Institutional Repositories, Open Access Movement and OAI- PMH Complaint Software

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Abstract

The article outlines the overview of Institutional Repositories. A growing number of universities across the globe are running institutional repositories projects using open source software, while many others are in the planning stages. We move towards global sharing of information using these software and librarian have to play pivotal role in archiving the digital content, produced by the faculty members. Within next few years, I expect that universities in India also create repositories and effectively use open source software. This article describes about the current development of Open Access Initiative, Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) an important infrastructure component for Institutional repositories. A convergence of technology developments and other initiatives has made IRs possible. Technology costs, especially storage costs, have dropped significantly. There is now a variety of open source and commercial software platforms available for an institution wishing to develop an IR.. The paper highlights about general overview of Institutional Repositories, open source software, standard and protocol and role of INFLIBNET.

Keywords : Institutional Repository, Open Access Initiative; OAI-PMH, Open Access, INFLIBNET

0. Introduction

Institutional repositories of scholarly content have been receiving increasing attention recently. The main purposes of institutional repositories are to bring together and preserve the intellectual output of a university. The number of significant developments, such as the launch of MIT's Dspace, University of California's eScholarship and the growth of repositories based on the University of Southampton's EPrint software, have brought the issue of institutional repositories increasingly to the fore. Further the open access and open archives movement and the changes in scholarly communication to remove barriers to access have begun driving the establishment of institutional repositories.

Keeping in view the recent changes in scholarly communication, emergence and various standards and protocols, and trend towards open access INFLIBNET being a national Centre for library and information Centre too is exploring the possibility of institutional repository and archiving faculty publication of universities in India. During the course of development of experts database and research projects database of academic and scientific community in India, it was observed that faculty generates enormous amount of information, which is untapped and not available for access. These content needs to be managed, preserved, and maintained for larger access to the users. Faculty members want additional visibility for their resources. INFLIBNET in future aims to provide a comprehensive system for managing these resources and play a pivotal role of repositories of these valuable resources. In this direction , Centre has opted Dspace open source software for achieving institutional publications including CALIBER and PLANNER proceeding.

1. What is Institutional Repositories ?

An institutional repository (IR) is a digital collection of a university's intellectual output. Institutional repositories centralize, preserve, and make accessible the knowledge generated by academic institutions. IRs also form part of a larger global system of repositories, which are indexed in a standardized way, and searchable using one interface, providing the foundation for a new model of scholarly publishing.

An institutional repository (IR) is defined to be a web-based database (repository) of scholarly material, which is institutionally defined as opposed to a subject-based repository; cumulative and perpetual (a collection of record); open and interoperable (e.g. using OAI-compliant software); and thus collects, stores and disseminates. In addition, most would include long-term preservation of digital materials as a key function of IRs.

1.1 Definition

Despite of the amount of press that the topic of institutional repositories has received in the past few years, providing a concrete, precise definition of an institutional repository (IR) is difficult to do.

Clifford Lynch (2003), executive director of the Coalition for Networked Information, describes an IR as "a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members."

Other than replacing "a university" with "an organization," this definition reflects how IRs are discussed in this report. Lynch's definition is particularly appropriate because services, and not technologies, are the emphasis.

Nevertheless, even with this definition in hand, the question remains: what exactly comprises this "set of services" to which Lynch refers? Unfortunately, this question has no single, correct answer because an institutional repository must be *institutionally defined.*

To be successful an IR must provide the set of services needed by its unique community of users, and these services will and should differ from institution to institution.

The SPARC position paper on IRs (Crow 2002) has been influential in setting the agenda for the IR debate. Crow argues that there are two key rationales for IRs:

- reform of scholarly communication, and in particular scholarly publishing;
- to enable the institution to enhance its prestige by making visible the fruits of its faculty's academic and research labours.

2. Core Features of Institutional Repositories

Despite this ambiguity, all IRs share some common features and functions, and it is this combination of features and functions that distinguishes IRs from other types of services. The first of five common features, and perhaps most obvious, is that an IR contains digital content. The range of different types of digital content can be vast, including text, audio, video, images, learning objects, and datasets. The material may be born digital or of a physical medium that has been digitized, such as scanned images.

A second core feature of an IR is that it is community driven and community-focused. The community of users not only determines what should be deposited into the IR, but they are individually responsible for

making the deposits. The members of the community also are the authors and copyright owners of the content. As a result, the IR reflects or showcases the scholarship, research, and interests of an organization.

A third core feature is that the IR has institutional support. An institutional repository is not a simple or cheap undertaking. A successful IR requires collaboration among divisions across an institution, which is accomplished most easily with top-down institutional support.

Moreover, an IR necessitates ongoing, long-term financial support to ensure, for instance, the integrity of the content through digital preservation. Without an institutional commitment to the project, the costs and obligation of an IR likely are too great for any one department or unit to bear on its own.

An assumption of durability and permanence is the fourth common feature of an IR. When a digital file is deposited into an institutional repository, the author expects that the document will remain there for the perceivable future.

Finally, an IR is not a black archive; the content in an IR is not hidden from the entire world. With some exceptions, the content of an IR can be accessed by more than just the content's owner because the material within an IR is meant to be shared. Access can vary greatly from just a few people within a department to the entire world, but the cost and scale of an IR discourages its use as a person's private, digital dumping ground.

3. Issues for Institutional Repositories

There are various issues which needs to be properly addressed before establishing any Institutional Repositories. The main issues for establishing are:

3.1 Cultural issues affecting faculty take-up

The biggest problem facing those setting up IRs is persuading faculty to use and contribute the content from them. Outside a few disciplines (e.g. physics, computer science and economics) there is little tradition of preprints or working papers and apparently still little interest in self-archiving. There is a great deal of inertia in the current publishing systems. The organisers of IRs need money for advocacy (marketing campaigns, meetings, flyers, websites, emails, etc.), for training users and producing guidelines, and for ensuring the interface design does not put off potential users.

3.2 Intellectual Property Rights/Copyright

Institutional repositories raise issues of rights - not just copyright but other intellectual property rights such as patent rights. The copyright issues have been extensively reviewed by the RoMEO project, in UK. As RoMEO notes, there are rights associated with metadata as well as with the content itself.

3.3 Existing digital collections

New IRs at most organisations will have to take account of existing collections. Some of these viz. personal self-archiving websites may be best source for the IR

3.4 Organisation and administration

Who will manage the IR ? Where will it be located? What will be the relationship between the centre and the departments ?

3.5 Funding/business model

How will the IR be funded, and what business model will it adopt ?

3.6 Preservation

This is very important issue. The long-term preservation of digital objects are very far from solved.

3.7 Accession Policies

The IR has to decide:

- who is allowed to deposit materials;
- what types of materials can be deposited (e.g. pre-prints, post-prints, working papers, theses, chapters, datasets, etc.);
- what digital formats will be accepted (and which formats will be migrated);
- quality assurance procedures (e.g. none, or approval by departmental head, or even peer review);
- storage limits etc.

3.8 Open access

Although IRs can be seen as part of the open access movement, this is not necessarily the case. IRs may well want to restrict access to part of their content to their own network only.

3.9 Central vs. institutional repositories

This argument is somewhat theological. Central, subject-based repositories have been very successful in a few fields (physics, computer science, economics, cognitive science) but have failed so far to migrate to other disciplines. Institutional repositories may offer a new route to reduce the inertia among the non-archiving communities. From the perspective of a web-based searcher (i.e. reader), however, there is (in theory) no difference between the two repositories, as articles are discovered on the basis of metadata independent of location (author, title or whatever), collected via the same OAI protocol. The searcher would be using an interface on a third party site, i.e. an OAI service provider. In practice, of course, there are significant benefits in centralised systems, for instance in terms of standardisation, single metadata schemes, etc.

3.10 Metadata

Without at least some metadata, nothing can be found. But too comprehensive a metadata requirement will inhibit users. Decisions also have to be taken on which metadata schemes to use. Metadata requirements may vary from field to field. Most of existing repositories are using Dublin core Metadata scheme.

4. What is the benefit of Institutional Repositories

Institutional repositories benefit both the institution and its scholars by raising the institutional profile while also bringing broader dissemination, increased use, and enhanced professional visibility of scholarly research. The main reason for universities to have institutional repositories is to impact of the research output of the university, its publishing faculty, and the institution itself. Few broader aspects of benefits of IRs are listed below:

- Researchers benefit through wider (and more rapid) dissemination of their work, resulting in more "research impact".
- PG and UG students benefit, as university publications are readily accessible via the institution's virtual learning environment, library system and institutional portal.
- The university benefits from a higher profile by making all output publicly (and freely) available.
- The university benefits by having a comprehensive managed and preserved record of its research output.

5. Why Institutional Repositories *?*

There has been a convergence of technology developments and other initiatives that have made IRs possible. Technology costs, especially storage costs, have dropped significantly so that repositories are now affordable. Standards such as the open archives metadata harvesting protocol are in place and work is being done on the metadata itself. Awareness of the needs for, and challenges of, digital preservation has accelerated. Developments in web publishing such as open archives initiatives, open access journals and disciplinary archives are pointing the way to opportunities to enhance scholarly publishing. The launch of the DSpace IR at MIT in November 2002 and the subsequent release of the DSpace software under an open source license have been seen as a seminal event and a trigger for the development of IRs. However the release of the EPrint software from Southampton University in January 2001 predated this by nearly two years and at present there are more functioning IRs running on EPrints than on the DSpace platform.

6. The open-access movement

For some years now there has been a movement towards "open access" to academic publications. This argues that sources of scholarly information, usually in the form of articles, should be freely available to all on the internet. The establishment of repositories contributes towards easy open-access publishing online. By ensuring that access to the results of academic research is not confined solely to subscribers to expensive journals, it allows them to reach a much wider audience.

There are over 20,000 peer-reviewed scholarly journals in existence; no academic library can come anywhere near stocking even a tiny proportion of titles appropriate to the needs of the research staff in an institution. This being the case, individual scholars cannot get access to some – perhaps much – of the literature that is pertinent to their work with the result that the efficient exchange of scholarly information is impaired. To exacerbate this problem, over the last two decades the so-called 'serials crisis' has become a more and more acute issue. Journal prices have risen faster than both the rate of inflation and the increases in library budgets, resulting in the cancellation of subscriptions to journals in large numbers. This has happened all over the world and India universities have been no exception: indeed, it is there that the problem has been seen to be most extreme. Data collected by the Association of Research Libraries show that in the 16 years between 1986 and 2002, inflation rose by 64% (in the US), library materials budgets rose by 184% and serials unit costs rose by 227%.

One way in which publishers have reacted to the seriousness of the serials crisis has been by developing the 'Big Deal' whereby parts or all of a publisher's journal list were offered to a library (or a group of libraries within a consortium) at a price that equated to less per journal than the library had originally been paying but which included journals that had not been required. These practices seem to conflict with the aims of scientists and scholars who, it is argued, primarily publish research papers for research impact, i.e. in having their work read, cited and built on in the research of others. This lead to the open access initiative and movment.

6.1 Open access initiatives

In the last three years there have been several key events that serve as milestones for the movement. In December 2001, the Open Society Institute organised a meeting in Budapest to assess the state of play on open access and to see how the various initiatives up to that point could be progressed. The outcome of this meeting was the Budapest Open Access Initiative (BOAI). This took the form of a public statement in support of open access for scholarly journal articles. In addition, a website was launched in February 2002 where supporters could add their signatures. The Budapest Initiative formally announced its endorsement of two strategies for open access – the establishment of open access journals and self-archiving by scholars of their work. The Budapest Open Access Initiative defines open access as: "free availability on the internet, permitting users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited.

Even mainland Europe is getting in on the act. In October 2003, the leading research associations of Germany, France and Switzerland signed what has become known as the "Berlin Declaration"—another call for free access to research findings. One of the groups behind the declaration, Germany's Max Planck Society, is now changing its employment contracts to require staff to return the copyright of their work to the society. At the moment it gets assigned to the publishers. Although the society's researchers will still be able to publish in journals, their work must eventually be put into an online repository.

The Open Society Institute continues to donate resources to the open access movement The Budapest Open Access Initiative(http://www.soros.org/openaccess/) and later Berlin Declaration promote the development of open access electronic journals and digital repositories, free to anyone with internet access. It may be possible in some fields to support open access journals by authors or research funding bodies covering the costs with article fees, following the economic model of BioMed central http:// www.biomedcentral.com/ and the Public Library of Science http://www.publiclibraryofscience.org/. For example, BioMed Central currently charge $500 per paper as an 'article processing charge,' while the PLoS initiative has estimated that authors will be asked to pay around $1,500 per paper when their journals become available sometime in 2003.

A US House of Representatives committee has recommended that the National Institutes of Health (NIH) provide free access to all research it funds and asked the NIH to submit a plan by December 1, 2004 for how to implement the new policy in fiscal year 2005.

UK parliament Science and Technology Committee recommended Open Access self archiving of funded research. The Australian Government has recently done the same for Australian universities along with numerous other institutions around the world. SPARC (The Scholarly Publishing and Academic Resources Coalition) has recently proposed a hybrid model, whereby each article in a journal would be made electronically available only to subscribers, unless its author chooses to pay, in which case it would be freely available to all.

There are other subject specific model viz. arXiv.org, covering physics, mathematics and computer science repository operated by Cornell University (*http://arxiv.org/*). This was set up at the Los Alamos National Laboratory (LANL) in the early 1990s to facilitate the communication requirements of high-energy physicists. Now based at Cornell University, it remains one of the largest e-print repositories with (in March 2003) almost 230,000 papers, growing by more than 30,000 per year.

Other subject-based e-print repositories exist, e.g. for cognitive sciences (CogPrints) or chemistry (the Elsevier-run Chemistry Preprint Server), but there is now a growing interest in the creation of interoperable repositories based on research or educational institutions.

Today, about 5% of academic publishing follows the open-access model. But the model is quickly gaining ground, including among both for-profit (BioMedCentral - BMC) and not-for-profit (Public Library of Science - PloS) publishers . In fact, more than 80% of conventional journals already allow their authors to deposit their postprints in OA repositories. Most OA repositories are interoperable in the sense that users can search them without knowing which repositories exist, where they are located, or what they contain

7. Technical developments

The existence of institutional repositories has been made possible by the development of standards and tools that facilitate interoperability between multiple repositories. The most important of these is the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH).

The OAI-PMH was developed from the 'Santa Fe Convention' agreed at the initial meeting of the Open Archives Initiative (OAI) in 1999. Version 1.0 of the protocol was issued in January 2001; the latest version (Version 2.0) being released in June 2002 (http://www.openarchives.org/). The protocol provides an interoperability framework based on the harvesting of metadata. To that end, it defines a simple set of metadata that can facilitate federated resource discovery. The protocol divides users of the OAI-PMH into two main categories:

Version 1.0 of the OAI-PMH was released in January 2001 for experimental use, the latest (v. 2.0) in June 2002. A growing number of open-source software tools that help support the implementation of the protocol are now becoming available (e.g. Van de Sompel & Lagoze, 2002). For data providers, the most important of these are the University of Southampton's EPrints software and MIT Libraries's DSpace system.

8. What is OAI- PMH ?

The OAI-Protocol for Metadata Harvesting (OAI-PMH) defines a mechanism for harvesting records containing metadata from repositories. The OAI-PMH gives a simple technical option for data providers to make their metadata available to services, based on the open standards HTTP (Hypertext Transport Protocol) and XML (Extensible Markup Language). The metadata that is harvested may be in any format that is agreed by a community (or by any discrete set of data and service providers), although unqualified Dublin Core is specified to provide a basic level of interoperability. Thus, metadata from many sources can be gathered together in one database, and services can be provided based on this centrally harvested, or "aggregated" data. The link between this metadata and the related content is not defined by the OAI protocol. It is important to realise that OAI-PMH does not provide a search across this data, it simply makes it possible to bring the data together in one place. In order to provide services, the harvesting approach must be combined with other mechanisms.

Open Archives Initiative Protocol for Metadata Harvesting is a protocol which facilitates access to heterogenous web-accessible material from various repositories. The Open Archives Initiative develops and promotes interoperability standards that aim to facilitate the efficient dissemination of content. The OAI protocol provides access to metadata from OAI-compliant repositories. There are two classes of participants in the OAI-PMH framework:

- Data Providers administer systems that support the OAI-PMH as a means of exposing metadata; and
- Service Providers use metadata harvested via the OAI-PMH as a basis for building value-added services

"OAI-compliant" means that the archive complies with the metadata harvesting protocol of the Open Archives Initiative (OAI). This makes the archive interoperable with other compliant archives so that the many separate archives behave like one grand, virtual archive for purposes such as searching. This means that users can search across OAI-compliant archives without visiting the separate archives and running separate searches. Hence, it makes your content more visible, even if users don't know that your archive exists or what it contains.

9. Software

There are a handful of open-source packages for creating and maintaining such archives. The four most important are eprints (from Southampton University), DSpace (from MIT), CDSWare (from CERN), and FEDORA (from Cornell and U. of Virginia). In addition to this there are few more software, which is being used for archiving. I have listed them with brief description, these are:

9.1 ARNO

The ARNO project—Academic Research in the Netherlands Online—has developed software to support the implementation of institutional repositories and link them to distributed repositories worldwide (as well as to the Dutch national information infrastructure). The project is funded by IWI (Dutch acronym for: Innovation in Scientific Information Supply). Project participants are the University of Amsterdam, Tilburg University and the University of Twente. The ARNO system was released for public use in December 2003. It has been in use at the universities of Tilburg, Amsterdam, Rotterdam, Twente and Maastricht.

9.2 CERN Document Server Software (CDSware)

The CERN Document Server Software (CDSware) was developed to support the CERN Document Server. The software is maintained and made publicly available by CERN and supports electronic preprint servers, online library catalogs, and other web-based document depository systems. CERN uses CDSware to manage over 450 collections of data, comprising over 620,000 bibliographic records and 250,000 full-text documents, including preprints, journal articles, books, and photographs. CDSware was built to handle very large repositories holding disparate types of materials, including multimedia content catalogs, museum object descriptions, confidential and public sets of documents, etc. Each release is tested live under the rigors of the CERN environment before being publicly released.

9.3 DSpace

The DSpace software has been purpose built in collaboration between Hewlett Packard and MIT to offer IR services. It is specifically designed to manage diverse heterogeneous types of digital content. It offers interoperability via OAI-MHP (Open Archive Initiative – Metadata Harvesting Protocol – a software standard that allows specialised search engines to gather article metadata from compliant websites) and built-in support for Dublin Core metadata (Dublin Core is an agreed metadata standard used in library cataloguing and elsewhere, though other metadata schemes are possible). It uses persistent identifiers (which are like URLs but have the benefit that unlike ordinary URLs they do not change when the linked document's physical location is changed) via the CNRI Handle system.

9.4 Eprints

The Eprints software has the largest and most broadly distributed installed base of any of the repository software systems described here. Developed at the University of Southampton,3 the first version of the system was publicly released in late 2000. The project was originally sponsored by CogPrints, but is now supported by JISC as part of the Open Citation Project and by NSF. Eprints worldwide installed base affords an extensive support network for new implementations. The size of the installed base for Eprints suggests that an institution can get it up and running relatively quickly and with a minimum of technical

expertise. The number of Eprints installations that have augmented the system's baseline capabilities—for example, by integrating advanced search, extended metadata, and other features—indicates that the system can be readily modified to meet local requirements.

9.5 Fedora

The Fedora digital object repository management system is based on the Flexible Extensible Digital Object and Repository Architecture (Fedora). The system is designed to be a foundation upon which full-featured institutional repositories and other interoperable web-based digital libraries can be built. Jointly developed by the University of Virginia and Cornell University, the system implements the Fedora architecture, adding utilities that facilitate repository management. The current version of the software provides a repository that can handle one million objects efficiently. Subsequent versions of the software will add functionality important for institutional repository implementations, such as policy enforcement, versioning of objects, and performance enhancement to support very large repositories.

9.6 i-TOR

i-Tor—Tools and technologies for Open Repositories—was developed by the Innovative Technology-*Applied* (IT-*A*) section of Netherlands Institute for Scientific Information Services (Dutch acronym: NIWI).4 NIWI calls i-TOR "a web technology by which various types of information can be presented through a web interface," irrespective of where the data is stored or the format in which it is stored. i-Tor aims to implement a "data independent" repository, where the content and the user-interface function as two independent parts of the system. In essence, i- Tor acts as both an OAI service provider, able to harvest OAI compatible repositories and other databases, and an OAI data provider. Because i-Tor is able to publish data from a variety of relational databases, file systems, and websites, the system allows an institution considerable latitude in the way it organizes its repository. It can create new databases for the repository, but it can also use already existing relational databases. Further, i-Tor supports harvesting of data directly from a researcher's personal home page

Because of this design, i-Tor does not enforce a specific workflow on a group or subgroup. Rather, i-Tor gives an institution tools (for example, fine grained security, notification, etc.) to set up any required workflow required by the organization, without integrating this workflow into the i-Tor system itself. i-Tor's design might make it an appropriate choice for an institution that wishes to impose a repository on top of an existing set of disparate digital repositories.

9.7 MyCoRe

MyCoRe grew out of the MILESS Project of the University of Essen. The MyCoRe system is now being developed by a consortium of universities to provide a core bundle of software tools to support digital libraries and archiving solutions (or Content Repositories, thus "CoRe"). The bundle is designed to be configurable and adaptable to local requirements (hence, the "My"), without the need for local programming efforts. In contrast to MILESS, which provides a hard-coded Qualified Dublin Core data model, the MyCoRe data model is completely configurable. Further, MyCoRe provides a sample application, based upon a "core" of functionality, that shows users how to build their own applications using metadata configuration files. The core contains all the functionality that would be required in a repository implementation, including distributed search over geographically dispersed repositories, OAI functionality, audio/video streaming support, file management, online metadata editors etc.

The list is incomplete. Major worldwide initiative of Institution Repositories using these software is listed in Annexure. Further detail can be viewed from the respective sites.

10. Institutional Repository and role of INFLIBNET

In India most of the research is being funded and supported by the Government. The software for implementation of IR is available free of cost and has been used to establish an e-print archive at very few institutions. The prominent among are the Indian Institute of Science and DRTC. The US and UK open-access proposals are inspiring and encouraging steps for other countries. In UK, JISC has funded number of e-print repositories. A US House of Representatives committee has recommended that the National Institutes of Health (NIH) provide free access to all research it funds and asked the NIH to submit a plan by December 1, 2004 for how to implement the new policy in fiscal year 2005. In our country, we too need such initiative and we should move towards open access.

In last one decade INFLIBNET has published reasonable amount of content in the form of database on it's central server. The foundation of repositories has already been established at the Centre, it further aims to provide many more potential services to support academics. On experimental basis, INFLIBNET has configured DSpace software and content is being archived (http://dspace.inflibnet.ac.in). Establishing IR though seems very simple but while implementing it has been observed that collection of content and faculty participation and pursuing them to submit the content are major issues. Thus success and failure of IR is reply upon these two factors. In order to implement IR successfully, we need to study the existing model of IR and adopt best model for universities in India. It is need of ours to develop a series of national, discipline-focused services through which the higher education community can access the collective output of e-print papers available from compliant Open Archive repositories, particularly those provided by universities. A policy and strategy in collaboration with UGC and universities has to be framed and faculties need to take the lead in ensuring that their papers are suitably archived. INFLIBNET can play major role by establishing central /discipline based repositories and fecilitate to create and maintain these archieve. UGC and other funding agencies should put a condition on research grants to submit the finding of research in to central repositories. When a grant recipient publishes the results of funded research in a journal, pre-print of the article should be submitted to INFLIBNET central repository. Similarly, faculty courseware and submission of full text of Phd Theses in digital form from universities at central repository should also be made available from INFLIBNET. Long-term preservation of these content has to be addressed by framing a policy with proper guidelines, involving UGC, INFLIBNET and universities so that repository can offer digital hosting, preservation and more effective web dissemination to the users.

11. Conclusion

IRs provides services to faculty, researchers, and administrators who want to archive research materials. Great progress has been made in the development of standards and software tools that permit the easy creation of repositories. Prominent amongst these has been the OAI-PMH, the University of Southampton's EPrints software and MIT's DSpace. The organisational side is less well developed. Creation and sustainability of a repository heavily depend on thinking together and learning what others on the team think so decisions can be made within their working context. Librarians and information scientist and administrator should come forward for planing a suitable model for universities in India. They have to work in collaborative manner to implement IR.

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Appendix

Institutional Repository Initiatives

1. ARNO (Academic Research in the Netherlands Online)
   cf.uba.uva.nl/en/projects/arno/

2. Australia National University
   eprints.anu.edu.au/

3. California Digital Library
   escholarship.cdlib.org/wprepositories.html

4. Caltech Collection of Open Digital Archives (CODA)
   library.caltech.edu/digital/

5. The Cambridge-MIT Institute (CMI)
   www.cambridge-mit.org/cgi-bin/default.pl

6. Canadian Association of Research libraries, Institutional Repository Pilot Project
   www.carl-abrc.ca/projects/ir/
7. Daedelus – University of Glasgow
   www.lib.gla.ac.uk/daedalus/

7 DARE (Digital Academic Repositories)
   www.surf.nl/en/themas/index2.php?oid=7

8. DSpace @ Cambridge
www.lib.cam.ac.uk/dspace/
See also, Paul Wheatley,A way forward for developments in the digital preservation functions of DSpace : options, issues and recommendations, July 25, 2003.

9 Edinburgh University: Theses Alive!
www.thesesalive.ac.uk/

10. FAIR (Focus on Access to Institutional Resources)
www.jisc.ac.uk/index.cfm?name=programme_fair

11. FIGARO
www.figaro-europe.net

12. The Open Archives Forum, List of Repositories
www.oaforum.org

13. Roquade
www.roquade.nl

14. SHERPA (Securing a Hybrid Environment for Research Preservation and Access)
www.sherpa.ac.uk/

15 University of Montreal
papyrus.bib.umontreal.ca/

16. University of Washington, Digital Scholarship
www.lib.washington.edu/digitalscholar

17. Utrecht University
dispute.library.uu.nl

Speciality Archives

1. National Science Digital Library (NSDL)
www.nsdl.org

2. Networked Digital Library of Theses and Dissertations (NDLTD)
www.ndltd.org

3. Oxford Text Archives (AHDS)
ota.ahds.ac.uk/

4. Research Papers in Economics
www.repec.org/

5. ArXiv.org ePrint Archive
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6. UK Archive
www.data-archive.ac.uk

About Authors

Mr. Prem Chand started his career in the year 1990 from Lal Bahadur Shastri National Academy of Administration, Mussoorie. Joined INFLIBNET in 1996 and has around 13 years of experience in Library Automation and Networking. He has published many papers in various journals and conferences. He has completed number of projects. Presently engaged in Development and Maintenance of online union catalogue of different types of document of university libraries in India. His areas of interest are Bibliographic Standards, ILL, Library Consortia, Library Automation and Networking.

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