

# Feature Article : Digital Library Initiative at the INFLIBNET Centre, Ahmedabad

The author of the article, Jagdish Arora, Director of the INFLIBNET Centre, highlights digital library-related activities and services initiated by the INFLIBNET Centre for providing effective and efficient information support to the higher education community in India. Major digital library-related initiatives taken-up by the INFLIBNET Centre include: i) Extending access to digital libraries owned by commercial publishers, scholarly societies and university presses to its member universities and colleges through consortia initiatives, namely UGC-INFONET Digital Library Consortium and N-LIST; ii) Setting-up of open access digital repositories, namely Shodhganga for electronic theses and dissertations, Shodhsagar for research articles and other scholarly content published by the researchers and faculty in universities, IR@INFLIBNET for e-prints of articles published by scientists and staff and papers published in INFLIBNET conference proceedings; and iii) Open Journal Access System (OJAS) for publishing open access journals. Moreover, the Centre is in the process of implementing Shibboleth-based access management system that would effectively liberate access to e-resources from the confines of the university campuses and allow faculty and researchers to access desired e-resources from comfort of their homes and while travelling, which, in turn, would boost the usage of e-resources. The Centre is in the process of launching Info-portal, to serve as a comprehensive information gateway to Indian scholarly content using software tool developed in-house. Moreover, e-Education, a Web-based interface to the CEC Video Database consisting of 15,000 bibliographical records and 1,000 LORs of educational video programmes produced by the CEC and its 18 EMMRCs, has also been launched recently.

## Introduction

The Information and Library Network (INFLIBNET) Centre (INFLIBNET, 2010a) was established in May 1996 as an independent, autonomous Inter-University Centre (IUC) of the University Grants Commission (UGC). Major activities and services of the Centre include automation of academic libraries and information centres, creation of union databases of resources available in academic libraries, promote resource sharing among academic libraries, promote information access and transfer, support scholarship, learning and academic pursuits. The Centre acts as a nodal agency for networking of libraries and information centres in universities, institutions of higher learning and R & D institutions in India with an aim to promote scholarly communication.

The INFLIBNET Centre has used multi-pronged approach to build-up its network-based digitized collections and organized

them into digital libraries with an aim to offer seamless access to scholarly content for its user community. Besides, acquiring and buying access to digital libraries from scholarly societies, university presses, commercial publishers and aggregators for its member libraries through consortia approach, in-house digital collections are being built-up through institutional repositories and open access journals. The article elaborates on the following digital library-related initiatives that can broadly be grouped into the following six categories:

- i) **Buying Access to Digital Libraries through Consortium Approach:** Two initiatives in this category include a) UGC-INFONET Digital Library Consortium; b) National Library and Information Services Infrastructure for Scholarly Content (N-LIST). These two initiatives provide access to scholarly e-resources to universities and colleges in India;
- ii) **Open Access Initiatives:** Four initiatives in this category includes i) Shodhganga: a reservoir of Indian Theses and Dissertations; ii) Open Journals Access System (OJAS): an open access journal publishing platform offered by the INFLIBNET Centre to academic community in India; iii) Shodhsagar: A digital repository of research articles published by faculty and researchers in Indian universities; iv) IR@INFLIBNET: Institutional Repository of the INFLIBNET Centre;
- iii) **Shibboleth-based Access Management System:** Provides off-campus access to subscribed e-resources to users in colleges and universities;
- iv) **Info-Portal:** The Info-Portal is designed and developed to serve as a comprehensive gateway to all Indian scholarly content; and
- v) **Search Interface for CEC Video Database:** The Web-based search interface to the CEC Video Database



consisting of 15,000 bibliographical records and 1,000 LORs of educational video programmes produced by the CEC and its 18 EMMRCs. The Lucene-based search interface is designed to facilitate users to interact with CEC Video Database, browse, search and retrieve records from it.

The initiatives mentioned above are described below in details.

### **Buying Access to Digital Libraries through Consortium Approach**

The INFLIBNET Centre has set-up two separate consortia, namely UGC-Infonet Digital Library Consortium and N-LIST to extend access to e-resources to universities and colleges, respectively. Two separate consortia were established not only to cater to the diverse needs of two sets of institutions, namely universities and colleges, but also to satisfy the requirements of different funding sources and economic models. A brief description of the two consortia is given below.

#### **1. UGC-Infonet Digital Library Consortium and its Associate Membership Programme (<http://www.inflibnet.ac.in/econ/>)**

The UGC-Infonet Digital Library Consortium (INFLIBNET, 2010b and Arora and Trivedi, 2010a) was launched by Dr. A.P. J. Abdul Kalam, the then President of India during December 2003. The Consortium provides current as well as archival access to more than 7,500 core and peer-reviewed electronic journals from 20 publishers including university presses, scholarly societies, commercial publishers and aggregators in different disciplines. Besides, Consortium also subscribes to 11 bibliographic and factual databases in different disciplines. The programme has been implemented in a phased manner. In the first phase that began in 2004, access to e-resources was provided to 50 universities who had Internet connectivity under the UGC-Infonet Connectivity programme. In the second phase, 50 more universities were added to the programme in the year 2005 as additional universities got Internet connectivity through UGC-INFONET programme. So far 172 universities that come under the purview of UGC have been provided differential access to subscribed e-resources. These e-resources cover almost all subject disciplines including arts, humanities, social sciences, physical sciences, chemical sciences, life sciences, computer sciences, management, mathematics and statistics, etc. Two new resources, namely Elsevier's Science Direct and Wiley InterScience journals were added from 2011 onwards on demand of user's community.

Success of UGC-Infonet Digital Library Consortium in the universities led to the demand for extension of the Consortium resources to the universities that are not under the purview of UGC. The Centre has initiated its Associate Membership Programme in 2009 with an aim to extend access to e-resources subscribed by the Consortium to private universities and other research institutions. Under the scheme, private universities and other research institutions can enroll themselves as "Associate Member" of the Consortium and subscribe to resources of their choice available through the Consortium. The rates of subscription to e-resources are same as applicable to the Consortium for its core members. Associate members are charged a token amount of Rs. 5,000.00 as annual membership. As on 1st December 2011, 97 private universities and other institutions have enrolled themselves as associate members of the UGC-Infonet Digital Library Consortium and are availing access to different e-resources on payment basis.

#### **2. Resources Subscribed Under the UGC-Infonet Digital Library Consortium and their Access to the Member Universities**

The Consortium subscribes to 7,500 electronic journals and 10 bibliographic and factual databases from scholarly societies, university presses, commercial publishers and aggregators. While all full-text resources subscribed by the Consortium contain electronic journals, bibliographic databases contain abstract of articles published in journals, conference proceedings or chapters in books along with links to the full-text e-resources. Details of resources subscribed and accessible to the universities under the UGC-Infonet Digital Library Consortium are given in Table 1. Phase I in the last columns stands for first fifty universities that were given the benefit of access to e-resources in 2004, Phase II stands for next fifty universities that were included in the Consortium in the year 2005. Remaining universities were included in subsequent years from 2006 to 2011 and are offered / being offered differential access to e-resources depending upon their requirements.

Access to electronic resources is IP-enabled for the member universities. Users in member universities do not require "Login ID and Password" to access resources made accessible to his / her university, instead, the resources are accessible to them anywhere on their respective campus networks. Currently the Consortium is working on Shibboleth-based access management technology with an aim to provide off-campus access to e-resources to day-scholars as well as to the faculty from their homes or when they are traveling.



Electronic Resources Subscribed by the UGC-INFONET Digital Library Consortium					
Sl. No.	Electronic Resources	URL	No. of Jrnls.	No. of Univ.	Phase
<b>Full-text Resources</b>					
1.	ACS	<a href="http://www.pubs.acs.org/">http://www.pubs.acs.org/</a>	37	100	I & II
2.	AIP	<a href="http://www.scitation.org/">http:// www.scitation.org/</a>	18	100	I & II
3.	APS	<a href="http://publish.aps.org/browse.php">http://publish.aps.org/browse.php</a>	13	100	I & II
4.	Annual Reviews	<a href="http://arjournals.annualreviews.org/">http://arjournals.annualreviews.org/</a>	33	100	I & II
5.	Wiley-Blackwell	<a href="http://www3.interscience.wiley.com/">http://www3.interscience.wiley.com/</a>	907	105	I & II
6.	Cambridge Univ. Press	<a href="http://journals.cambridge.org/">http://journals.cambridge.org/</a>	224	100	I & II
7.	Science Direct (Elsevier)	<a href="http://www.sciencedirect.com/">http://www.sciencedirect.com/</a>	1036	60	I & II
8.	Econ. & Political Weekly	<a href="http://www.epw.in/">http://www.epw.in/</a>	1	160	I - III
9.	Emerald - Lib. Sci.	<a href="http://iris.emeraldinsight.com/">http://iris.emeraldinsight.com/</a>	29	60	I & II
10.	Institute of Physics	<a href="http://www.iop.org/EJ/">http://www.iop.org/EJ/</a>	46	100	I & II
11.	Jstor	<a href="http://www.jstor.org/">http://www.jstor.org/</a>	1401	64	I & II
12.	Nature	<a href="http://www.nature.com/">http://www.nature.com/</a>	1	50	I & II
13.	Oxford Univ. Press	<a href="http://www.oxfordjournals.org/">http://www.oxfordjournals.org/</a>	206	75	I & II
14.	Portland Press	<a href="http://www.portlandpress.com/">http://www.portlandpress.com/</a>	8	50	I
15.	Project Euclid	<a href="http://projecteuclid.org/">http://projecteuclid.org/</a>	36	50	I
16.	Project Muse	<a href="http://muse.jhu.edu/journals">http://muse.jhu.edu/journals</a>	411	100	I & II
17.	RSC	<a href="http://www.rsc.org/">http://www.rsc.org/</a>	29	100	I & II
18.	SIAM Journals	<a href="http://epubs.siam.org/">http://epubs.siam.org/</a>	14	50	I
19.	Springer Link	<a href="http://www.springerlink.com/">http://www.springerlink.com/</a>	1389	125	I - III
20.	Taylor & Francis	<a href="http://journalsonline.tandf.co.uk/">http://journalsonline.tandf.co.uk/</a>	1365	80	I & II
<b>Bibliographic Databases</b>					
1.	ISID Databases	<a href="http://isid.org.in/">http://isid.org.in/</a>		160	I - III
1.	JCCC	<a href="http://jccc-infonet.informindia.co.in/">http://jccc-infonet.informindia.co.in/</a>		150	I - III
2.	MathSciNet	<a href="http://www.ams.org/mathscinet/">http://www.ams.org/mathscinet/</a>		50	I
3.	SciFinder Scholar	<a href="http://www.cas.org/SCIFINDER/ SCHOLAR/index.html">http://www.cas.org/SCIFINDER/ SCHOLAR/index.html</a>		20	I
4.	RCS Abstracts & News Bulletins	<a href="http://www.rsc.org/Publishing/">http://www.rsc.org/Publishing/</a>		100	I & II
5.	Web of Science	<a href="http://isiknowledge.com/">http://isiknowledge.com/</a>		100	I & II

Table 1: Resources Subscribed and Accessible to Member Universities



The INFLIBNET Centre maintains a separate, dedicated website for the Consortium. The web site provides detailed information about the Consortium including i) search and browse interface for more than 7,500 journals covered under the Consortium; ii) Classified index to journals covered under the Consortium; iii) Search interface for member institutions (universities) and e-resources accessible to each one of them; iv) E-resources Access Management System (E-RAMS) designed to provide access to usage statistics to member universities and for monitoring their complaints; v) Detailed tutorials on each e-resource; vi) Licensing and fair use of e-resources; vi) Associate membership programmes and information on how to join the Consortium; and vii) UGC Guidelines for the UGC-Infonet Digital Library Consortium.

The Consortium provides financial assistance to member universities for conducting one or two-days user awareness programme with an aim to facilitate optimal use of subscribed e-resources. These programmes help faculty members, research scholars and students to get acquainted with resources, their features, functionalities and advance options.

The Centre has also initiated Inter-Library Loan (ILL) through JCCC (Journal Custom Content for Consortium) that provides bibliographic details of all articles published in journals subscribed by the UGC-Infonet Digital Library Consortium as well as in journals subscribed by 27 university libraries designated as ILL Centres of the INFLIBNET Centre.

### 3. N-LIST (<http://nlist.inflibnet.ac.in>)

The Project entitled "National Library and Information Services Infrastructure for Scholarly Content (N-LIST)" (Arora and Trivedi, 2010b; and INFLIBNET, 2010c), funded by the National Mission on Education through Information and Communication Technology (NME-ICT), provides for access to scholarly content to colleges, universities as well as centrally-funded technical institutions through its four distinct components, i.e. i) Subscription to UGC-INFONET e-resources for centrally-funded technical institutions (IITs, IISc, IISERs, NITs, etc.); ii) Subscription to INDEST e-resources for universities; iii) Access to e-resources for 12,000 Govt.-aided and non-aided colleges; and iv) National Monitoring Agency at the INFLIBNET Centre to manage access, monitor, promote and impart training to promote optimal usage of e-resources and for monitoring all activities involved in the process of providing effective and efficient access to e-resources to colleges.

The INDEST-AICTE Consortium and the UGC-Infonet Digital Library Consortium are jointly responsible for activity listed at i) and ii) above. The UGC-Infonet Digital Library Consortium,

INFLIBNET Centre, Ahmedabad is responsible for activities listed at iii) and iv) above. The INFLIBNET Centre is also responsible for developing and deploying appropriate software tools and techniques for authenticating authorized users so as to enable them to access e-resources. The N-LIST project is being jointly executed by the UGC-Infonet Digital Library Consortium, INFLIBNET Centre and the INDEST-AICTE Consortium, IIT Delhi under the overall guidance of Joint National Steering Committees of the two Consortia that guide and steer the activities of the N-LIST programme.

#### 3. 1. Electronic Resources Subscribed under the N-LIST Programme

The N-LIST programme subscribes to Web of Science for universities, Annual Reviews (33 journal titles), Nature (27 journal titles) for Project Muse (400+ journal titles) for 35 technical institutions including selected IITs, IISc, IISERs and NITs.

The programme subscribes to more than 3,100 e-journals and 80,000 e-books for colleges. The electronic resources covered under the N-LIST programme covers almost all subject disciplines except medicine, pharmacology, engineering and technology. It covers all relevant areas taught in colleges such as arts & humanities, social sciences, physical and chemical sciences, life sciences, computer sciences, political sciences, library and information science, law, business, mathematics, statistics, etc. All full-text resources subscribed under the N-LIST programme contain electronic journals as revealed in the Table 2.

Electronic books under the N-LIST programme are either subscribed on annual subscription basis as in case of ebrary or purchased on "one-time payment and perpetual access basis" as in all other cases. Total number of electronic books accessible to colleges under N-LIST programme exceeds 58,646 as revealed in the Table 3.

#### 3.2. Implementation Methodology

E-resources identified for cross subscription for universities and technical institutions are being made accessible to the beneficiary institutions on their respective IPs. While the UGC-Infonet Digital Library Consortium manages access to cross subscribed e-resources for universities, INDEST-AICTE Consortium is responsible for managing access to e-resources for the technical institutions.

Given the fact that majority of colleges registered under the N-LIST Programme do not have static IP addresses, access to e-resources to the registered colleges is provided through proxy server set-up at the INFLIBNET Centre. The Centre has implemented and configured EZ-Proxy from OCLC to facilitate access to e-resources to students, researchers and faculty in



Sl No.	E-resources	Publishing Country	No. of Journals	Backfiles from
1	American Institute of Physics	USA	18	Five yrs.
2	American Physical Society	USA	10	Five yrs.
3	Annual Reviews	USA	33	Ten yrs.
4	Cambridge University Press	UK	240	Five yrs.
5	Economic and Political Weekly	India	1	1966+
6	Indian Journals	India	150	2007+
7	Institute of Physics	UK	46	Vol. 1+
8	MathSciNet	USA	1	1940+
9	Oxford University Press	UK	206	1996+
10	Royal Society of Chemistry	UK	29	Ten yrs.
11	Wilson Omnifile	USA	1420	1982+
	<b>Total</b>		<b>2154</b>	

Table 2: E-journals Subscribed under the N-LIST Programme

Sl. No.	E-resource	Publishing Country	No of Books	No of Publishers
1	Ebrary	USA	70,000	250
2	Cambridge Univ. Press		1,000	1
3	Hindustan Book Agency		65	1
4	Institute of South East Asian Studies (ISEAS) Books		382	1
5	McGraw Hill (on My-i-Library)	USA	1,124	1
6	Oxford Scholarship	UK	902	1
7	NetLibrary	USA	936	44
8	NetLibrary (open access books)		3,500	1
9	Springer eBooks		1500	1
10	Taylor and Francis		1,000	1
	<b>Total</b>		<b>80,409</b>	<b>302</b>

Table 3: E-books Subscribed / Purchased under the N-LIST Programme



colleges. The authorized users from colleges can access e-resources and download articles required by them directly from the publisher's website once they are duly authenticated as authorized users through EZ-Proxy deployed at the INFLIBNET Centre. Meanwhile, the Centre is working towards implementation of Shibboleth-based access management system which is time-consuming process requiring intensive software configuration, cooperation and collaboration amongst participating institutions, publishers and recognition of INFLIBNET Centre as an Identity Provider (IDP) by the publishers as Service Provider (SP).

### 3.3. Current Status

As on 31st December 2011, N-LIST programme, formally launched by the Honourable Union Minister of Human Resource Development, Shri Kapil Sibal on 4th May 2010 at Shastri Bhawan, New Delhi, has registered a total number of 2,214 colleges including 2,026 eligible colleges that are already getting access to resources subscribed under the N-LIST programme. Log-in IDs and passwords have been issued to more than 2,54,457 faculty members, students and researchers after obtaining list of authorized users from these 2,026 registered colleges. Group login ID and passwords have also been issued to colleges awaiting list of actual users. Efforts are being made to enrol more colleges through advertisement in newspaper as well as by organizing training and orientation programmes through affiliating universities and regional offices of the UGC.

#### Open Access Initiatives

Open access initiatives taken-up by the Centre includes OJAS for open-access journals and three institutional repositories, namely IR@INFLIBNET, Shodhganga and Shodhsagar. These initiatives are described below:

#### 1. Shodhganga: A Reservoir of Indian Theses (<http://shodhganga.inflibnet.ac.in>)

Shodhganga (INFLIBNET, 2010d) is a digital repository set-up for submission of electronic version of theses and dissertations by students / research scholars in universities in India and make them available on open access to the world-wide academic community in response to the UGC Notification (Minimum Standards & Procedure for Award of M.Phil. / Ph.D Degree, Regulation, 2009) where-in the responsibility of maintaining the digital repository of Electronic Theses and Dissertations (ETDs) is assigned to the INFLIBNET Centre. Shodhganga is set-up using Dspace that uses internationally recognized protocols and

interoperability standards. The repository provides a platform to research students in universities to deposit, reuse and share their theses and dissertations.

Organization of Shodhganga reflects academic structure of every university covered under 12 (B) / 2(f) Sections of the UGC Act, to facilitate scholars to submit their theses in the respective Department / Centre of the universities. Ingestion interface of Dspace has been customized to meet the specific requirements and make the process of submission easy and simple. The customized ingestion interface is simple to use and involves lesser number of steps in comparison to default submission interface of Dspace. The interface facilitates submission of theses either by university administrators, university representatives or researchers themselves once they get themselves registered. The interface also facilitates self-registration of scholars wherein user gets e-mail alerts and notifications at different stages of workflow. The Shodhganga Website provides all information relevant to the students, research supervisors and university authorities with regard to ETDs including their responsibilities, access policies, submission process, metadata structure, etc.

Considering the fact that process of adaptation of the UGC Notification, 2009 may take time for universities. Research students are encouraged to submit electronic version of their Ph.D theses into the Shodhganga on voluntary basis. Once the submission of theses is mandated by a university, process of submission of theses can be monitored by respective universities so as to ensure that correct and final version of all the theses from a given university are submitted into the Repository.

Universities have started signing MoU with INFLIBNET Centre for granting non-exclusive rights to host their ETDs in the Shodhganga. Moreover, students from different universities have access to e-resources to students, researchers and faculty in been submitting electronic version of their theses into the repository on voluntarily basis. So far, students from 49 universities have submitted their theses into the repository and 47 universities have signed MoU with the INFLIBNET Centre. Total number of theses submitted into the repository has grown to 2,694 as on January 12, 2012.

#### 2. Open Journal Access System (OJAS) @ INFLIBNET

Open Journal Access System (OJAS) at INFLIBNET Centre uses Open Journal Systems (OJS), an open source solution developed by the Public Knowledge Project through its federally funded



efforts to expand and improve access to research. The OJS is designed for managing and publishing scholarly journals online. It is a highly flexible editor-operated journal management and publishing system that has been designed to reduce the time and energy devoted to the clerical and managerial tasks associated with editing a journal, while improving the record-keeping and efficiency of editorial processes. OJS also supports content in multiple formats including text (structured and unstructured), audio, video, graphics and animation, etc. and reading tools for content. It seeks to improve the scholarly and public quality of journal publishing through a number of innovations, from making journal policies more transparent to improved indexing. OJS is compliant to Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH).

The INFLIBNET Centre has installed and configured Open Journal System (INFLIBNET, 2010e) on servers at INFLIBNET to facilitate hosting of electronic version of journals into open access mode with all processes of submission, peer-reviewing, editing, layout designing and publishing built into it. The initiative, named "OJAS@INFLIBNET", encourages universities and institutions that are publishing journals in print format to use the OJAS @INFLIBNET for hosting electronic version of their journals free-of-cost on servers at the INFLIBNET Centre. The initiative also encourages faculty in universities to start their own open access journals using the platform offered by the INFLIBNET Centre. Journals hosted on OJAS @ INFLIBNET are accessible to all users world-wide without any restrictions. Currently, Open Journal Access System @ INFLIBNET hosts eleven journals namely Journal of Literature, Culture and Media Studies, Assam University Journal of Science & Technology in two parts, namely, Biological and Environmental Sciences and Physical Sciences and Technology, ICSSR Journal of Abstracts and Reviews – Geography, ICSSR Journal of Abstracts and Reviews – Political Science, ICSSR Journal of Abstracts and Reviews – Economics, ICSSR Indian Psychological Abstracts and Reviews, Management Convergence, International Journal of Farm Sciences, Karnataka Journal of Agricultural Sciences and Management Insight.

### **3. Shodhsagar: Repository of Preprints and Post prints of Research Articles by Researchers and Faculty in Indian Universities**

Shodhsagar (INFLIBNET, 2010f), a project submitted for financial support to the National Mission on Education through

ICT by the INFLIBNET Centre, proposes setting up of a chain of interoperable distributed institutional repositories in universities and institutions of higher education and research in India. Moreover, it is also propose to set-up a Central Institutional Repository for institutions that do not have adequate ICT infrastructure, requisite expertise and network infrastructure required for setting-up and maintaining institutional repositories. The researchers and faculty from all institutions including universities and colleges would be invited to submit their research publications into the Central Institutional Repository set-up at the INFLIBNET Centre. The INFLIBNET Centre will extend its assistance to universities in the process of setting-up interoperable institutional repositories; providing training in maintenance of IRs and train staff and faculty in populating IRs. The participating universities would be responsible for uploading of preprints / post-prints of research articles produced by the faculty and researchers in the universities in the IRs. Moreover, the INFLIBNET Centre would also act as a service provider and harvest metadata from all repositories with an aim to provide a unified index to all submissions made in IRs distributed across beneficiary universities. While access to e-resources through library consortia like UGC-Infonet Digital Library Consortium, INDEST-AICTE Consortium and N-LIST would facilitate access to subscription-based scholarly content, institutional repository would enable participating institutions to create a repository of their own scholarly content and share it with other universities and institutions of higher learning.

### **4. IR @ INFLIBNET (<http://iam.inflibnet.ac.in:8080/dxml/>)**

The Centre has established an institutional repository called IR@INFLIBNET using DSpace, open source software accessible at <http://iam.inflibnet.ac.in:8080/dxml/>. The papers published in the proceedings of the CALIBER and PLANNER, are uploaded in to the repository in PDF format. The Repository also includes course materials, newspaper clippings, etc. The repository has 1,146 full-text articles.

### **Shibboleth-based Access Management System**

Access management (Arora, 2007 and Arora, 2008), variably called access control, licensing terms & conditions and Digital Rights Management (DRM), refers to control of access to digital collections. Digital Rights Management (DRM) is a system of solutions created or designed as a means to prevent unauthorized



access, duplication and illegal distribution of copyrighted digital media. In online environment, the scope of DRM can be leveraged to control access to and usage of digital objects and to impose restrictions on their misuse.

The INFLIBNET Centre, as one of its core mandates, provides access to scholarly e-resources to universities in India under the UGC-Infonet Digital Library Consortium and N-LIST Programme. The Centre has taken steps to optimize the utilization of e-resources so as to ensure better Returns on Investments (RoI) and greater benefits to the academic community. At present, access to e-resources in universities is IP-authenticated and, as such, access is restricted within the confine of a given university campus due to lack of proper authentication mechanism.

The Centre is working towards deploying appropriate access management tools, enabling users to access e-resources from his / her campus, home or even while travelling. The Shibboleth is standard-based open source middleware software that provides Web-based single sign-on (SSO) access to subscribed e-resources across or within organizational boundaries so as to enable users to access e-resources from anywhere irrespective of his / her physical location. It allows web sites to make informed authorization decisions for individual access to protected online resources in a privacy-preserving manner. Implementation of such a solution requires setting-up of proper user authentication and access control mechanism ensuring trust relationship between publisher, identity providing agency and the user institution.

Shibboleth software implements widely used federated identity standards, i.e. Security Assertion Markup Language (SAML), to provide a federated Web SSO and attribute exchange framework. Shibboleth also provides extended privacy functionality allowing users and their home site to control the attributes released to each application. Using Shibboleth-enabled access simplifies management of identity and permissions for organizations supporting users and applications. Shibboleth is developed in an open and participatory environment as free management tool. In addition to providing Web SSO functionality, Shibboleth helps in controlling the access to e-resources on-campus and off the campus. While working with identity management system, the Shibboleth releases information for which service provider (Publisher) authorizes access. This reduces the need for developers to have access to the directory and instead provides fresh data, just-in-time.

The Shibboleth working architecture requires each participating institutions to set-up their own service identity provider (IDP). Looking at the present scenario, universities and colleges do not have requisite technical know-how and ICT infrastructure, as such, the INFLIBNET Centre took-up the task of acting as an IDP for all its core and associate members, including universities and colleges under its umbrella. The implementation of Shibboleth technology (Patel, 2009) at INFLIBNET Centre would function in the following manner:

- i) The service providers (publisher) will recognize INFLIBNET Centre as a trusted organization for authenticating the user and give an option on their Web sites to select INFLIBNET as an IDP;
- ii) When a user chooses INFLIBNET as its IDP, he / she would be re-directed to IDP link at INFLIBNET Server;
- iii) After verifying user's credentials, IDP at INFLIBNET will pass "user attributes" to the publisher which would include user's institute, department and role as faculty / student / researcher; and
- iv) Once authenticated, user gets access to his / her authorised e-resources. Unauthenticated users are denied access.

Shibboleth implementation at the INFLIBNET Centre was tested with Shibboleth test site and IDP service was tested with one publisher. Proposal for setting up INFLIBNET Access Management Federation (INFED) has been approved by the Governing Board of the INFLIBNET Centre.

#### **Info-Portal: A Subject Guide to Indian Scholarly Internet Resources**

While Centre uses and promotes Intute, a well known subject gateway developed by MIMAS, UK, the Info-portal is being designed and developed to serve as a comprehensive gateway to all Indian scholarly content. The Info-Portal uses "Subject Gateway Management System (SGMS) (INFLIBNET, 2010g), the software designed and developed at the INFLIBNET Centre. The SGMS facilitates entry of Internet resources and extending its access to users. SGMS supports browsing of Internet resources by Dewey Decimal Classification (DDC) Scheme. The main functional components of SGMS are:

- i) **Dewey Decimal Classification (DDC) Search:** Internet resources fed into SGMS are organized accordingly to DDC



classification (from 000 to 900). On clicking at main classes, sub-classes are displayed as per the DDC classification scheme. Users can see the list of electronic resources available under the sub-classes with brief description on each resource.

- ii) **Search Cloud:** Keywords that appear in DDC are shown as link in search cloud. Most frequently used keywords appear on homepage of SGMS with number of hits for that keyword. Users can access resources by clicking on the keyword that appears on the search cloud. Keywords that are searched more frequently are displayed in larger and bolder size as compared to other keywords.
- iii) **Free-Text Search:** Searches can be performed on words that appear in title of resources, keywords that are assigned to Internet resources and words that appear in the description of e-resources, etc.
- iv) **Alphabetical Listing:** Users can browse list of subjects arranged alphabetically.
- v) **Resource Type Search:** User can also browse Internet resources by type i.e. corporate website, e-book, e-journals, personal websites, portals, etc.

#### **Search Interface for CEC Video Database: An INFLIBNET-CEC Collaborative Endeavour**

The INFLIBNET Centre and Consortium for Educational Communication (CEC), in its endeavour to reach out to the unreached, are collaborating for dissemination of textual and visual resources through use and application of ICT. The INFLIBNET Centre and CEC, two Inter-university Centres of the UGC, provide information support for education and research to colleges and universities through their services and facilities. The INFLIBNET specialises in textual-based information retrieval services through its union databases and by facilitating access to full-text and bibliographic e-resources through consortium arrangements. The CEC and INFLIBNET Centre, in their endeavour to cooperate, coordinate and collaborate in the process of creation, development and dissemination of their resources and services, have recently launched Web-based interface to the CEC Video Database consisting of 15,000 bibliographical records and 1,000 LORs of educational video programmes produced by the CEC and its 18 EMMRCs.

The Lucene-based search interface designed to facilitate users to interact with CEC Video Database (INFLIBNET, 2010h), browse, search and retrieve records from it. This interface is totally based on MARCXML. Video information are stored in MARCXML format which was originally provided in MS Access Format. After Converting to MARCXML, Lucene is being used for creating Index of stored MARCXML data by different field and stored into system as a flat file. Apache Solr is being used to run search query using SolrJs and Jsp is being used to display results. The interface was formally launched by Prof. S.K. Thorat, Former Chairman, UGC on 4th December 2010.

#### **Conclusion**

The INFLIBNET Centre has intensified its digital library-related activities and services for providing effective and efficient information support to the higher education community in universities in India. Major digital library-related initiatives taken-up by the INFLIBNET Centre includes: i) Extending access to digital libraries owned by commercial publishers, scholarly societies and university presses to its member universities and colleges through consortia initiatives, namely UGC-Infonet Digital Library Consortium and N-LIST; ii) setting-up of open access digital repositories, namely Shodhganga for electronic theses and dissertations, Shodhsagar for research articles and other scholarly content, IR@INFLIBNET for e-prints of articles published by scientist and staff and papers published in INFLIBNET conference proceedings; and iii) Open Journal Access System (OJAS) for publishing open access journals. The Centre has gone full-throttle to promote and support open access movement through Shodhganga, Shodhsagar, IR@INFLIBNET and OJAS. All open access initiatives taken by the INFLIBNET Centre has great potential to grow into major knowledge bases on research conducted in Indian universities. Shibboleth-based access management system being implemented by the Centre would effectively liberate access to e-resources from the confines of the university campuses allowing faculty and researchers to access desired e-resources from comfort of their homes and even while travelling, which, in turn, would boost the usage of e-resources. The Centre has recently launched I-Gate, to serve as a comprehensive information gateway to all Indian scholarly content using software tools developed in-house. Moreover, e-Education, a Web-based interface to the CEC Video Database consisting of 15,000 bibliographical records and 1,000 LORs of educational video programmes produced by the CEC and its 18 EMMRCs has also been launched recently.



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