital information to the users. It provides an open interface architecture.

2.3.3 Handle system

To identify the digital objects and other internet resources persistent identifiers are used which are called as the Handles. These are used to manage the objects stored in the repository for long periods of time. The Handle System is a technology used for assignment, management and naming resolution of the handles. In these systems, different protocols are specified which store the identifiers on a distributed computer system. These names are resolved into information which is required to access the internet resources. This information can be updated accordingly when required without affecting the identifiers.

2.3.4 Search system

Digital libraries provide an interface for searching the contents of the repository. The internet resources are usually called as hidden web contents which cannot be located by web crawler programs of the search engines. To expose their metadata to other digital libraries, digital libraries use Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH).

Generally, Digital libraries use two searching strategies

- **Distributed Searching –** In this type of search, client sends multiple search requests to multiple servers simultaneously by using the search module. Results of each query are collected at a single place. Redundant

results are removed and the rest of the results are processed and provided to the client. The issue with this method is that it is problematic to combine the results based on their relevancy.

• **Metadata Searching –** In this method, index from the previous searches are stored locally on the client system. An indexing and harvesting mechanism is involved in this method which regularly updates the resources by connecting with the digital libraries to gather new information. When new search is conducted, first the index or metadata is saved from previous search results is looked. Since this approach requires more methods, it is expensive than the distributed searching.

2.4 Digital Library Services

Types of services provided by a library largely depend on the type of functions it performs. Changes in the technological trends, today, have influenced these functions at large and in turn have influenced the services of libraries. The recent trends related to information management such as collection of information, information storage, it's processing and distribution have occasioned the emergence of digital libraries. Among the services of a library, reference and information services are considered as one of the most important services. In this phase of change, technical and economic factors such as increased usage of new technologies in libraries influence the reference services of library (Parida, 2004).

Some of these services are discussed below:

• **Personalised Services –** Digital library environment such as technologies and information resources cannot provide services to users on their own. To make a library effectively useful priority based personalised services are provided by digital libraries. Users can be helped by library personnel to locate the required information in the vast digital world. It was found in a study that library professional play different roles in digital library environment, such as selection, acquisition, cataloguing and indexing of macro and micro documents. Library professionals act as the gateways to provide users the information services. Subject specialist library professionals assist users to formulate subject based search strategies.

• **Reference and Information Services based on Internet –** These days, internet provide several reference and information services. These services are provided by non-library organisations also. There are many websites available on internet which provides real time services to the users. According to (Chowdhury & Chowdhury, 2002) internet based reference and information services can be divided into three key groups:

o Services provided by publishers, database search services and by institutions

o Services provided by libraries/ experts

o Self-search by users

• **Search Engine Services –** Search engine service includes the service of asking questions. It is useful in asking complex questions by the users. Users, who are not familiar with the methods of searching such as Boolean method, can ask a question on the topics of their interest. The search results come up with a list of questions on the same topics or topics akin. Users can select these predefined questions and the digital library can provide users with the answers. (Chowdhury & Chowdhury, 2002) give some websites which provide this type of service such as Help.com (https://help.com/) and About.com (http://www.about.com/).

• **General Public Digital Reference Service –**Digital reference services are provided by the network of public libraries also. These services are for the general users in the society. Any user can make query on the interface provided by the libraries' network. The query is forwarded to the library which is having the concerned record related to the query. The information is then provided to the users through e-mail service. Service related to simple queries are provided free of cost to the users. But if the queries asked by users are complex then such services are provided at some prescribed fees.

• **Academic Library Digital Reference Service –**Digital reference services are also provided by the academic libraries. A study conducted on the academic libraries in USA shows that almost all the libraries provide reference services through e-mail. These libraries use customer relationship management (CRM) software packages to provide reference services on web.

• **Cooperative Digital Library Services –** In order to provide their users with the new services such as digital reference services there are multiple costs involved such as investments for new services, rising prices of digital

reference sources, staff salaries for extra technical staff required for management of new services. Libraries have adopted a new way to reduce these costs. Many libraries with same interests come together and form a group. They subscribe the services together as a group. The services can be used by the all the members of the group. These types of services are called as the Consortia-Based Services or Cooperative Services.

3. ISSUES AND CHALLENGES

Establishment of digital libraries is not an easy task. This process possesses some critical challenges. Some of these issues are discussed here below:

• **Technical Needs for Digital Libraries –** For establishing a digital library, there is a requirement of augmentation in the existing architecture of traditional libraries. For establishment, digital libraries require high speed networks and internet connectivity. Database Management Softwares are required to manage multi-format digital contents. Search engines with the latest searching methods are required to provide users full text access to the digital resources. For management of the digital libraries different types of latest servers are also required.

• **Collection Development in Digital Libraries –** One of the key issues in establishment of digital libraries is collection development. Issues such as, to which extent digitization of existing collection of library is to be done and how much of new material is to be acquired. It is necessary to identify the process of digitization of existing library material and acquisition of new digital material. There also remain issues of access rights and ownership in this process. Responsibility of development, acquisition and management of the digital material is given to staff based on certain factors such as quantity of material to be developed or acquired, types of material to be acquired, user demands for specific type of material, amount of material to be managed, and technical skills of the staff etc.

• **Process of Digitization –** This issue is named in the previous point. It is also an important issue in the development of digital libraries. Digitization is defined as the process of converting conventional material in the library to the digital form. Each type of material, viz. books, journals, photos, microfilms, microfiche etc., can be converted to digital form. Different types of approaches are used by libraries, according to their needs of conversion, to convert material in conventional form to digital form. Some of these approaches can be:

- o Digitization of material for retrospective preservation
- o Categorised Digitization i.e. Digitization of specific material or a portion of it
- o Digitization to diversify the collection
- o Digitization of material which is in high usage in library
- o Digitization of material on the request of users etc.

Digitised object require naming identifiers which are used to identify digital objects in the digital world. These identifiers should be permanent for the digital objects and should be globally unique so that every digital object can be uniquely identified over the internet. There are three proposed naming schemes which are commonly used for naming identifiers in scholarly community. There are Persistent URLs (PURLs) developed by the Online Computer Library Center (OCLC) in 1995, Uniform Resource Name (URNs) developed by Internet Engineering Task Force (IETF) and Digital Object Identifier (DOI) introduced in year 2000 by Association of American Publishers and Corporation for National Research Initiatives.

• **Copyright Issue for Digital Material –**Another key issue which hinders the development of digital libraries is the issue of Copyright for the digital material. Digital objects can be duplicated easily because these can be distributed easily even to the remote locations to the multiple users. In case of libraries, since libraries act as the serving bodies for their users, they do not possess any copyright of their collection. Copyright can be easily broken as there is less or no control over the documents in the digital environment. Libraries have to develop strategies to manage copyright issues.

• **Preservation of Digital Material –** It is another important issue faced by the libraries in digital environment. The process of preservation of digital material in libraries is an issue for libraries because most of the libraries lack in updated technologies for management of the digital contents. Preservation media used in most of the libraries such as storage tapes, floppy discs, hard drives are considered as the obsolete technology. Latest technologies must be used by the libraries to increase the life of digitally preserved documents.

4. DIGITAL LIBRARY INITIATIVES IN INDIA

In this age of Information Technology, digital libraries have become the new face of information collection, storage and dissemination through electronic sources all over the world. But in India, when compared to other developed countries, this growth is slow. There are certain factors such as social, economic and political which hinder the growth of digital libraries in India. Despite these factors, different states in India have taken some initiatives to improve the development of digital libraries.

Digital libraries emerged in India in the mid-1990s after the propagation of Information Technology and internet technologies. During this period, Central Government of India also paid serious attention towards the uplift of society in the field of technology. Although, several steps have been taken by the libraries and also by the government for establishing efficient digital libraries in India, still these are at infancy in the country. Some of these initiatives are discussed here below:

• Archives of Indian Labour

It was a setup in July 1998 by V.V. Giri National Labour Institute and the Association of Indian Labour Historians in collaboration. This archive is devoted for preservation and accessibility of the rapidly depleting documents on the Indian Labour (/or working class in Indian society). It was felt that these documents can be permanently lost if preservation of these is documents is not properly done. For this purpose this archive is involved in several activities such as research, collection building, archiving, and dissemination of digital documents. Apart from collection building of digital documents, the archive, also, promotes research in the field of labour history(Sujatha, 2008).

• Digital Library of India (http://www.dli.ernet.in)

Digital Library of India (DLI) is the one of the biggest digital library initiatives in India at national level. It consists of a collection of rare books which can be accessed freely by anyone. DLI project was started in early 2000. The idea was to archive all the important works of mankind, to preserve these works in digital form and to provide free access of this material to everyone over internet. This project was commenced by the Office of the Principal Scientific Advisor to the Government of India. Later, it was taken over by the Department of Electronics and Information Technology (DeitY), Ministry of Communications and Information Technology (MCIT), Government of India.

• Digital Library of Works of Art

It was a pilot project of Hewlett Packard in collaboration with Centre for Development of Advanced Computing (CDAC). The purpose of the project was digitization of the collection of National Gallery of Modern Art (NGMA) so that people can see and order the full sized paintings through internet also.

• Down the Memory Lane

It is a digitization programme started by the National Library of India in late 1990s. The objective of this programme was to digitize rare books, manuscripts and other resources which are in the collection of National Library of India. The books that were published in English language prior to 1900 and Indian books published before 1920 were taken into consideration(Sujatha, 2008).

• Indian National Digital Library in Engineering Science and Technology (INDEST) (http://paniit.iitd.ac.in/indest/)

The INDEST-AICTE Consortium is the most aspiring initiative taken so far in the country. It is the largest consortium in Asia in terms of number of member institutions. The Indian National Digital Library in Engineering Sciences and Technology (INDEST) Consortium was set up by the Ministry of Human Resource Development (MHRD) in 2003. It was recommended to be set up by an Expert Group appointed by the Ministry in its report. The Indian Institute of Technology (IIT) Delhi is the headquarters for coordinating activities of Consortium. In December 2005, it was renamed as INDEST-AICTE Consortium as All India Council for Technical Education (AICTE)

plays a crucial role in enrolling its approved engineering colleges and institutions as members of the Consortium. It allows its members to subscribe to electronic resources at discounted rates of subscription and favourable terms and conditions.

• Kalasampada (http://www.ignca.nic.in/dlrich.html)

It is a digital library, Digital Library – Resources of Indian Cultural Heritage (DL-Rich), established by Indira Gandhi National Centre for the Arts (IGNCA). In its collection, it includes print as well as non-print materials. The objective of this initiative is to provide highly researched publications of the IGNCA from a single window. It provides new facets in the study of Indian Art and Culture by integrating multimedia computer technology and software.

• Khuda Baksh Oriental Public Library (http://kblibrary.bih.nic.in/)

The Khuda Baksh Oriental Public Library has initiated digitization of Arabic and Persian manuscripts of the medieval India. It has a rich collection of manuscripts in digital form in Persian, Arabic, Urdu and other languages.

• Mobile e-Library (Dware Dware Gyan Sampada)

It is a digital library initiative of Centre for Development of Advanced Computing (CDAC) Noida for promoting literacy among citizens through mobile digital libraries. A mobile van with satellite internet connection, printer and binding machine to provide books to users is used for this purpose.

• Mukhtabodha Digital Library and Archiving Project

The objective of the Muktabodha project is to preserve endangered texts from the religious and philosophical works of classical India and provide them for study and scholarship worldwide.

• National Institute of Advanced Studies (NIAS), Bangalore

The NIAS has started digitization of paintings and the microfilming of Indian Publication Project (MIPP) and preservation of rare manuscript for both microfilm and microfiche.

• National Mission for Manuscripts (http://www.namami.org/)

The National Mission for Manuscripts was established by the Ministry of Tourism and Culture, Government of India in February 2003. The objective of the mission is to conserve and preserve the vast manuscript wealth of India. India is the biggest repository of manuscripts possessing an estimate of five million manuscripts, covering a variety of themes such as, textures and aesthetics, scripts, languages, calligraphies, illuminations and illustrations. The National Informatics Centre (NIC) has prepared detailed guidelines for digitization of Manuscripts.

• National Resource Centre for Women

The National Resource Centre for Women (NRCW) was set up by the Government of India under National Mission for Empowerment of Women (NMEW)as a Virtual Resource Centre on Women's issues. It acts as an entity which provides access to online digital catalogues of different libraries which deal with women's issues. It also provides reports of diverse nature, statistics, events, legislations etc. which may be helpful to clientele in different issues.

• Library of Parliament of India (http://164.100.47.134/plibrary/Home.htm)

A digital library has been set in the library of parliament by Government of India to fulfil the needs of members and staff of Parliament Secretariat. A large number of index-based databases of information was initially developed by the computer centre. The data stored and available now in PARLIS databases for online retrieval relates to questions, debates, reports, bio-data of present and past members of parliament including

photographs and addresses etc.

• Vidyanidhi

Vidyanidhi, "Treasure of Knowledge" in Sanskrit, started as a pilot project in the year 2000 at the Department of Library and Information Science, University of Mysore, Manasagangotri, Mysore. The project is sponsored by the National Information System for Science and Technology, Department of Scientific and Industrial Research, Ministry of Science and Technology, Government of India. The objective of the project was to provide an information infrastructure to improve the quality of research at doctoral level. This project was started to provide a repository for Indian electronic thesis so that these can be accessed by users from anywhere in the world and at time when required.

5. CONCLUSION

In this millennium of Information Technology, it is clear that digital libraries are promising sources which provide an energizing new model for the library community. Digital libraries provide access to an intellectual store of information which is scattered in the society through electronic environment. Electronic access to information is increasing briskly as the quantity of digital information on internet has reached to a new level of information boom and to contain such a large quantity traditional sources have become powerless. In this scenario, digital documents have proved their significance. They provide facilities to store information in any format and provide features of searching and retrieval. Also, once available on the internet they can be accessed easily worldwide.

What will the libraries look like in the future? Technically speaking, as the libraries are evolving with the fast changes in information technology it is a possibility that the libraries of the future will be digital only. This is so because, there is inevitable make over in the methods of publishing. Print publishing is gradually transforming into the digital publishing. Most of the homes of scholarly publishing have either started publishing in both print and digital forms or have eliminated their traditional methods of print publishing and have adopted the digital only publishing.

Despite the progress we have made till date in the direction of digital environment, still our digital libraries are at the early stage of development and their practice for scholarly research and communication. To inject the digital environment usage in our daily lives, there is a need of more research to be done in this direction. Like computer technology has evolved itself from room sized systems to hand held mobile systems, digital libraries also require such type of evolution.

There are many problems which still persist with digital libraries of today and which need to be solved. The challenges of their usage and needs of users need to be understood by the researchers to make digital libraries more erudite, more practical and more compatible to be used in association to other applications of internet. Time has come when researchers should try to figure out new ways to use new technologies for improving access and usage of digital libraries.

Besides this, studies have shown that some people yet not have heard the term "Digital Libraries". Users, who have knowledge about latest technologies, can efficiently perform information retrieval functions without any help of library staff. But for naïve users it is proposed that libraries should regularly conduct the user training and information literacy programmes to assist users in searching and retrieval and to make people aware of significance of usage of digital libraries.

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