DIGITAL LIBRARY INITIATIVES AND ISSUES IN INDIA : EFFORTS ON SCHOLARLY KNOWLEDGE MANAGEMENT

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DIGITAL LIBRARY INITIATIVES AND ISSUES IN INDIA : EFFORTS ON SCHOLARLY KNOWLEDGE MANAGEMENT

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ABSTRACT

The academic and research libraries across the globe are striving hard to harness technology for achieving scholarly knowledge management, which is fast proliferating, distributed and scattered. Knowledge Management leveraging on information science (IS) and information technology (IT) is the recent trend and strategy seen in the advanced academic and corporate environment. Building world standard digital libraries, as powerhouses of knowledge, that are able to address the complex issues put forth by the technology push as well as the demand pull are fast catching up worldwide attention. Particularly, in India, Open Digital Library (ODL) initiatives are picking up unprecedented Institutional as well as professional group attention owing to a variety of excellent features offered by these DLs. During the past five years India has been responding to this global trend quite proactively and positively. One of the major reasons being, presently, more than 70 percentage of world's scholarly literature are born digital. Naturally when they are acquired by the libraries for patron's use they will have to be acquired in the digital form. A digital library is a collection of information that is both electronic (born digital) as well as digitized and it gives us powers we never had with traditional libraries. Digital libraries have attracted almost all the developed and developing countries due to its multifaceted features and the opportunities it extend to the information providers and information seekers. It offers new levels of access to broader audiences of users and new opportunities for library and information science field to advance both theory and practice. Creating effective digital libraries and providing cutting edge digital information services poses serious challenges for existing and future technologies. They include collection building, infrastructure, acceptability, access restrictions, readability, standardization, authentication, preservation, copyright, policy and strategic issues, user interface, funding etc. Yet the advantages outweigh most of the bottlenecks and hardships and therefore the importance of digital libraries have been recognized by all nations of the world. India has recognized the power of digital libraries and lots of initiatives are on the move for developing state-of-art digital libraries.

This paper discusses the various problems, challenges and issues involved in the design and development of world standard digital libraries, focused on the Indian context. It also highlights the initiatives taken by various Indian libraries / organizations towards the development of digital libraries.

Introduction

Knowledge Management leveraging on information science (IS) and information technology (IT) is the recent trend and strategy seen in the advanced academic and corporate environment. Libraries, especially academic and research libraries, are perceived to be knowledge repositories of scholarly content. Scholarly communication is a complex mechanism acted up on by many stakeholders. Scholarly communication refers to the formal and informal processes by which the

research and scholarship of researchers, faculty and independent scholars (freelance researchers) are created, evaluated, edited, formatted, distributed, organized, made accessible, archived, used, and transformed. Publishing is the formal system whose key players include researchers, publishers (including scholarly societies), and libraries (1).

Over the past two decades dramatic changes have fundamentally reshaped the entire system of scholarly communication eco system. Recent advancements in technology and the advent of computers, Internet and communication technologies have revolutionised the scholarly communication scenario drastically. The first and foremost among these changes is the phenomenal increase in the body of published knowledge.

Data, Information and Knowledge

The role of pertinent and contextually relevant scholarly information in an academic or research environment is a complex issue which calls for an exclusive paper itself. Generally information involves data in context. Information is not separate from its context because the interpretation of incoming data streams is dependent not only on the perception of the receiver, but in the context of the moment. Information that is relevant becomes actionable knowledge during the duration of the specific context. This is the reasoning behind the design of specific subcomponents and companion-components to be introduced shortly. For a learning organization in particular, scholarly information is the critical piece that transforms fact into knowledge.

In the current practical setting the recorded knowledge reaches libraries by way of established scholarly publication types both in print as well as digital formats. There is an amazing penetration of scholarly digital information through a variety of forms such as books (published as such or issued as accompaniment), journals, portals, vortals, reports, CBTs, WBTs, cases, databases etc. To make matters more complex the vast array of different file formats, standards and platforms in which documents are published, pose a multiplicity of threats to the information professional who is supposed to be the custodian and service provider of these information products once it has found its way into the library.

Digital Libraries

Digital Libraries (DL) are now emerging as a crucial component of global information infrastructure, adopting the latest information and communication technology. Digital Libraries are networked collections of digital texts, documents, images, sounds, data, software, and many more that are the core of today's Internet and tomorrow's universally accessible digital repositories of all human knowledge. According to the Digital Library Federation (DLF, USA - http://www.dlf.org), "Digital libraries are 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 and economically available for use by a defined community or set of communities".

In India currently the concept 'Digital Library' is being practiced by and large loosely or even confused by many information systems. It is therefore imperative that the concept is properly understood so that there is no ambiguity while we progress with the work of designing or developing a digital library which is fully justified in the technical sense of the word. It is important that embarking on a digital library project is something which will take away substantial amount of time, energy, manpower and of course the hard earned money being pumped into it – be it for system development or towards development and maintenance of the collection, in a meaningful way. There is consensus all over that there exists a very large quantum of digital information,

scholarly as well as trade, which are scattered and distributed throughout the Net and also being stored in numerous other databases and repositories spread across the world. Also there is an unprecedented technology support and availability of infrastructure for digital libraries.

Features

Digital libraries have attracted almost all the developed and developing countries due to its features and the opportunities it extend to the information providers and information seekers. The digital library has the information in the electronic form and electronic media facilitates the access to information available in digital form at different places. It offers new levels of access to broader audiences of users and new opportunities for library and information science field to advance both theory and practice. They contain information collections predominantly in digital or electronic form. Electronic publications have some special problems of management as compared to printed document. They include infrastructure, acceptability, access restrictions, readability, standardization, authentication, preservation, copyright, user interface etc. But still the advantages are more and therefore the importance of digital libraries have been recognized by all nations of the world. India has indeed recognized the importance of digital libraries and lots of initiatives have been taken by various libraries / institutes / organizations.

Digital libraries do enable the creation of local content, strengthen the mechanisms and capacity of the library's information systems and services. They increase the portability, efficiency of access, flexibility, availability and preservation of content. Digital Libraries can help move the nation towards realizing the enormously powerful vision of 'anytime, anywhere' access to the best and the latest of human thought and culture, so that no classroom, individual or a society is isolated from knowledge resources. Digital library brings the library to the user, overcoming all geographical barriers.

DL Software

Undoubtedly it is essential to have a robust and flexible digital collections management and presentation software for creating and delivering digital collections. The preservation of digital objects is currently intimately tied to software that presents those objects. Complete preservation of complex digital objects, especially, is likely to require preservation of the software needed to use those objects. (2). The complexity of the situation is that digital library technologies and contents are not static. Continual evolution and investment are required to maintain the digital library. Commercial digital library products are comprehensive and extensible enough to support this evolution, but in many cases they are beyond the reach of most of the libraries in India. Some of the popular commercial DL software in the Indian libraries are VTLS (http://www.vtls.com) from the international market and ACADO (http://www.transversalnet.com/acado/index.htm**)** as an Indian initiative. The latter is definitely less costlier when compared but still striving its best to get a critical mass of users. The whole lot of associated issues include initial purchase fee, licensing fee, upgrade fee, annual maintenance contacts (AMCs) and so on. The best available choice for the librarian now is to turn to an Open Source Software (OSS). OSS has grown tremendously in scope and popularity over the last several years, and is now in widespread use. The growth of OSS has gained the attention of research librarians and created new opportunities for libraries (3). OSS is close to our hearts primarily for their free (or almost free) availability and the broad rights it awards to the consumer. According to Stallman and others at OSS, 'Free Software' uses the 'free' from 'freedom', not the one from 'free beer'
(http://www.opensource.org/docs/definition_plain.html).

OSS is software for which the source code is available to the end-user. The source code can be modified by the end-user. The licensing conditions are intended to facilitate continued re-use and wide availability of the software in both commercial and non-commercial contexts. The cost of acquisition to the end-user is often minimal. According to the proponents of OSS, 'Open source is a development methodology; free software is a social movement'. There are number of other notable features to OSS. Firstly, it has no secrets and the innards are available for anyone to inspect. It is not privately controlled and hence likely to promote open rather than proprietary formats. It is typically maintained by communities rather than corporations and hence bug fixes and enhancement are often frequent and free. It is usually distributed free of charge (developers make their money from support, training, and specialist add-ons; not marketing). It is also essential to clear up some of the misunderstandings about OSS. Open source software may or may not cost money. The cost of ownership often bears little relation to the cost of acquiring a piece of software. 'Public domain' is something different. Open source software has a copyright holder and conditions of legal use. Open source software does not mandate exclusivity. One can use open source programs under Windows. Also one should not choose software solely on the basis of open source. Interoperability and open standards for data are equally important.

For the library fraternity there are other set of reasons too for preferring OSS over commercial software : preservation, privacy and auditing, community resources, and open standards. Since commercial software is usually distributed only as a binary that will run only on a single hardware platform (and often only under a single version of a particular operating system) commercial software is very difficult to preserve over the long run without developing hardware emulation (and possibly OS 'emulation', as well). OSS, in contrast, can often be recompiled, or at least ported, to new hardware and operating systems. In order to get a picture about the availability of OSS for digital library applicartions, it is encouraged to visit the directories of OSS projects, such as GNU (http://www.gnu.org/) and Sourceforge (http://www.sourceforge.net/) which list over fifty-thousand projects, and the numbers continue to grow.

DL Objectives and Workflow

The primary objective of a digital library is to enhance the digital collection in a substantial way, by strategically sourcing digital materials, conforming to copyright permissions, in all possible standards/formats so that scalability and flexibility is guaranteed for the future and advanced information services are assured to the user community right from beginning. The digital library should also be able to integrate and aggregate the existing collections and services mentioned above with an outstanding client interface. This implies that the digital library system should also have a strong collection interface capable of embracing almost all the popular digital standards and formats and software platforms, in line with the underlying digital library technologies in vogue. This is crucial in the case of multimedia integration, which is again important as we planned to also host a digital audio and video library as part of the core library collection. Emphasis should also be given to maximise the efficiency and effectiveness of the information access and retrieval capabilities of the system by deploying cutting edge Resource Description Framework (RDF) standards for metadata and its encoding. The Internet also possesses, in addition to its mammoth proprietary information base, an invaluable wealth and a vast collection of public domain information products such as databases, books, journals, theses, technical reports, cases, standards, newsletters etc., scattered and distributed across the world. This treasure should also be explored to its maximum for collection building, based on the source and quality.

Standard workflow patterns are to be identified for the system which include 'content selection', 'content acquisition', 'content publishing', 'content indexing and storage', and 'content accessing

and delivery'. The system should also concern about such related issues, viz., preservation, usage monitoring, access management, interoperability, administration and management etc. It was proposed to value add the digital catalogue of the library (OPAC), which acts as a stepping stone for effective information discovery in the library, by supplementing the bibliographic information with the scanned picture (.gif/.jpg) of the front cover and the contents page, so that users will be able to evaluate the book for further consultation while browsing the catalogue, right from their desktops. Dublin Core standards are the desired metadata format and XML, the desired encoding scheme (4).

Selection of the DL Software

The software selection based on set parameters is an uphill task, as the technology itself was still emerging only. In general, what is desirable is a system that is flexible enough to fit the current digital information system as above and to accommodate future migration. It should be robust in technical architecture as well as the content architecture. The system should address all major digital library related issues such as 'design criteria', 'collection building', 'content organisation', 'access', 'evaluation', 'policy and legal issues' including 'intellectual property rights'. That the system should be in a position to embrace almost all predominant and emerging digital object formats and capable of supporting the standard library technology platforms, should be the major focus. It should provide two important user interfaces: a public user interface for presentation and a metadata creation interface for administration. The system should also provide a powerful search engine and the interface should be easy to navigate and there should be provision for customisation.

There are many digital library softwares available, proprietary as well as open source, and most of them conform to international standards. As mentioned earlier, VTLS and ACADO are the commercial ones available and popular in the Indian market. Some of the popular Open Source Softwares for digital libraries, which are in use internationally, are 'DSpace', 'Dienst', 'Eprints', 'Fedora', 'Greenstone' etc. For want of control and clarity, Greentone, EPrints and DSpace are discussed in this paper.

Greenstone

The Greenstone (http://www.greenstone.org) Digital Library Software (GSDL) is a top of the line and internationally renowned Open Source Software system for developing digital libraries, promoted by the New Zealand Digital Library project research group at the University of Waikato, headed by Dr. Ian H. Witten, and is sponsored by the UNESCO. The software is issued under the terms of GNU General Public License. Greenstone provides a way of building, maintaining and distributing digital library collections, opening up new possibilities for organizing information and making it available over the Internet or on CD-ROM. One of the pioneering and laudable efforts of Greenstone is its commitment to lower the bar for construction of practical digital libraries, yet at the same time leave a great deal of flexibility in the hands of the user. Greenstone is being used by lot of libraries and institutions across the world and the feedback is encouraging. Couple of promotional articles appeared in D-Lib Magazine by the Greenstone team also were strong indicators for their continued interest and commitment to the software. Another word of inspiration is of Ian Witten's team itself, that 'we should now stop talking about digital libraries and start developing them'. Fig. 1 below shows the digital library site set up at IIM Kozhikode. The site is available at 'http://intranet.iimk.ac.in/cgi-bin/library'. Fig. 2 shows the system architecture of the IIMK digital library.

Fig. 1. IIMK Digital Library Home Page

User Interface

Search

Suggested Term

Results

Browse

Textual Knowledge Source

Image/Audio/Visual Knowledge Source

Dublin Core Metadata

HTML Tagging

Greenstone Digital Library Software

Structured XML Metadata

E-Books

E-Journals

Digitized Images/Audio/Videos

Data in Greenstone Archival Format (XML)

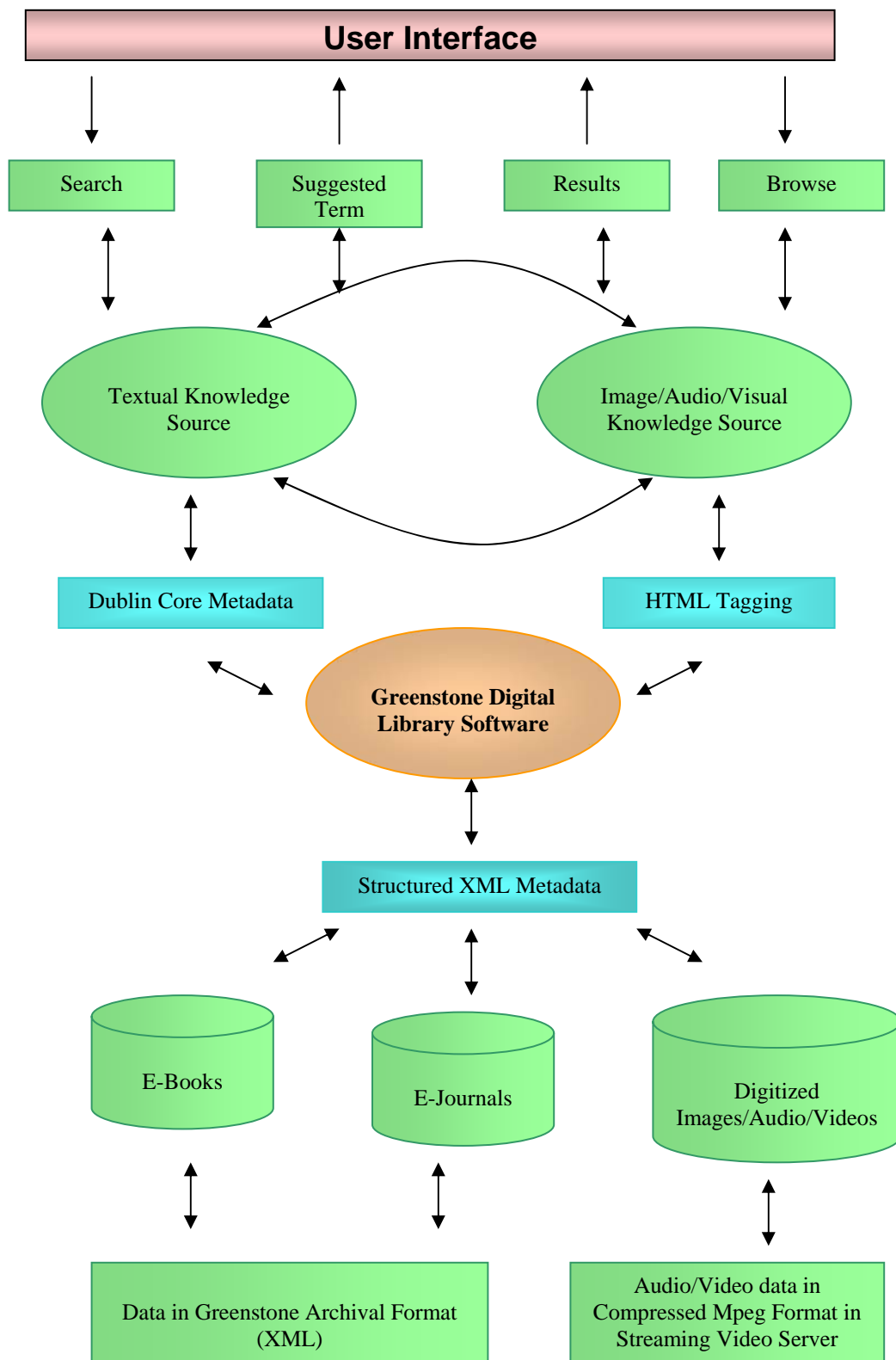Audio/Video data in Compressed Mpeg Format in Streaming Video Server

Fig. 2. System Architecture of IIMK Digital Library

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Institutional Repository (IR) Softwares for DL applications

The current trend is to install, configure and customize softwares that are capable of performing as digital library as well as institutional repository functions.

An institutional repository, generally termed as E-prints archive, is a digital archive of the research output created by the scientists, faculty, research staff, and students of an institution and accessible over the Internet to end-users both within and outside of the institution, with few if any barriers to access. As a facility it consists of hardware, software and procedures to capture, organize, archive, disseminate and manage digital research resources of the institution. IRs provide a simple, web-based mechanism to researchers to deposit ('self-archive') and access their research publications. Further, by using the Open Archives Initiative (OAI) interoperability protocol, content in these repositories can be easily shared at metadata level to establish a single-point cross-indexing and search service at national level. The same protocol enables integration of content in these repositories with worldwide cross-archive search services.

As more and more research and educational material is 'born digital', institutions and organizations are increasingly realizing the need for a stable place in which such material may be stored and accessed long-term. Examples to this are EPrints software developed by the Southampton University, U.K. and the DSpace software of MIT, USA.

EPrints

The GNU EPrints is a free software which creates online archives. The default configuration is a repository of the research output of an academic institution. An EPrint archive can be adapted for many more purposes. It has been developed at the University of Southampton in relation to a variety of projects. The latest recommended version is 'eprints-2.3.11'. In India NCSI has been conducting workshops and training programmes for installing and customizing EPrints software. Details of the recently conducted programme is available at 'http://www.ncsi.iisc.ernet.in/indest-ncsi-ir/'. NCSI will provide a shell-script written by them for easy installation of EPrints on request. Fig. 3 below shows the system architecture of the Institutional Repository of IIM Kozhikode, and Fig.4 shows the archive's interface. The archive is available at 'http://eprints.iimk.ac.in'.

DSpace

DSpace (http://www.dspace.org) is a digital repository platform jointly developed by Hewlett-Packard and MIT Libraries collaborating over two years. DSpace provides the basic functionality required to operate an institutional digital repository, and is intended to serve as a base for future development to address long term preservation and access issues. On November 2002, the system was launched as a live service hosted by MIT Libraries, and the source code made publicly available according to the terms of the BSD open source license, with the intention of encouraging the formation of an open source community around DSpace (5). Initial developments in this area have been very promising. The software download, system documentation, installation, configuration and customization guide is available at 'http://dspace.org/technology/system-docs/install.html'.
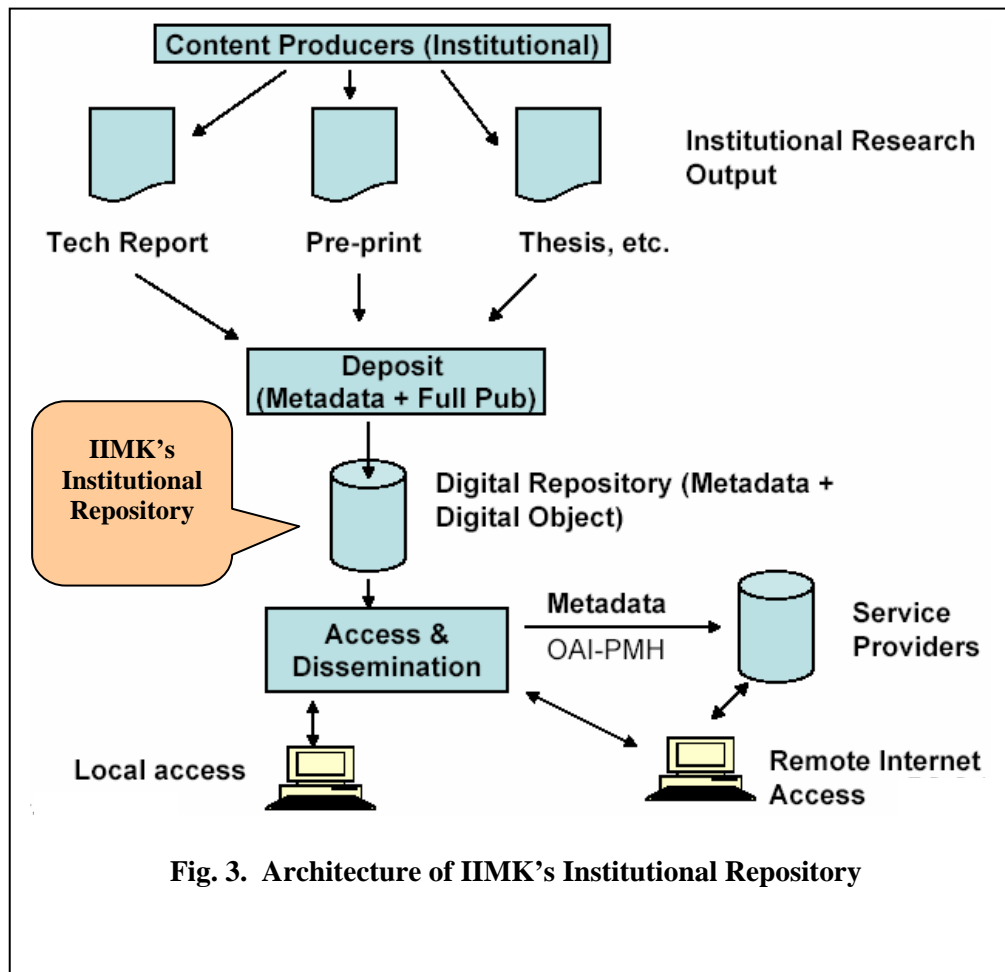
Fig. 3. Architecture of IIMK's Institutional Repository

Fig. 4. Institutional Repository Home Page of IIMK

Digital library initiatives in India

During the past five years, India has seen several Digital Library initiatives at the institutional, organizational and at national levels. Some of them are quite successful while others are making significant progress.

Some of the major initiatives on Digital Libraries in India are furnished below:

- 'Archives of Indian Labour' at the V.V. Giri Institute of Labour (http://www.indialabourarchives.org/sources/ jnu.htm)
- Indian Institute of Science NCSI (http://vidya-mapak.ncsi.iisc.ernet.in/cgi-bin/library)
- Indian Institute of Management Kozhikode (http://intranet.iimk.ac.in/cgi-bin/library)
- Search Digital Library SDL at DRTC Bangalore (https://drtc.isibang.ac.in/index.jsp)
- Nalanda Digital library, National Institute of Technology (NIT) Calicut (http://www.nalanda.nitc.ac.in)
- Vidyanidhi Project (http://www.vidyanidhi.org.in)
- Million Book Universal Digital library Project - Carnegie Mellon - IISc - ERNET (http://www.dli.ernet.in)
- Indira Gandhi Centre for the ARTS (IGNCA Digital Library) -(http://ignca.nic.in)
- INDEST, Ministry of HRD, GOI (http://paniit.iitd.ac.in/indest)
- National Tuberculosis Institute (NTI), Bangalore (http://ntiindia.kar.nic.in/)
- Rajiv Gandhi University of Health Sciences, Karnataka (RGUHS) http://www.rguhs.ac.in/dl/index.html
- Traditional Knowledge Digital Library (TKDL) – (http://203.200.90.6/tkdl/langdefault/common/home.asp)
- Indian School of Business (http://www.isb.edu/lrc/index.html)
- Indian Institute of Technology, Kharagpur (http://www.library.iitkgp.ernet.in/usr/elib/digital.htm)
- Indian Institute of Technology, Mumbai (http://www.library.iitb.ac.in/ ~mnj/gsdl/cgi-bin/library)
- IITMK Trivandrum (http://www.iiitmk.ac.in/iiitmk/digitallibrary.htm)
- National Chemical Laboratory (NCL, CSIR) – Digital Repository – (http://dspace.ncl.res.in)
- University of Hyderabad (http://202.41.85.234:8000/cgi-bin/gw_42_ 6/chameleon

Digital library development issues in India

There are umpteen number of problems the Digital Library development teams face in India while they embark on the digital library development as well as during the progress phase. Some of the prominent and predominant among them include the following :

i. Lack of proper Information & Communication Technology (ICT) Infrastructure

Digital Libraries demand cutting edge IT and Communication infrastructure such as:

a) High end and powerful Servers; Structured LAN with Broadband Intranet facilities, ideally optical fibre based Gigabit networks;
b) Required number of Workstations capable of providing online information services, computing and multimedia applications;

c) Internet connectivity with sufficient bandwidth, capable of meeting the informational and computational requirement of the user community;

There are many more related facilities / services which are highly essential in an ideal digital library environment. It is observed that the ICT infrastructure in most of the Institutions / Organizations, barring exceptions, are not up to the desired level so as to run advanced digital library services to the optimum level.

ii. Lack of Proper Planning and Integration of Information Resources

Presently the library acquisitions in India are either paper based and electronic. In most of the libraries, paper based documents outnumber the electronic subscriptions and acquisitions. Some of the libraries need retro-conversion and digitization of library holdings too. Literature on related studies show that there is a severe lapse on the libraries with regard to proper planning of their information resources which are conducive for developing digital libraries. Also, the electronic resources penetrate to the libraries in a multiplicity of complex formats and with different access terms and conditions. These information resources are scattered and distributed across a wide variety of publication types and a vast number of publishers. There is a dire need for proper planning and a meticulously framed content integration model which is achieved and implemented through world standard digital library technologies.

iii. Rigidity in the publishers' policies and data formats

Having successfully installed and configured a digital library does not qualify a library to automatically populate all its digital collection into the digital library. One has to obtain publisher's consent and copyright permissions for the same. Digital library softwares usually accept and process all popular and standard digital formats such as HTML, Word, RTF, PPT, or PDF. Most of the publishers put their materials in their own proprietary e-book reader formats, from which the text extraction becomes almost impossible. A vast majority of the scholarly content rests in journal literature and due to copyright issues they cannot be easily (almost impossible) find its way into the local repositories of the digital library.

iv. Lack of ICT Strategies and Policies

A vast majority of the libraries in India do not have laid down policies on ICT panning and strategies to meet the challenges posed by the technology push, the information overload, as well as the demand pull from the users.

v. Lack of Technical Skills

The Human Resources available in the libraries need time-to-time professional enrichment inputs and rigorous training on the latest technologies which are playing around in the new information environment. The kind of training programmes being imparted in India at the moment are not able to meet the demand in terms of quantity as well as quality.

vi. Management Support

For the provision of world class information systems, resources and services the libraries need the wholehearted support from the respective management. Institutional support in terms of proper funding, human resources and IT skills enrichment are prerequisites for the development and maintenance of state-of-art digital library systems and services.

There are many more pressing problems being faced by the libraries in India in its pursuit of building digital libraries.

vii. Copyright / IPR Issues

Issues of copyright, intellectual property, and fair use concerns are posing unprecedented array of problems to the libraries and librarians are struggling to cope with all these related issues in the new digital information environment.

Conclusion

This paper discussed the current trends in the recorded and explicit scholarly knowledge finding its way into our institutions and some of the proven methods of their efficient handling, effective access and management. Any forward looking enterprise or institution of these days need to be open to the changing information environment. Timely and strategically framed organizational transformation is a prerequisite for survival alone. For a learning organization in particular, scholarly information is the critical piece that transforms fact into knowledge. In the current practical institutional setting the recorded knowledge reaches our libraries by way of established scholarly publication types both in print as well as digital formats. There is an amazing penetration of scholarly digital information through a variety of forms and formats, standards and platforms, in which documents are published, which pose a multiplicity of threats to the information professional who is supposed to be the custodian and service provider of these information products. From the user perspective, what is important is the seamless access and uninterrupted services offered by the information system, no matter what kind of format and platform in which these information rests, whether sourced from internal repositories or from outside. It is heartening to note that Greenstone, DSpace and EPrint installations are picking up quite fast in India, and institutions like DRTC, INFLIBNET, NCSI, IIT's, IIMK and many others are giving wide popularity and training opportunities on these softwares.

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