

DEVELOPING A DIGITAL LIBRARY SYSTEM : AN OVERVIEW

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Abstract :

A library may procure contents in various sources and forms to service their clients. In the predominantly paper based erstwhile environment all these contents were put to similar types of use, and copyright restrictions were imposed based on the quantum of pages copied etc. Research and practice in Digital Libraries has exploded worldwide in the 1990s. Substantial research funding has become available, libraries are actively involved in DL projects and conferences, journals and online news lists proliferate. This paper explores need for these developments, purpose and characteristics of digital libraries in short, pre-requisites for digitization , various stages in digitizing the documents, functions of digital libraries, advantages and limitations, some Digital Library Initiatives in India and some significant Digital Library Software Packages.

Keywords: *Definition of Digital Library, Factors for Change, Different*

tages, Characteristics of Digital Library, Functions of Digital Library, Digital Library Software Packages.

Introduction

A digital library is a collection of documents in organized electronic form, available on the Internet or on compact-disk read-only memory disks. Depending on the specific library, a user may be able to access magazine articles, books, papers, images, sound files, and videos.

On the Internet, the use of a digital library is enhanced by broadband connection such as cable modem or DSL. Dial-up connections can be used to access plain-text documents and some documents containing images, but for complex files and those with animated video content, a downstream data speed of at least several hundred kilobytes per second can make the user's experience less tedious, as well as more informative. Internet-based digital libraries can be updated on a daily basis. This is one of the greatest assets of this emerging technology.

Some institutions have begun the task of converting classic books to electronic format for distribution on the Internet. Some files can be viewed directly in HTML format; others can be downloaded in PDF format and printed. Some publishers keep electronic files of books and produce them one unit at a time in printed and bound form on demand.

Definition of Digital Library :

A Digital Library is 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. Digital libraries can vary immensely in size and scope, and can be maintained by individuals, organizations, or affiliated with established physical library buildings or institutions, or with academic institutions. The electronic content may be stored locally, or accessed remotely via computer networks. An electronic library is a type of information retrieval system.

From Digital Libraries by William Arms:--

"An informal definition of a digital library is a managed collection of information, with associated services, where the information is stored in digital formats and accessible over a network. A crucial part of this definition is that the information is managed. A stream of data sent to earth from a satellite is not a library. The same data, when organized systematically, becomes a digital library collection. Most people would not consider a database containing financial records of one company to be a digital library, but would accept a collection of such information from many companies as part of a library. Digital libraries contain diverse information for use by many different users. Digital libraries

range in size from tiny to huge. They can use any type of computing equipment and any suitable software. The unifying theme is that information is organized on computers and available over a network, with procedures to select the material in the collections, to organize it, to make it available to users, and to archive it."

From the Berkeley Digital Library SunSITE

There are many definitions of a "digital library." Terms such as "electronic library" and "virtual library" are often used synonymously. The elements that have been identified as common to these definitions are:

- The digital library is not a single entity;
- The digital library requires technology to link the resources of many;
- The linkages between the many digital libraries and information services are transparent to the end users;
- Universal access to digital libraries and information services is a goal;
- Digital library collections are not limited to document surrogates: they extend to digital artifacts that cannot be represented or distributed in printed formats.

Factors of change to digital libraries:

The limited buying power of libraries, complex nature of recent document, storage problem etc are some of the common factor which are influencing to change to digital mode, some other factors are-

-Information explosion

-Searching problem in **traditional libraries**

-Low cost of technology: When we consider the storage capacity of digital document and

-it’s maintained then it can be easily realize that the cost of technologies is much more less than that of traditional libraries.

-Environmental factor: the use of digital libraries is the cleanest technologies to fulfill the slogan “Burn a CD-ROM save a tree”

-New generation needs

Purpose of a Digital Library:

- Purpose of Digital Library Expedite the systematic development of procedures to collect, store, and organize, information in digital form.
- Promote efficient delivery of information economically to all users.

- Encourage co-operative efforts in research resource, computing, and communication networks.
- Strengthen communication and collaboration between and among educational institutions.
- Take leadership role in the generation and dissemination of knowledge, the components of a digital library are: Infrastructure, Digital Collection, Systems function, Telecommunication facility, Human resources etc.

Characteristics of digital libraries:

Cleveland (1998) describes some characteristics of digital libraries that have been gleaned from various discussions about digital libraries (DLs), both online and in print:

- DLs are the digital face of traditional libraries that include both digital collections and traditional, fixed media collections. So they encompass both electronic and paper materials.
- DLs will also include digital materials that exist outside the physical and administrative bounds of any one digital library
- DLs will include all the processes and services that are the backbone and nervous system of libraries. However, such traditional processes, though forming the basis digital library work, will have to be revised and enhanced to accommodate the differences between new digital media and traditional fixed media.

- DLs ideally provide a coherent view of all of the information contained within a library, no matter its form or format
- DLs will serve particular communities or constituencies, as traditional libraries do now, though those communities may be widely dispersed throughout the network.
- DLs will require both the skills of librarians and well as those of computer scientists to be viable.

Requirement for digital libraries:

The Internet and World Wide Web provide the impetus and technological environment for the development and operation of a digital library. The Internet provides the TCP/IP and or its associated protocol for accessing the information and web provide tools and technique for publishing the information over Internet. In the digital environment it is reasonable to say that a central back up or archive should be created at the national level, which will store information output of the region as well as information from outside the country. Some of the requirement for a digital libraries are:

- a. - Audio visual: Color T.V., V.C.R., D.V.D., Sound box, Telephone etc.
 - b. - Computer: Server, P.C. with multimedia, U.PS. etc.
 - c. - Network: LAN, MAN, WAN, Internet etc.
 - d. - Printer: Laser printer, Dot matrix, Barcode printer, Digital graphic printer etc.
 - e. - Scanner: H.P. Scan jet, flatbed, Sheet feeder, Drum scanner, Slide scanner, Microfilming scanner, Digital camera, Barcode scanner etc.
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f. - Storage devices: Optical storage device, CD-ROM, Jukebox etc.

g. - Software: Any suitable software, which is inter-connected and suitable for LAN and WAN connection to PC

Different Stages in Digitizing Documents:

Cornell University Library/Research Departments (2000), provides six stages in digitizing documents for a digital library: Registering, Scanning, Optical Character Recognition, Proofreading and formatting and producing the Final Version.

Registering:

Before scanning large number of documents, there is the need to first register them and use a filing system to keep their track. If not, you risk misplacing hardcopies, losing files, skipping steps in the process or duplicating work, perhaps

Planning:

Planning mainly involves identifying various tasks related to creating a digital library collection, developing strategies for handling these tasks, identifying required resources and formulating a timeline for accomplishing these tasks. If there is a need to have a large digital project, you may consider conducting a feasibility study to assess the viability of the project before detailed planning. The outcome of the feasibility study could be a formal proposal for obtaining management approval or grant for the project.

- a.** The first step in planning a digital library collection development project is to specify the need for creating the digital library collection, its purpose and target user community. You should indicate if management, the users or others have expressed this need and defined what this need is. The purpose could be improving preservation of some rare or delicate materials, improving access to and the visibility of certain material or facilitating re-use of documents. It is important to identify the target user community for a digital library collection and their profile
- b.** There is the need to define the source material that constitutes the digital library collections and the key attributes of this source material. Examples of source material include project reports, staff publications, working papers, theses, dissertation, audio and video lectures, songs and musical scores etc. There is also the need to specify what portion of the material is to be digitized and if all the material or only a sub-set will be covered in the digital collection. Remember to assess copyright restrictions.
- c.** Define the key features of the digital library collection you plan to build. Identify the nature of the collection e.g. static or dynamic. Indicate the type of usages you would allow the users to adhere to and the kind of service delivery they should expect from you e.g. CDROM or on-line or both. Define metadata, search and retrieval requirements.
- d.** The important task in creating a digital library collection is the conversion of the source materials available in hardcopy into a digital format. There should be a clear cut statement about the related requirements and their processes, namely:

i. How to convert the source material into required digital format.

ii. What are the digitization requirements?

iii. The workflow involved in digitizing the source material.

e. Identify the resources and money required for creating and maintaining digital collections.

There is a need to identify:

i. What type of information technology (IT) infrastructure is required for establishing and maintaining the digital collections?

ii. What are the personnel requirements and

iii. What are the financial requirements involve for setting up and maintaining the collection.

f. Finally, there is the need to define how the project is going to be implemented and what the major milestones and time requirements are?

Scanning documents:

It is necessary to clean and dust off the documents to be scanned; make sure that all the pages are present and in the right order. If the document is in poor condition, try to find a fresh copy. If it is a sheet fed scanner, cut the document open to get individual sheets to feed through the scanner. If necessary, you can rebind the documents later. If you do not want to damage the documents, you can photocopy each page and feed in the photocopy through the scanner, though this uses a lot of paper and reduces the quality of the scan. To scan a document on a flatbed scanner, place it face down on the scanner platen or put the pages into the sheet feeder. Then, in the software, choose a setting, resolution and colour and scan each page of the document at the settings you have chosen.

Optical Character Recognition (OCR) software converts a scanned image into a text file that a word processor can read. To do this, it must first recognize where the text is on the page. The software breaks the text blocks down into lines or into an individual character. It tries to match the image of each letter against patterns it recognizes as an “a”, “b”, etc. There is a problem to encounter with languages that use Latin scripts with accented characters. As a solution, you should use the OCR software that is specific for language.

Proofreading:

This is the act of making corrections to the document text and layout. This is done in two ways:

- a.** Comparing the scanned text on the screen with the hardcopy and entering the corrections directly into the computer. The word processor’s spellchecker will help in spelling errors quickly.
- b.** Printing out the scanned text and comparing it with the original copy. Mark any corrections on the printout, and then enter them into the computer. This is a slower method, but may be the best option if there are not enough computers for each proofreader.

Reformatting:

The Optical Character Recognition (OCR) software may produce a document that consists of straight text, no columns, no headers and footers. There is the need to reinsert these by hand or correct where they appear on the page. There may be also need to change the typeface, heading styles and so on, to make the document more attractive and readable. Alternatively, you may be able to adjust the settings of your OCR program to preserve the layout of the page.

Final Version:

For many documents, there is a need to add some information to the text so that readers can identify it easily. As for a book you must make sure that the book title, the author or the editor, the publisher and the publication date are all included. As for chapter in a book, you should include the title and the author of that chapter and the original page numbers in the printed version of the book. As for the journal articles you should include the journal title, the date, the volume and the issue number, the article title and the authors and the page numbers in the original printed journal. In other words there is the need to add Metadata to describe each document.

Implementation:

Planning is followed by implementation. That is getting down to the actual steps required to set up the collection. This means that there must be a need to obtain the management approval for the plan and the required resources before proceeding with the implementation. There is a need to identify and designate a project manager to lead the implementation of the digital project. For large digital library projects, it is essential to have a full time project manager for the project period. The Implementation of a digital library project involves the following activities.

i. -Establish the project team

ii. -Set up the Information Technology (IT) infrastructure

iii. -Procure and install digital library software

iv.- Finalize policies and specifications

v. -Complete arrangement of workflow for digitization

vi. -Set up the digital library collection site in case of Internet distribution

vii. -Obtain copyright permissions and

viii. -Release the digital library collection for use.

Promotion and Provision of Services:

The digital library collection created should be visible, and it should provide an easy access for users. One-way of achieving this is to include links to the collection site in the appropriate pages of the library website and other related on-line services in the organization. In addition to, or in the absence of remote on-line access to the digital collection, there is the need to explore other modes of providing access to the digital collection. These may include:

i. Setting up local public access computers on the library Local Area Network.

ii. Provision of e-mail based services and

iii. CD-ROM based distribution of the collection.

Functions of the Digital Library:

Digital Library collection contains permanent documents. The digital environment will enable quick handling ephemeral information. Digital libraries are based on digital technologies. The assumption that digital libraries will contain only digital materials may be wrong. Digital libraries are often used by individual working alone. The physical boundaries of data have been eliminated. Support for communications and collaboration is as important as information seeking.

- Access to large amounts of information to users wherever they need it.
- Access to primary information sources.
- Support multimedia content along with text.
- Network accessibility.
- User Friendly Interface .
- Hypertext links for navigation.
- Client server architecture.
- Advanced search and retrieval.
- Integration with other digital libraries.

Advantages of the Digital Library:

A digital library is not confined to a particular location or so called building it is virtually distributed all over the world. The user can get his/ her information on his own computer screen by using the Internet. Actually it is a network of multimedia system, which provides fingertip access.

- **No physical boundary:** The user of a digital library need not to go to the library physically, people from all over the world could gain access to the same information, as long as an Internet connection is available.

-**Round the clock availability:** Digital libraries can be accessed at any time, 24 hours a day and 365 days of the year

-**Multiple accesses:** The same resources can be used at the same time by a number of users.

-**Structured approach:** Digital library provides access to much richer content in a more structured manner i.e. we can easily move from the catalog to the particular book then to a particular chapter and so on.

-**Information retrieval:** The user is able to use any search term bellowing to the word or phrase of the entire collection. Digital library will provide very user friendly interfaces, giving click able access to its resources.

-**Preservation and conservation:** An exact copy of the original can be made any number of times without any degradation in quality.

-Space: Whereas traditional libraries are limited by storage space, digital libraries have the potential to store much more information, simply because digital information requires very little physical space to contain them. When the library had no space for extension digitization is the only solution.

-Networking: A particular digital library can provide the link to any other resources of other digital library very easily thus a seamlessly integrated resource sharing can be achieved.

-Cost - The cost of maintaining a digital library is much lower than that of a traditional library. A traditional library must spend large sums of money paying for staff, book maintains, rent, and additional books. Digital libraries do away with these fees.

Limitations:

The computer viruses, lack of standardization for digitized information, quick degrading properties of digitized material, different display standard of digital product and its associated problem, health hazard nature of the radiation from monitor etc. makes digital libraries at times handicap.

- **Copyright:** - Digitization violates the copy right law as the thought content of one author can be freely transfer by other without his acknowledgement. So One difficulty to overcome for digital libraries is the way to distribute information. How does a digital library distribute information at will while protecting the copyright of the author?
- **Initial cost is high:** - The infrastructure cost of digital library i.e. the cost of hardware, software; leasing communication circuit is generally very high.
- **Efficiency:** - With the much larger volume of digital information, finding the right material for a specific task becomes increasingly difficult.
- **Environment:** - Digital libraries cannot reproduce the environment of a traditional library. Many people also find reading printed material to be easier than reading material on a computer screen.
- **Preservation:** - Due to technological developments, a digital library can rapidly become out-of-date and its data may become inaccessible.

Digital Library Initiatives in India :

The concept of digital libraries in India began in the mid 1990s with the spread of information technology, the internet and the support of the Central Government. In 1996, this concept was recognized during the Conference on Digital Libraries organized by the Society of Information Science at Bangalore. Though a few libraries have made attempts earlier in this direction, the digital library initiative in India is still at budding stage.

Majority of the Digital library initiatives were largely confined to limited uses such as subscribing to e-journals, scanning documents and installing them on the intranet. But there is every need for rapid change in this scenario of libraries in India to use the Information Technology (IT) and ICTs which are confined so far to the prestigious National institutes such as the Indian Institutes of Technology (IIT), Indian Institutes of Management (IIM), Indian Institutes of Science (IIS) Research Institutes under the control of NISSAT and some special Libraries. Some government agencies and institutions, mostly in the public sector are also engaged in digitization of their libraries in a limited a way. However, it is evident from the initiatives taken so far in this direction that the great potential of ICTs for developing digital libraries has not yet been fully utilized. Some of the important digital library initiatives and programmes initiated across the country are reviewed below ----

Archives of Indian Labour : The Archives of Indian Labour was set up in July, 1998 as a collaborative project of V.V. Giri National Labour Institute and the Association of Indian Labour Historians. The core activities of the archive are Digital Archiving, Research, www.klibjlis.com

Collection, Public Interface & Dissemination. It was instituted in order to address the urgent need for preservation of rapidly decaying documents and material on labour and to provide for greater public access to the same, as It was felt that documents and data on Indian Labour are being irretrievably lost due to lack of an organized initiative to preserve these documents in the country. The archive, apart from being a repository of documents also builds collections and initiates research in the field of labour history.

Digital Library of India: Digital Library of India (DLI) is the biggest national level digital library initiative in India. It is a part of the Universal Digital Library Project, envisaged by Carnegie Mellon University, USA, which has some other international partners such as China and Egypt. DLI is coordinated by Indian Institute of Science, Bangalore and is supported by Ministry of Communications and Information Technology, Government of India. The Mission is to create a portal for the Digital Library of India which will foster creativity and free access to all human knowledge. As a first step in realizing this mission, it is proposed to create the Digital Library of one million books, predominantly in Indian languages, available to everyone over the Internet. This portal will also become an aggregator of all the knowledge and digital content created by other digital library initiatives in India.

Digital Library of art Masterpieces: HP Labs, (Hewlett Packard’s) announced a pilot project with the Centre for Development of Advanced Computing (CDAC) to digitize part of the art collection in the National Gallery of Modern Art (NGMA). NGMA plans to

put up images of the paintings on the net, from which customers can order full-sized prints.

The museum will make reproductions on demand on Hp design Jet printers and sell them.

Similarly, the Indira Gandhi National Centre for the Arts (IGNCA) has taken up multimedia projects for the digitization of traditional artwork and artifacts that will be made available on the web. The digitization of “Geet Govinda,” an important classic of Indian literature, is one of their successful ventures.

Down the Memory Lane: The National Library of India has initiated in late 1990s a digitization programme, known as 'Down the Memory Lane', to digitize rare books, manuscripts and other resources from its collection. The English books that were published prior to 1900 and Indian books published before 1920 were taken into consideration. Similarly, the Central Secretariat Library has initiated a programme to digitize government publications like, Gazette of India, Commission & Committee Reports, Annual Reports of the Ministries.

Indian National digital Library in Engineering Science & Technology: The Ministry of Human Resource Development (MHRD) has set-up the Indian National Digital Library in Engineering Sciences and Technology (INDEST) Consortium on the recommendation made by the Expert Group. INDEST Consortium is the most ambitious initiative taken up so far in the country. It welcomes other institutions to join and offers highly discounted rates of subscription and better terms of agreement with the publishers.

INDEST Consortium presently include ACM Digital Library, ASCE Journals, ASMe

Journals, Capitaline, Euromonitor (GMID), IEL Online, Indian Standards, Nature, ProQuest Science, Sciencedirect, Springerlink and bibliographic databases of Compendex, Inspec and MathSciNet.

Kalasampada: Indira Gandhi National Centre for Arts (IGNCA), established a Digital Library, known as “Kalasampada”, (Digital Library Resource for Indian Cultural Heritage). It includes non-print as well as printed materials. The users will have access to the highly researched publications of the IGNCA from a single window. The integration of multimedia computer technology and software provides a new dimension in the study of the Indian Art and Culture.

Khuda Baksh Oriental Public Library: The Khuda Baksh Oriental Public Library has initiated digitization of Arabic and Persian manuscripts of the medieval India. It is one of the Oriental Libraries having rich collection of Persian, Arabic, Urdu and other languages manuscripts.

Mobile Digital Library (Dware Dware Gyan Sampada): For spreading and promoting literacy among the common citizens, Internet enabled Mobile Digital Library was brought to use. Mobile Van with satellite connection for Internet connectivity is used. The van is also fitted with printer, and binding machine for providing bound books to the end user from a single point. This is a product from C-DAC-ERDC Noida.

Mukhtabodha Digital Library and Archiving Project: The Mukhtabodha Project is an attempt to create a digital library in Indian languages specially the ancient texts on palm leaves, birch tree barks etc.

National Institute of Advanced Studies (NIAS), Bangalore: This institution has started digitization of paintings and the Microfilming of Indian Publication Project (MIPP). The NIAS has also started work on rare manuscript preservation projects for both microfilm and microfiche.

National Mission for Manuscripts: The Department of Culture, Government of India has launched the 'National Mission for Manuscripts' in 2003 with the main objectives of conservation and preservation of Manuscripts for posterity. India, being the largest repository of Manuscripts, rare books, classics etc., urgently needs digitization to preserve as well as give access to. The National Informatics Centre (NIC) has prepared detailed guidelines for digitization of Manuscripts.

National Resource Centre for Women: The National Resource Centre for Women was set up by the Government of India as a Virtual Resource Centre on Women's issues. It serves as a decentralized, participatory and partnership oriented entity aiming at giving access to digital catalogues of different libraries dealing with women's issues, reports of diverse nature, statistics, events, legislation etc using different media to reach the clientele at different levels.

Parliament Library: In order to cater to the needs of Members of Parliament and officers and staff of Parliament Secretariat a digital library has been set up in the parliament library. 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 – a Sanskrit word means “Treasure of Knowledge”. It is begun as a pilot project to demonstrate the feasibility of electronic Theses and Dissertations. As per the Action Plan of the National Task Force on Information Technology and Software Development, it is mandatory for all universities and deemed universities across the country to host every thesis/ dissertation on a designated website. This national policy has provided a policy framework for initiating a digital library of ETDs. ‘Vidyanidhi’ project was started in the year 2000 at the Department of Library and Information Science, University of Mysore, with the sponsorship of National Information System for Science and Technology, Government of India. The Project's vision is to build and strengthen the research capacities and enhance the quality of doctoral research in India.

Digital Library Software Packages:

For the construction and administration of a digital library one needs digital library software. Many commercial digital library software packages are available today. But they are too costly to be afforded by average libraries. These proprietary software packages

also require high installation costs followed by recurring annual maintenance costs (AMC) and/or updating costs. A remedy for this situation is the adoption of open source software for digital library purposes. With the recent availability of several open source digital library software packages, the creation and sharing of information through digital library collections has now become an attractive and feasible proposition for library and information professionals around the world. To build a digital library under economical conditions open source software is preferable, there are some examples of major open source digital library software, namely, D-Space, Greenstone and E-Prints.

DSPACE

MIT (Massachusetts Institute of Technology) and HP (Hewlett-Packard) have created D-Space software as digital repository to manage intellectual output of multidisciplinary Research and Development organizations. D-Space supports digital preservations, planning and managing institutional repository in a large institution D-Space allows workflow and customization. It supports community/ collection based content and submission by different user community (<http://www.dspace.org>).

GREENSTONE

This software is for building and distributing digital library collection. New Zealand Digital Library Project at the University of Waikato has developed and distributed this in cooperation with UNESCO and the Human Info NGO. This open source

software can handle multilingual documents, with search and browse facility under GNU General Public License (<http://www.greenstone.org>).

EPRINTS

Is the largest and widely distributed and installed digital library software developed by University of Southampton, with minimum technical expertise. The software can be installed by any institution world over. By its integrated advanced search, extended metadata and other features, the software can be customized to local requirements (<http://www.eprints.org>).

Conclusion:

Digital libraries are not going to replace the physical existence of document completely but no doubt to meet the present demand, to satisfy the non local user digitization must be introduced so that at least libraries becomes of hybrid nature. The initial cost of digitization is high but experiment shows that once digitization is introduced then the cost to manage this collection will be cheaper than that of any traditional library. Day by day the cost of digitization is decreasing, the online publication is increasing, the needs of user are shifting towards a different environment so it's needless to say that after one or two years my library or your library will go to be digitized so it's the pick time to all informational and library professional that they geared themselves to take the challenge.

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