

Digital Information Services: Challenges and Opportunities

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Abstract: The paper focuses on the Digital Information Service (DIS), its scope, opportunities and challenges. Technological and Cultural changes have a considerable effect on the digital resource collection of the DIS. Two case studies of IIT Delhi Central Library and TERI Library are described in this paper. The paper reflects on the modern trends of Digital Information Services.

Introduction: The Digital Information Services from the Library has become a favourite issue with the end users, whether they are students, researchers, faculties or Corporate World. Getting the required information in no time just with the click of a mouse has brought a revolutionary progress in the area of Library and Information Sciences of 21st century. The main focus of the Digital Information Service is to get the right information at the right time to the right users in the right format at the right place.

Uniqueness of DIS:

DIS is amongst the most complex and advanced form of information systems. It present unique challenges and opportunities because of many diverse requirements involving collaborative support, rapid access, highly interactive interfaces, digital document imaging, distributed database management, hypertext, information retrieval, enforcement of intellectual property rights, integration of multimedia information services, management of multilingual collection, information mining, electronic reference service, electronic document delivery and selective dissemination of information. As such deployment of DIS require integration of several information technologies.

Objective: The main objective of this paper is to assess the utility of the DIS, the problems encountered in providing the DIS and the opportunities available in making the service more effective with the modern tools of IT. The paper focuses on case studies of digital information services of two libraries, namely Central Library of IIT Delhi, and TERI Library.

Growth of DIS: Recent growth and development of digital libraries can broadly be grouped into three broad categories; (i) Digitization of traditional printed resources and

their integration with secondary sources of information like Medline, ISI Electronic Library etc.; (ii) Digital Library derived from the data elements generated as a byproduct in the process of printing of primary journals or major reference works. Most of the publishers of Science Technology and Medical (STM) journals have launched their digital collections consisting of electronic counter- parts of their printed journals; and (iii) New information sources that are created specially for the web imbibing frills of technological advances. The numbers and variety of resources in the last category are expected to increase as the users respond to technologically advanced products and services. The meaning of DIS is in the process of evolution as it climbs along the technological ladder. Further advances in the area of DIS would rest upon further technological developments as well as well as conceptual foundation that is being laid down presently.

Functions of Digital Information Service (DIS)

- (i) Provide access to a very large information collection(s); (ii) Support multimedia content; (iii) Network accessible; (iv) Provide user – friendly interface; (v) Unique referencing of digital objects; (vi) Enable ‘links’ representations to local/external objects (hypertext); (vii) Support advised search and retrieval; (viii) Information available for a very long time; (ix) Also supports traditional library mission of collection development, organization, access and preservation of information; (x) Support editing, publishing, annotation and integration of information; (xi) Integrate personal, group, enterprise public digital Libraries.

Advantage of DIS

- (i) Promote universal accessibility; (ii) Access to more information than is possible to physically acquire and maintain; (iii) Protecting rare books that are rapidly deteriorating due to overuse and poor storage conditions; (iv) The user can pursue them instantly; (v) The e-books and journals provide keywords, subject and various other searches; (vi) Provide multiple access and access through the campus LAN; (vii) Facility for the downloading and printing; (viii) Saving the cost and manpower required for publishing and bringing out new edition; (ix) One copy of the documents could be viewed by any number of persons simultaneously; (x) Saving space which is required for physical documents; (xi) A tool for the preservation of heritage

Managing Digital Resources

The growing acceptance of digital media has resulted in libraries *inter alia* gaining much more experience of their management. This is being manifested in several different ways. There has been an explosion in the use of CD-ROMs as publishing media for the last few years. This is driven largely by cost decrease of both CD-ROMs and CD drives. The Internet has, over the last 4-5 years, seen a rise in the number, power and maturity of search tools, mainly for the WWW. The increasing dominance of WWW, when

combined with its extensive coverage, mean that resource discovery on the Internet is now becoming easier. Many libraries have gained experience with aspects of digital resource management. Some with public access to the Internet, many with networked CD-ROMs, and others by scanning publications and managing images. The expertise gained is gradually being disseminated to the library community at large.

Challenges faced by the DIS

(i) *Protecting the intellectual property rights.* A major administrative challenge is in complying with copyright and intellectual property rights issues. The library authorities, have to discuss seriously with publishers on this aspect in order to evolve some mechanism profitable to both users, publishers as well as authors. Users may be charged for each access, downloading from servers and/or each kind of digital library collection. This would provide revenue for publishers, authors and libraries; (ii) *security aspect-* security aspect is the most pressing challenge of digital information service. Piracy of database, viral invasion, parallel satellite networking stress are some of the issues of digital libraries that are confronted as a way of routine. (iii) *Lack of Expertise-* Not too many vendor/experts are available in the country and abroad as well. Overseas vendors charge too much and are also reluctant to import techniques/technology; (iv) *Technophobe* – In general, some people do, however, fear any upcoming technology. Individuals may have several reasons for not using the new technology.

Right Management and Access Control in Digital Library

A true digital library not only requires an organized collection of online digitized contents, it also requires that the contents be accessed and distributed as widely as possible to legitimate users around the globe. Distribution does not mean just onsite access, it also means allowing access to authenticated members of the subscribing organization regardless of their physical location. Server- side software are now available that allows a server to be configured to distribute information with or without right management. Most vendors of online digital contents supports password authentication to their products. Many others like ScienceDirect, IEEE, Link Information Services, AIP support IP address authentication as well as password support. However, a few have (i.e., Proquest Direct) adopted technologies that allow secure access to vendor's server from legitimate patrons who are not on an institutional LAN. The use of CGI scripting/proxy servers allow a subscribing institution to authenticate patrons from its server and then pass them through to the vendors with the assurance that they are in fact legitimate consumers irrespective of their log-in-location.

Bandwidth problem:

Digital libraries are multimedia products incorporating structured text, sound, graphics, pictures, photographs, video clips, etc. which require intensive use of bandwidth. The developing countries, as such have restrictions of bandwidth available to them. Moreover, the “last mile problem” that every user has in every country is much more intense in

developing countries like India. Moreover, increased use of network for transferring data by more people would increase the load on network traffic. This is further compounded by the size transferred if it include full-text multimedia document. While simple text takes up only a small amount of space, pictures and graphics take up more, video and sound files are really space-hungry demanding much more space transmission time. Successful implementation of digital library would, therefore, require concerted movement to raise National Information Infrastructure (NII) in different countries for increased bandwidth, speed and accessibility to provide necessary inputs for growth and development of digital library. These high-speed transmission rates and increased bandwidth would accommodate image-rich, multimedia-based digital library of future. The combination of digital technology and national infrastructure would provide instant access to stored information that something was unthinkable just a few years ago.

Interoperability in Digital Information Services

Interoperability is a critical problem in the network environment with increase in number of diverse computer systems, software applications, information resources and users. It is particularly more important in a digital library implementation given the fact that digital conversion activities are distributed amongst libraries that held traditional print –based resources and the digitized information is to be made accessible universally. Collaboration amongst participants is, therefore necessary in order to adopt a framework for achieving suitable level of information sharing. Interoperability is ability of digital components and services to be functionally and logically interchangeable by virtue of their having been implemented in accordance with a set of well defined publicly known interfaces. In this model different services and components can communicate with each other through open interfaces, and clients can interact with them in an equivalent manner. The ultimate goal of interoperability is to create and develop components of digital library independently yet be able to call on one another efficiently and conveniently. Interoperability in digital library implementation addresses the challenges of creating a general framework for information access and integration across many domains. Digital Library created on principles of interoperability result in repositories of digital contents which may have different attributes but can be treated in the same manner due to their shared interface definition. There are several approaches to achieve interoperability in digital library implementation. Some off the common approaches are:

(i) Standardization e.g., (schema definition, data models and protocols); (ii) Distributed Object request architecture (e.g., CORBA); (iii) Remote procedure call; (iv) Mediation (e.g., gateways, wrappers); (v) Mobile Computing (e.g. Java Applets)

Preservation problems

Digital technologies present a preservation solution for the documents in the libraries with increased access to digitized documents over the electronic networks. However digital technology as well as all other associated Internet and web technologies are in a continuous flux of change. New Standards and protocols are being defined on a regular basis for file formats, compression techniques, hardware components, network interfaces, storage media and devices etc. The digital librarian should be aware of constant threat of

“techno-obsolescence” and transitory standards. Magnetic and optical discs as a physical media are reengineered to store more and more data. We are already witnessing phasing out of one of the most popular and wisely used optical storage media, i.e., CD ROMs. There is a constant threat to backward compatibility for the products that were used in the past. Digital images will have to be constantly migrated and Converted to new formats computing devices, storage media and software to ensure that valuable digital objects are not left behind in obsolete system which will eventually break down rendering data in accessible. The initial conversion of printed–text into digital objects is not only expensive; it would also necessitate diversion of manpower and resources into constant re-invention of wheels in terms of migration of digital resources.

Digital Library Infrastructure and Services (See fig 1)

Digital Information System comprises two broader components, which are as follows:

Digital Library Infrastructure: This consists of the following

Collection Infrastructure: Acquire, Create Convert and access

Access Infrastructure: Search, Browse, ISR Portals

Computing & Network Infrastructure

Digital Resource Organization: Standards, Protocols, and Access Control

Digital Library Services: This consists of the following

Modified Web-based Library Services: This contains the following

OPAC to WebPAC

CDROM to Web Databases

Manual to Digital Reference Service

Manual to Real – time Digital Reference Service

Reference Service

Manual to Electronic Document Delivery Service

New Web-based DI Services

Virtual Library Tours

Library Web sites

Library Portals

Web-based User Education

FAQ

Library Calendar

Web Forms

Bulletin Boards, Discussion Forum and Listservs

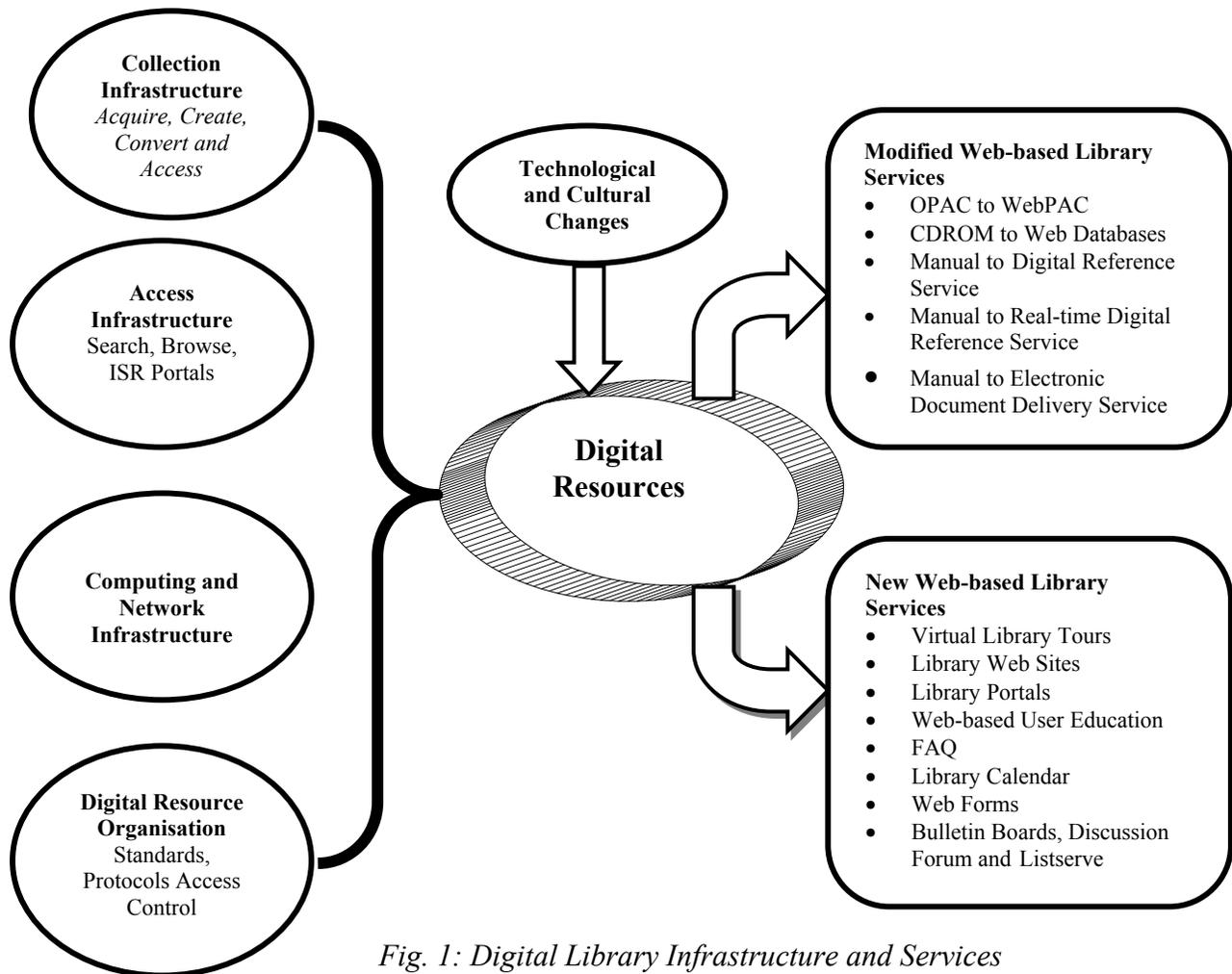


Fig. 1: Digital Library Infrastructure and Services

Digital Information Services from Central Library IIT Delhi

The Central Library of IIT Delhi provides a number of Services in digital form. They have been well appreciated by the students, researchers and faculties. The increasing commitment for building-up network-enabled digitized collections at the Central Library, IIT Delhi coincides with installation of fiber optics-based Campus –LAN connected to a 2 Mbps VSNL Radio Link enabling faster access to the Internet for the academic community of the Institute. The availability of high-speed Internet connection has led to launching of a number of sponsored and non-sponsored project for building network – enabled digitized collections within the framework of traditional library and information services at the Central Library, IIT Delhi. The Library has adopted a multi-pronged strategy to embark upon the digital world.

Access Infrastructure for Digital collections at the IIT Delhi

An effective and efficient access mechanism that allow a user to browse, search and navigate digital resources has become necessary as electronic resources of a collection grow in number and complexion. The access infrastructure for digital resource at the IIT Delhi consists of the followings:

Libsys OPAC/ WebPAC

The Online Public Access Catalogue (OPAC) of the Library is accessible not only through the Libsys Windows client but also through the Libsys WebPAC and through telnet link to the Libsys server. The Library OPAC can be used to access more than 1,30,000 bibliographic records available in the Library database. Besides bibliographic records of books available in the Library, the Library OPAC also provides information on 850 current journals subscribed in the Library along with their current issues and back volumes.

CD ROM based Search Services through a CD NET System

The CD ROM based search services were established at the Central Library, IIT Delhi in 1991. The Library acquired three CD ROM workstations and four important bibliographic databases on CDs namely, COMPENDEX Plus (1985 +), INSPEC (1990 +), METADEX (1990 +) and World Research Databases. The CD ROM networking system was hooked to the then existing 10 base T Ethernet –based campus LAN now replaced with one gigabit fast Ethernet fibre optics LAN. The CD ROM databases subscribed in the Library are available for searching throughout the Campus LAN. The CD ROM databases subscribed in the Library are mostly bibliographic in nature.

Web sites for specialized collections

Separate dedicated web-based interface have been developed to provide access to collections digitized in-house. The scanned images of fragile, deteriorating and old volumes of journals are accessible through such an interface with facility to browse and

search the collection. Separate dedicated web-based interfaces have been developed to provide access to collections digitized in – house. The scanned images of fragile, deteriorating and old volumes of journals are accessible through such an interface with facility to browse and search the collections. Separate dedicated site has also been developed for the “ **Directory of Online Interactive Courseware in Information Technology**” with fairly sophisticated browse and search interfaces.

Research Articles in ERL Linked to Full-text through Silver Linker

Bibliographic records of research articles indexed in the ERL databases are hot-linked to their full-texts at the publisher’s site using Silver Linker software from the Silver Platter. Since the Library subscribes to more than 1,450 full-text journals, this interface is very useful for the students, researchers and faculty at the IIT Delhi.

Online Access to Journals Subscribed in Print

The Serials Database developed in-house using Micro CDS/ISIS package of UNESCO and ported to WWW/ISIS contains around 16,00 records of serials that include 850 current serials on subscription and 750 discontinued from subscription since 1990. The database provides URL for each journal. A user can access full-text of journals for which the license agreement has been signed, for others, he would be able to see at least content pages and even abstracts in some cases.

Home Page and the Subject Gateways for Web Resources

The Library maintains a home page (**See figure 2**), which serves as a single integrated interface designed to provide access to the following computer-based services available to the academic community of the Institute:

- (ii) a gist of all activities, infrastructure and services of the Library. The page also provides floor plans and library layout design through map; (ii) Web-based access to the Library’s OPAC; (iii) Access to the Developing Library Network (DELNET) Databases and Services; (iv) Access to the CD Networking system available on the intranet server; (v) Access to databases on ERL server; (vi) Access to bibliographic databases developed in-house; (vii) Access to the scanned images of old, fragile and deteriorating volumes of journals scanned in-house described above; and (viii) Subject portal to serve as a structured and organized guide to the electronic resources available on the Internet. The electronic resources available on the Internet are kept updated regularly for new and outdated links. In all, the Central Library Home Page provides more than 2500 links to electronic resources on the Web. The Library’s Home Page can be accessed both on Internet and Intranet at the following site:

<http://10.116.2.1/iit/index1.html> (Intranet)

<http://www.iitd.ernet.in/library> (Internet)



Figure 2: Home page of Central Library, IIT Delhi

Digital Information Services at TERI

TERI has been able to establish a knowledge management system. This incorporates the electronic library. TERI –Information resources may be accessed at various accessed layers. TERI has specialized Networks and Information Centres of National, Regional and International Importance, e.g., Mycorrhiza Network; SAFIR (South Asian Forum For Infrastructure Regulation), GIS (Geographic Information System). It is also providing e-mail based Newsflash service to various corporate bodies in various electronic forms. These Newsflash service is computer generated HTML (Hyper Text Markup Language) files with hyperlinks to the news-items on the Internet (See **fig.3**). Online access to in-house users is provided through TERInet, the Intranet facility of TERI to library catalogue (OPAC) and electronic collection that includes bibliographic and statistical databases, CD-ROM databases, newsclipping archives, and on-line journals being subscribed by the TERI library. Online DIS includes daily news highlights; alert services on various aspects and automated current content service from different publishers. The bibliographical databases comprising bibliographical details of abstracts being covered in the secondary Journals being published from TERI such as TIDE (Teri Information Digest on Energy), TIMES (Teri Information monitor on Environmental Science) etc are available in electronic form for in-house staff under TERInet.



Figure 3: Home Page of Information Technology and Services Division of TERI

Virtual electronic Library: TERI has developed the virtual Electronic collection in the areas of Energy, Biomass Energy Technology, Solar Energy, Policy, Economy, Environment (Pollution, climate change, Global warming, Natural resources); Plant Bioscience (Microbiology, Biotechnology, Mycorrhiza), Biodiversity, forestry, Regulatory Issues (related to Telecommunications, Energy, water, Transport, Insurance etc); Urban Transport

SAFIR: It is one of the Electronic Library projects of TERI being funded by the World Bank. There is a virtual library in the area of regulation covering Publications, Newsletter, Databases, other useful links in the area of Environment, Power, Telecom, Transport, Water, Oil and gas etc, available for anybody to access.

Directory of Internet Journals: TERI is subscribing to more than 700 national and international journals. To provide access to online journals- a directory of journals website was compiled so that in-house staff could access the Internet journals at the earliest. This helped in accessing the journals almost after the publication of a particular journal on the Internet by the publisher or a minimum of three months in advance of the hardcopy of the journals received by the library. To appraise researchers about the latest

launch of a new issue of any journal the staff were aided/supplemented with Contents **Page Alert Service (CPAS)** from the journal publisher through the TERI Electronic Library. This CPA Service is provided to the particular group of persons or an individual depending upon their profile for information requirement. These content pages are web-enabled with hyperlinks to the service.

Apart from that many of the serial publications are freely accessible on the Internet was of use to the staff. Two directories one according to the title alphabetically and the other according to the Subject alphabetically were compiled.

CD-ROM collections accessible through TERI net or Intranet: The browser friendly CD-ROMs are mirrored into the CD-ROM mirror server, so that it becomes easily accessible just by the click onto the linkages. Application based CD-ROMs that is not browser friendly may be accessed through TERInet from where the applications run easily.

In-house bibliographic/news clippings / external library membership / reference or referral service databases: TERI is managing around 7 in-house databases on various subjects and in various ranges in CDS/ISIS. The web Interface- the WWWISIS has been implemented. These databases are linked and are accessible from the opening page of the Electronic library page.

Library Catalogue: TERI is using Libsys software for Library management. This is accessible through TERInet. However, for easy access, again the database has been converted to CDS/ISIS for WWWISIS interface.

Conclusion:

Digital Information Services is still in the evolutionary stages. With the application of the latest IT technologies the service becomes highly reliable. The paper studies in detail the problems and opportunities facing the DIS. The two case studies described in this paper signifies the importance of DIS in the modern era, where getting the relevant information in no time at one's desktop has become the need of the hour. The user satisfaction and the feedback received from the user to improve the DIS has been found to be very important in providing improved DIS.

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