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## Digital Library: Infrastructure and Service

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### Abstract

*Every digital library's goal is to meet the information need of its users. But the fundamental roles of libraries have not changed, services and collections are still essential, although they have, sometimes assumed different form and to support the growing range of digital library resources and services that complement the library's more traditional collection's services which is comprise the software, hardware and telecommunication. This approach allows continuing programs on digital collections and applications, which the library build on the technology acquired and implemented in earn stage and also providing internet service in libraries and urging for professionally qualified and IT trained library staff and information service to the users in this age of information explosion and globalization. Now the information resource, digital resource in various formats are produced on the web.*

**Keywords :** Digital Library, Digitization, Digital Infrastructure, Digital Environment, Computer Network.

### 0. Introduction

The terms electronic library, e-library, virtual library and digital library, have been used interchangeably. (the digital library, encompassing many concepts was best defined by Christme Borgman (1996, p. 223)). Now Digital Library is refer to Information system (IS) and services that provide electronic document text files, digital sound, video- available in dynamic or archival repositories/ collection. "They also include digital hypertext, hypermedia & multimedia compositions (Yerkey, 1996)". [personal option].

A digital library is understood to have the information stored predominantly in electronic or digital medium such as digital books, scanned images, graphics, textual numeric data, films, audio and clips etc. Digital Library is in a transitory phase towards the Universal library, a vast distributed information and active adieus repository accessible from anywhere with an increasing improved indexing, extraction and summarization techniques. It will be a library without walls or national boundaries. Digital libraries aim at unhindered access to contents over computer and communication networks and the information, the Infrastructure Technology and Application (IITA) working group considers 'digital libraries'.

### 1. Collection Infrastructure (Acquire, Create, Convert, Access)

On the base, the term "acquire" is shown to hold all kinds of digital material such as discovery, searching, selection, ordering and receiving each of the aforesaid five important ingredients which constitute book, journals, films newspaper, pamphlets, or microforms (Heiliger and Henderson, 1971, p. 25) [1]. "Create", processing includes statistics, mathematical, calculation for payrolls, filling tasks and all traditional activities such as automated teller machine record and also convert the raw data into information (usable form). The new way of "access" has potential coverage in coming digital age, as the European Commissions on Green papers expressed (European Commission 1997), is the ability of different network platform to carry and coming together of consumer devices such as the telephone, television, personal computer. We can also say that access of digital concept are so many such as potential coverage (access to signal), Microwave Video Distribution System (MUDS), XDSL (Generic digital

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subscriber live) technologies, access to content (Actual Coverage) Conditional access- pay TV operators use the system, EPG (Electronic Programme Guide).

## **2. Access Infrastructure**

Every where there will be a group of “cutting-edge” people who lead the way in online learning. These are the ones who move a head with their online efforts even before policies and support mechanisms are put in place. Firstly student, staff, Research scholar need access to computer they access not only to computers but to updated computers reliably connected to the Internet with Updated software and in many cases multimedia capability.

Digital libraries's constituents are (1) Collection acquired in digital form (2) collection digitized in house (3) buying access to electronic resource including e-journal and (4) subject gateways are the library OPACs' (Science Direct connections, 2000).

## **3. Search**

Search is the act of a user, an information worker on the user's behalf, or automated system activated by the user or the intermediary, in the making of a systematic investigation to obtain data or information. Information professional are expected to devise a coherent search strategy for this purpose. In data base software, the process of seeking out an entry, keyword, or phrase is caved search for insurance use several keyword strung together and qualified by Boolean operators such as AND, OR, NOT and Links spatial navigation, query, filter, Agent (Mobile User). Filter- includes W3C, there is filtering standard set by the platform for internet content selection (PICS)

A new market research service is now available via the Internet, according to an announcement from Global Infrastructure Resources. It is a new service, Emerging Markets online, is an Internet- based information research Center that provides daily news, newsletters, “off-the shelf” market studies and customized consulting services EMO focuses Exclusively on the power energy, telecommunication, transportation, and waste-water development sectors of Asia, Eastern Europe and Latin America. [2]

## **4. Browse**

Browsing is one of the most important ways in which readers seek information. It is essentially a sampling process in which silent features of the text and graphics are scanned until the reader is satisfied with the desired amount of information has been gathered e.g. – readers of scholarly journal often flip through the pages of a newly received issue to see if anything catches their attention. It is casual investigation of the contents of a collection of book or documents possibly with some subject in mind but equally possibly for “interesting” material.

Browsing or the term “serendipity”, described as the knack of making unexpected discoveries by accident, it really refers to the ability to perceive the potential or immediate utility of information encountered whilst not actively being sought at that time. It is a traditional and sometimes very effective way a using a liberally.

### **4.1 Browsers**

A web browser is a complex piece of computer software that views web pages (HTML files) and it simply downloading and displaying the textual information of a web page, most web browsers automatically display in line images, as well. Most web browsers are capable of accessing gopher directories,

downloading FTP files & sending mail, you can now access practically everything on the net- all with the click a mouse (Include) HTTP request, Form, From data, Query, HTTP Response.[3]

#### 4.2. Portals

A portal in English means a large impressive doorway at the entrance of a building. Portal in the Web is a web-site that hosts on a huge web server, it has a large knowledge base, it offers the usual services like site documents server, search facility, e-mail server and user registration and the portal sites or the gateways restrict their operation to providing linkages to independent third party sources.

### 5. Computer Network and Infrastructure

A computer Network can be a point to point network (connection oriented), a multicast Network, or broadcast network.[4]

In constructing a house the various rooms are connected the need to know the topology by which the various nodes interconnect. [2]

#### 5.1 Topology of Networks

(a) Topology or an Arrangement (b) Bus Network (c) Ring Network (d) Star Network (e) Intersecting Network (f) Hub Network (Branches) (g) Tree network (h) fully interconnected (Mesh) Network (i) Irregular Network (Pathways).

The after lies in the concept of open system interconnection (OSI)- Layers in Networking is to interconnect the application programs one requesting and responding during a data interchange, there is a subsystem in a mode or computer.

OSI is defined as open system Interconnect in in a computer network system is not manufacture dependent but is based on International Standard. The OSI reference world has become the standard computer networking modes as such.

- (1) Application Layer- (7<sup>th</sup> OSI Layers) Access peistocal, Access Management, GUI
- (2) Presentation Layer – Data Transmission, Encryption Compression.
- (3) Session Layer- Synchronization, Dialog Establishment.
- (4) Transport Layer- Segment and Fragments Connection Management.

Network Layer- Routing, Addressing and Management.

Data link Layer- Media Access Bridging and Addressing,. Protocol Analysis.

Physical Layer- Multiplexing, RS23, RS 449, RS 423.

#### 5.2 Switching in the Networks

In the Network, a point-to-point Network established by different technologies.

First Technique: is the one used in the public data Networks as such PStNC Public switched telephone Network) are PSDNs (Public Switched Data Network).

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Second Technique: is Packet- Switched Networked which establishes a connectionless network different from a circuit- switched (or signaling) Network.

Third Technique: is Synchronous Transport Module (STM) and B-ISDN- Broad Based Integrated service Data Network.

Fourth: is ATM and Cell Switched Network.

### 5.3 Bridges, Routers and Gateways

Bridge: A bridge interconnect two dissimilar data link and physicals layer (media) as LAN (Local Access Network)

Route: is formed by a routing algorithm (software), it interconnects two dissimilar sets of Networks, data link, and physical layers (WAN).

Gateway: It is formed by a translation algorithm (software). The latter runs on a computer at a hub, service, mainframe, processor or embedded front end processor, the gateway interconnects the dissimilar application by translating the protocols that are inherent in different layers in the network system gateway also help in the Internet and PSTN interconnection application can be for dissimilar networks and work groups in the web.

## 6. Digital Resource Organization

The library should develop an information resources collection and development policy consistent with the objectives of its institution or community. These information resources should satisfy through content, currency format organization and quality, i.e., OPAC, Electronic text and journals, Electronic books, Internet wave, email, bulletin board, database (CD ROM and DVD- ROM database).

The digital information services personnel should, beyond in house collections and in house expertise, draw on the resources of other organizations, collect and provide information, by consulting individual experts and by tapping external information sources.

The digital library should provide access to the most current reference source available in order to assure the accuracy of information. This is based on many types resource organization such as;

### 6.1 Standards

Now, in India, very few standards pertinent to digital materials have been developed. The guide for data elements and records format for computer based bibliographical database for bibliographic description (IS: 11370-1985) is perhaps the only relevant Indian standards that has been developed for digital materials so far. More standards can be developed and adhered to for the purpose. The government of India enacted IT act during 2000. According to IT act, the information technology architecture certifying authorities may support open standards and accepted de facto Standard such as SGML (Standard Generalized Markup Language). It is meta language formalized and facilitated descriptive markup language for people electronic information encoding and decoding. SGML is an internal standard defined in document.

ISO8878: 1989 SGML parsers, Browsing Data conversion, Transformation, Formatting DSSSL Software tools XML/XSL/XLL Digital Library tools, input device, ISO 2700, UBCIM (Universal Bibliography Control and Information Mark) [5]

The most important standards :

Product	Standards
Public Key Infrastructure	PKIX
Digital Signature Certificates and Digital Signature revocation list	X. 509. Vers3 Certificate ITURFC 1422
Directory (DAP and LDAP)	X 500 CRLS (Certificate Revocation Lists)
Database Management Operation	SQL
Public Key algorithm	DSA and RSA
Digital hash Function	MD5 and SHA-1
RSA public key technology	PKCS #1 RSA Encryption Standard (512, 1024, 2048 bit) PKCS #5 password based Encryption standard PKCS #7 cryptographic message PKCS # 8 Private key Information standard PKCS # 9 Selected Attribute types PKCS # 10 RSA request PKCS # 12 Portable format for storing transporting
Distinguished name	X. 520

Internationally, however quite a good number of Standards are available and grouped as follows:

- OSI & Internet Data transfer Standards
- Character Set Standards
- Document Interchange, Standards
- Audio Interchange Standards
- Image & Multimedia standard
- Moving Image & Multimedia Standard
- 3-Dimensional Standards
- Directory standards
- Metadata Standards
- Locator Standards
- Z39.50 communication-to access database.

## 6.2 Protocols

The "Must follow" regulations that govern the transmission and receipt of information across a data communicates on link, languages that computers use to talk to each other. A set of standards that assures that different network can work together. And any product using a given protocol should work with any other product using the same protocol. There are some example such as TCP/IP Transport Protocols Telnet, FTP, SNMP Network file systems (NFS), simple mail transfer protocol TCP/ LP and Inter-networks, vendor Products Intercrosses TCP/Panel Inter-networks communication, Peer to peer Protocols net BIOS (Network Basic I/O system, etc.) [6]

## 7. Access Control

Firstly : access mean the digital library arrange its services according to a coherent plan taking in to accent ready accessibility to users.

Secondly: for Information services, work space should be large enough to accommodate staff. The collection of information resources, equipment and users seeking their services and to make service areas for information services highly visible and accommodate the needs of users services, users with disabilities and also support state of the art communication methods for accessing information resources.

Thirdly; to provide good facilities for the convenient efficient consultation of local and remote, information resources by staff. This included communication hardware and software to receive and answer queries from users.

Fourthly: Operation/working hours for the information services should be responsive to the user needs and behavior.

We know that the rapid growth and demand for internet access on 16<sup>th</sup> Sept, 97 relinquished its monopoly over the digital information resources, internet and three it open to private service providers. There are some Limitations;

- Lack of screening or validation
- Lack of quality control editing standards
- Preservation of a fixed copy
- Lack of preservation "of best in class"
- Not easy in Knowing and locating every thing that is available, and differentiating valuable from useless information.
- Job loss for traditional publisher and librarians
- Costs are spread and many become hidden

### 7.1. Access Control and Digital Rights and Wrong

Right : John Perry Barlow wrote "Intellectual property Law cannot to patched, retrofitted or expanded to contain digitized expression" (Co-founder of the Electronic Frontier Foundation an Online lobbying group, in an influenced easy.) "Digital Technology is detaching information the physical plane, where property law of all sort has always found. The bottle was protected, not the wine".

Wrong : A lot of people still went to protect their electronic wire. More than a dozen companies are rolling out so called digital rights- management system to do just that. These systems are complicated pieces of software that could, if widely deplaned, only establish property right in the digital domain, but also strengthen the power of publishers.

Internet or digital information concern over the encouragement of piracy, is likely to receive from the advent of Rights Technologies.

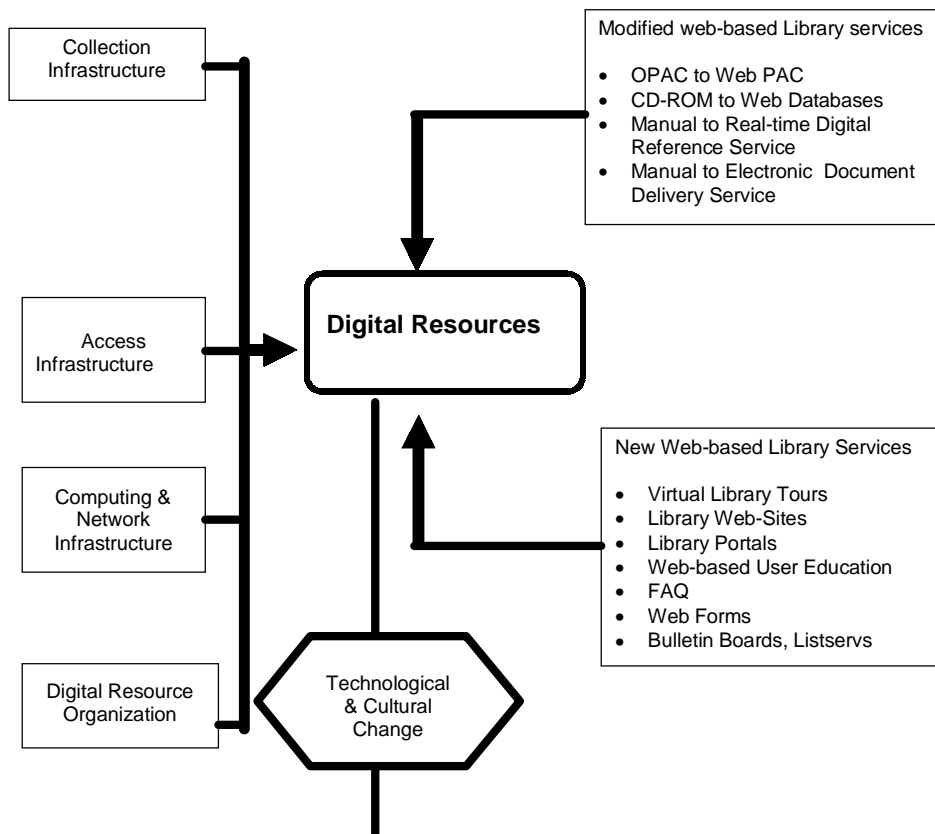
Equally important are the needs for scientific and technological enterprise for free exchange of information in the public domain should not be lost to the private interests. Both interest should be balanced by any legal treaty or instrument for protection of database.

### 7.2 Digital Information Access with cost Involved

An important factor is the cost involved to gain access to any information network. Generally, high-cost prevents the optional use of resources available on any computerized information network or online service, even in most derived situations. The cost prescribed by different firms to get access to internet are varied and diverse, depending upon the type and level of access one desires to get.

Finally, access control is going to control online service and digital information by government prescribe the standardization of the items for maintaining protecting granted, recording invented their quality. Every sphere of activity has been now standardized e.g. BSI (British Standards Institution, ISI (Indian Standards Institution and ACM (Association of Computing Machine) EJN (Electronic Journal Navigator) AGRICOLA, (Educational Research Information Centre-Free). But as of now, only (ERNET-1986, NICNET- 1987, VSNL-1995) and Satyam-1998 online and Mahanagar Telecom Nigam Ltd.-1999, are providing Internet access, except the STPT (Software Technology Park of India) which serves only software exporting organizations. And also include UBCIM (Universal Bibliography, Control International MARC), ANSI (American National Standards Institute).

## 8. Digital Library Services



**Fig : Digital Library Resources and Services**

The Digital Services through different way as such:

### 8.1 OPAC to Web OPAC

The incorporation of Web OPAC has helped replaced traditional system of OPAC (online public access catalogues). On OPAC the user can access information in a way which meets his specific requirement such as browsing facility available for beginners. They can search a book by title, author, subject and keyword or phrase searching, search term is not case sensitive. The Union Catalogues in print form have been replaced by "On line data bases" providing instant access to the information rather than to the "Source of information". Quick retrieval and transmission of information through e-mail and online access and connectivity to Internet is now possible.

### 8.2 CD-ROM to Web Database

Compact disk- read only memory (CD-ROM) optical drives are used for storage of information that is distributed for read only use. It has a variety of application in digital system such as implementation of combination logic and sequential logic character generation look-up table, micro processor programme storage etc.

In the field of digital library, the digitization of existing collection of thesis, dissertation, manuscripts and rare books of all university libraries should be taken up. All have insist in digital form e.g.-CD-ROM, and DVD and CD-ROM technologies are spin-offs of the entertainment Industry (Eaton, Mac Donald, and Saule; 1989. P.17), introduced by Sony and Philips in 1980 (Saffady, 1989, p.3) FTR (Full text Retrieval).

CD-ROM as a library resource was introduced in January, 1985 Karch (1990; p.51, 81-86) says by white Zink (1990, p.51) [11]. There are some example about CD-ROM in library service CD-OPACs, Collection Development (e.g. Booking in print, Browsers Ulrich's plus and Ingram's Laser search), Reference support. 20<sup>th</sup> Edition DDC, CCF, BNB, Oxford English Dictionary, Physics of Motion (i.e. camride science media's motion, CD-ROM contain 54 short movies of subjects in motion) (The telegraph; 29.8, 95; p.5) [12].

### 8.3 Manual to Digital Reference Service:

In the case manual Reference service, we go to source of Information such as

- i. Primary Source: The primary source in the field of manual digital reference service in new form, all are available in digital form such as monograph, books, journals, reports, technical bulletins, thesis etc. Now digital way all source are covered in CD-ROM such as. MIT movie manual; Interactive Graphics Documents. The manual of medical therapeutics, Guinness Disk of Records, CD-ROM Reports, CD-ROM technical report, CD-ROM on Bulletin and thesis or dissertation etc.
- ii. Secondary Source: It included such as CAS, service, BIOSIS CCF, (Bibliographies) BNS, CBI, INB Encyclopedia Video CD, American 98; world Book multimedia encyclopedia Microsoft Encarta 98. Dictionaries Oxford English Dictation web-star, Dictionary of Living world; and Microsoft Dinosaurs and Directory; hand book, readable database in different modes and formats are also available.
- iii. Tertiary Sources: There are another example of online CD-ROM sources
  - a. *Butterworth Guides to information source (London and U.K.)*
  - b. *Information Source is Science and Technology (Bharti Pub., Delhi)*
  - c. *Bibliography of Bibliographies on India (Concept Pub. Co.; New Delhi)*



#### 8.4. Manual to Electronic Document Delivery Service:

Document Delivery service manually based on printed material such as book, dictionary, and primary source Vice versa own N/C (National information centre printed different NET document delivery service provided by CSIR or ILMR or ICSSR, INSDOC, NASSDOC, SENDOC or DESIDOC to collect, organize publicize retrieve and market Information, union catalogue and database-MACISIS-ILL, BLDC (British Lib. Doc. Center). [5]

### 9. New Web-based Library Services

#### 9.1 Virtual library tours:

It mean library without walls, provides access to resources , Library without resources or Gopen (1994) defined "the concept of remote access to the contents and services of libraries and information resources combining an online collection of current and mainly used materials in both print and electronic form, with an electronic network which provides access to and delivery form external world wide library and commercial information and knowledge sources, e.g.

1. Argus Clearinghouse- <http://www.clearinghouse.net>
2. INFOMINE- <http://www.ver.edu>
3. Internet Public Library- <http://www.ipl.org>
4. Librarians Index to Internet- <http://www.sunsiteberkeley.edu/internetindex>
5. World wide web Virtual Library - <http://www.vlib.stanford.edu/overview.html>

#### 9.2 Library Services

1. Acquisition - <http://www.booksfinder.com>  
Acquisition - <http://www.mazone.com>
2. Classification- <http://www.oclc.org/dewey>
3. Cataloguing- <http://www.light.com/webcats>
4. Serial Collection- <http://www.blackwellpublisher.co.uk>
5. Resource Sharing - <http://www.ifla.org>
6. Reference Services- <http://www.eb.com>
7. Services- <http://www.sciencedirect.com>
8. OPAC - <http://www.blpc.bl.uk>

Various search engines used are Altavista, Excite, Yahoo, Hotbot, Infoseek, Lycos, Web Crawler, Galaxy.com

#### 9.3 Library Portals:

Library portals is allowing links amongst electronic resources stored on services dispersed geographically on distant locations. The portal sites or gateways redirect a user to the holders of the original digital material. It may provide its own indexing and search services or may combine original providers and portal sites or the gateways restrict their operation to provide linkages to independent third party sources e.g. the portal site [6]

- Virtual library- <http://www.edoc.com>
- Internet Public library- [www.ipl.org](http://www.ipl.org)
- Penn electronic Library- [www.library.upenn.edu/resources](http://www.library.upenn.edu/resources)
- Internet Index - [www.sunsite.berkeleg.edu/internetindex](http://www.sunsite.berkeleg.edu/internetindex).

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#### 9.4 Web-based user Education :

The educational needs of users and accessing information have been in vague for more than a century now, but year after year the processes of use of education is increasingly becoming complex.

Firstly and chiefly they are the libraries and secondly, the users of the participating libraries. Though the main purpose of Networking is to help the users, the Networks or web based material have to educate them.

#### 9.5 FAQ (Frequently Asked Questions):

Frequently asked questions is a document routinely developed by a news group, which hits question most commonly asked in the news group, along with their answer, FAQ's help a news group's members to avoid the repeated posting of the same information to the group.

#### 9.6 Web Forms:

As you explore the Net, you will also hear about the "Wide Area Information Service of WAIS and (www). The quick handle on both of these features in that they let you search actual data. e.g. Archie, Veronica, jughead news etc. web forms".

#### 9.7 Bulletin Board:

A place on which public notices user displayed. It is used as the generic descriptor of a computer based information service information sent to an editor, who posts it on the electronic bulletin board. Access is usually by the Internet e.g. In U.K., the Bulletin Board for libraries (BUBL) has become an invaluable information source

#### 9.8 LISTSERV:

LISTSERV software designed by 'Eric Thomas' LISTSERV is arguably the best electronic conference management software of even greater importance to librarians and historians is the ability of LISTSERV to automatically archive part postings and to permit searching and retrieval of past messages. [7]

### 10. Conclusion

The most significant shift in building digital collection is greater interoperability among information systems across the country and outside country. With the technology available at an affordable cost, the libraries are initiating, single or as a group of libraries can build up digital collection and infrastructure required to access them, is a challenge to every library to deal with. Today's digital libraries are built around Internet and web technologies with electronic journals as their building blocks. The increasing popularity of internet and development in web technologies are catalyst to the concept of digital library.

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