Chapter 1

INTRODUCTION

Scholars require access to relevant scholarly literature, to further the development of knowledge. Increasingly, this literature is interdisciplinary, global, expensive, digital, and hidden behind technical walls to comply with license restrictions. It is also burgeoning.

Little wonder that even scholars of the richest universities in the world have difficulty accessing the specialised literature that they need, while those at the poorest barely have any access at all.

The open access movement believes it has an answer to this critical situation. Many of its prominent figures have little or no interest in reforming the existing scholarly communication system. Rather, they are interested in transforming it so that it can function effectively in the rapidly changing technological environment (Bailey, 2006b).

To understand the institutional repositories one need to know what is open access which forms the basis of institutional repositories.

1.1 Definition "Open Access"

There are a variety of definitions of "open access" and the concept is still evolving; however, one of the classic and important definitions is of Budapest Open Access Initiative.

The Budapest Open Access Initiative

In December 2001, the Open Society Institute convened a meeting of prominent scholarly communication change agents in Budapest that strongly influenced the nascent open access movement. The result of this meeting was the "Budapest Open

Access Initiative" (BOAI) was made public in February 2002. According to BOAI Open access refers to literature that provides:

> It's free availability on the public internet, permitting any 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 (http: //www.soros.org/openaccess/read.shtml).

According to Chan (2004) this definition underscores the open or non-proprietary nature of Internet technologies and their potential, as well as the recognition that research results are best utilized when others are permitted to build upon them, provided credits are duly given.

A second key definition is of **'Bethesda Statement on Open Access Publishing'** which requires that:

1. The author(s) and copyright holder(s) grant(s) to all users a free, irrevocable, worldwide, perpetual right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship, as well as the right to make small numbers of printed copies for their personal use.

2. A complete version of the work and all supplemental materials, including a copy of the permission as stated above, in a suitable standard electronic format is deposited immediately upon initial publication in at least one online repository that is supported by an academic institution, scholarly society, government agency, or other well-established organisation that seeks to enable open access, unrestricted distribution, interoperability, and long-term archiving (for the biomedical sciences, PubMed Central is such a repository) (Bethesda Statement on Open Access Publishing, n.d.).

To achieve open access to scholarly journal literature, BOAI recommend two complementary strategies for authors to participate in open access these are:

1.1.1 Open Access Journals

1.1.2 Self-Archiving of E-Prints

1.1.1 Open Access Journals

Open access journals are e-journals that are freely available (some open access journals have supplementary fee-based print versions as well). They mirror the quality assurance practices of conventional journals, such as editorial oversight, peer review, and copy editing. The extent to which they have an organisational infrastructure similar to that of traditional publishers varies according to whether they are revenue generating (this includes both commercial and nonprofit publishers) or "no profit," meaning they literally make no money from their publishing endeavors. The existence of fee-based add-on products, such as supplemental print versions, is another factor. As noted earlier, electronic-only publication offers some meaningful cost savings, since physical reproduction, storage, distribution, and claiming costs are eliminated. Open access advocates recognise that it costs money to produce journals and that viable business models are required to accomplish this, even though they may be unconventional.

There are a small number of young commercial (e.g., BioMed Central) and nonprofit (e.g., Public Library of Science) publishers, whose only function is to publish journals and who only use the open access business model (Born-OA journal publishers). These publishers use a variety of strategies to fund open access journals, but the key ones are author publication fees (grant agencies may pay such fees), library membership fees that subsidize author fees in whole or in part for authors affiliated with the institution’s library, grants, and supplemental products (such as print versions). Author fees are usually waived in cases of financial hardship, leveling the playing field for less affluent authors, and author fees do not influence publication decisions. Born-OA journal publishers typically let authors retain the copyright to their articles and use the Creative Commons Attribution License or a very similar license (Bailey, 2006a).

1.1.2 Self-Archiving of E-Prints

"Self-archiving" refers to making "e-prints" available on the Web. An e-print is either a digital preprint or a postprint.

The typical preprint is an article that has been (or is intended to be) submitted to a scholarly journal for peer review and editorial acceptance and editing. However, the term is also commonly used to refer to articles submitted to serials that do not conduct peer review and to articles that will never be submitted to any serial.

A postprint is the final version of an article, which reflects changes made during the peer review and editorial process. It can either be the publishers' digital version or a preprint that the author has modified to mirror the publisher's changes. The author may, for legal reasons, choose to append a list of changes (errata) to the original preprint rather than incorporating those changes in the body of the document (Bailey, 2006b).

E-prints are typically made available in one of four primary ways:

1. the author's personal website;
2. a disciplinary archive that includes works by authors worldwide about one or more subjects;
3. an institutional e-print archive that includes e-prints by authors in a single academic unit, such as a department, or the entire institution; or
4. an institutional repository that includes diverse types of digital works (e.g., data sets, electronic theses and dissertations, presentations, and technical reports), including e-prints, by authors at a single institution. Of course, given the flexibility of digital archiving tools and the inventive imagination of their users, there are other variations on the theme. For example, there are academic unit archives that include diverse types of works.

   A wide variety of free open source software is available to support digital archives and institutional repositories, and commercial vendors have begun to offer turnkey systems to support the latter (Bailey, 2006a).

2.1 Drivers of open access publishing

According to Pickton (2005) the drivers of OA publishing are technological, financial, ethical and scholarly. They include:

- An increasing audience with widespread access to the Internet.
- Reductions in the cost of online storage.
- Improvements in search and harvesting technology, enabling users to find and access relevant online material efficiently.
- A desire to publish new and supporting material in different formats, for example data sets and multimedia items.
- Increasing concern over the preservation of digital scholarly research material.
- An escalating financial burden on libraries to purchase more journals at prices that are increasing in excess of the rate of inflation (Ayris, 2001; Falk, 2004, as cited in Pickton, 2005, p. 2). This is the 'journal-affordability problem' (Harnad et al., 2005, as cited in Pickton, 2005, p. 2), or the 'serials crisis' (Banks, 2004, as cited in Pickton, 2005, p. 2).
- Increasing support for the view that the results of research funded by public money are 'public goods' (Berry, 2000, as cited in Pickton, 2005, p. 2) and should be made freely available to the public (i.e. support for the principle of OA).
- Increased pressure on academics to publish, longer lead times in print publishing, and increasing author dissatisfaction with the process.
- Demand for immediate dissemination and research impact (Crow, 2002; Lamb, 2004; Lynch, 2003, as cited in Pickton, 2005, p. 2).

The aim of the present study was to document the efforts now in progress i.e. Open access movement with sharp focus on Institutional repositories, which is one of the important means of achieving open access. Rest of the chapter elaborates the institutional type of repository which was the main focus of this research.

3.1 Institutional Repository

The classical definition of IR by Clifford Lynch (2003) as follows:

> A university-based institutional repository is 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. It is most essentially an organisational commitment to the stewardship of these digital materials, including long-term preservation where appropriate, as well as organisation and access or distribution.

According to the Bailey (2005) the definition by Lynch emphasis on long-term preservation:

> Since preserving digital information, which can be prepared in a wide variety of formats (e.g., ASCII, HTML, or PDF), is not simple and the long-term costs of doing so are basically unknown, it is no small matter for a university to commit to preserving all these diverse and ever changing formats forever.

Publisher and Library/Learning Solutions (PALS) (2004) adds OAI-compliance in the IR definition:

> 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 (is part of the process of scholarly communication). In addition, most would include long-term preservation of digital materials as a key function of IRs.

Raym Crow's (2002a) definition discusses the potential of IRs to change the scholarly communication system:

> An institutional repository is a digital archive of the intellectual product created by the faculty, research staff, and students of an institution and accessible to end users both within and outside of the institution, with few if any barriers to access.

In other words, the content of an institutional repository is:

- Institutionally defined;
- Scholarly;
- Cumulative and perpetual; and
- Open and interoperable.

Bailey (2005) focuses on the diversity of digital materials that IRs can contain:

> An institutional repository includes a variety of materials produced by scholars from many units, such as e-prints, technical reports, theses and dissertations, data sets, and teaching materials. Some institutional repositories are also being used as electronic presses, publishing e-books and e-journals.

According to Prosser (2004) there are undoubted benefits to institutions in building up of repository as they are able to greatly extend the amount of material they can offer to their researchers.

To the institution, an IR offers:

- A means of increasing visibility and prestige: A high profile IR may be used to support marketing activities to attract high quality staff, students and funding.
- The centralisation and storage of all types of institutional output, including unpublished or 'grey' literature.
- Support for learning and teaching: Links may be made with the virtual learning environment and the library catalogue (Day, 2003, as cited in Pickton & Barwick, 2006, p. 2). Shared material may be 're-purposed' and re-used.
- Standardisation of institutional records: The compilation of an 'institutional CV' (Swan et al., 2005b, as cited in Pickton & Barwick, 2006, p. 2) and of individual online CVs linked to the full text of articles (Harnad et al., 2003, as cited in Pickton & Barwick, 2006, p. 2) are possible outcomes.
- Leverage of existing systems: By exploiting existing computer networks, IT services and library expertise, the IR enables these units to demonstrate greater efficiency (Yeates, 2003, as cited in Pickton & Barwick, 2006, p. 2).
- Improvements in administrative efficiency, especially if the IR is integrated with other institutional data management systems. Obligations regarding

records management, health and safety record-keeping, and Freedom of Information may all be supported by the IR (Heery & Anderson, 2005, as cited in Pickton & Barwick, 2006, p. 2).

- Possible long term cost savings: Some hope that the widespread adoption of IRs will ultimately enable savings to be made in subscriptions to academic journals. This however is unlikely to occur until a 'critical mass' of content is achieved (Pinfield, 2002, as cited in Pickton & Barwick, 2006, p. 2).

There are also benefits to authors:

- Increased dissemination and impact: Research has shown that the usage and citation of open access material is greater than that of restricted access work (Antelman, 2004; Kurtz, 2004, as cited in Pickton & Barwick, 2006, p. 2).
- Storage and access to a wide range of materials, including digital representations of artwork, data sets, and audio-visual material. Compared with traditional print-based publication, the IR offers greater variety and flexibility; compared with personal or departmental web sites, the IR offers greater security and longer term accessibility.
- Feedback and commentary: Some digital repositories permit the deposit of pre-publication 'preprints', enabling authors to assert priority and receive commentary.
- Provision of added value services such as hit counts on papers, personalised publication lists and citation analyses (Hubbard, 2003; Pinfield 2002, as cited in Pickton & Barwick, 2006, p. 2).

3.1.1 Issues of IRs / Basic Components of an Institutional Repository

This section briefly discusses the main issues concerning those establishing IRs.

3.1.1.1 Contents of an Institutional Repository

An institutional repository as compared with traditional print publishing, offers the ability to store and provide access to a much wider variety of materials like:

- Pre-prints / post prints
- Research reports
- Conference papers / posters

- Book reviews
- Teaching materials
- Student's assignments / projects
- Doctoral theses and dissertations
- Datasets resulting from research projects
- Audio / video materials such as speech
- Photographs / images
- Convocation address
- Programs / softwares
- Annual reports / manuscripts / maps
- Newspaper clippings / articles
- Profiles of faculty members / administrative staff / scientists etc. (Hirwade & Hirwade, 2006).

3.1.1.2 IR Staffing

Robinson (2007) identified staff and skills required for developing repository such as managing the repository budget, services, familiarity with software, ability to customize software, preservation and metadata etc.

It was observed that generally people in library positions lead in IR effort. It was evident from various reports by Bell, Foster, and Gibbons (2005), Carver (2003), Jenkins, Breakstone, and Hixson (2005), Lyon (2003) how librarians are involved in the IR development, and how they provide a wide range of necessary functions, including overcoming publisher and academic resistance, providing good metadata standards, and pushing for inclusion in external search services.

The MIT case study however makes it clear that partnership is essential both with IT (to develop and maintain the systems) and with senior management (to gain the clout to secure start-up budgets and to gain buy-in from the faculty at large).

According to Barton and Waters (2004) depending on the scope of IR service and the budget available, institution may or may not hire new staff, or find / develop these skills among existing staff.

3.1.1.3 Costs / Funding

Most of the institutional repository softwares for e.g. Eprints, DSpace and Greenstone are open source which are freely available on the Internet. So the major initial cost that the institution has to bear is to purchase hardware and pay for staff who will be responsible for the activities related to the repository (Barton & Waters, 2004). However, staff costs including time spent drafting policies, arranging licensing agreements, developing guidelines, publicising the repository, training and supporting users and creating metadata, may be significant (Crow, 2002; Horwood et al., 2004, as cited in Pickton, 2005, p. 11). Ongoing costs, for hardware and software, maintenance or for storage capacity, may be difficult to predict, making financial planning difficult (Baudoin & Branschofsky, 2004, as cited in Pickton, 2005, p. 11).

3.1.1.4 Authorised contributors

The participation of users is required in two main ways to make an e-prints archive work: first they need to contribute content; secondly they need to use it (Pinfield**,** Gardner, & MacColl, 2002). So the students, research scholars, teachers, scientists, administrative staff etc. can be considered to be authorised contributor as well user of IR.

According to Crow (2002a) works of faculty authors typically represent an institutional repository's critical mass of intellectual output. However, there are, of course, other populations within the institution-including students and non-faculty researchers-whose works may be highly relevant and valuable to the repository program, if not crucial to its success.

3.1.1.5 Policies

The institutions that develop institutional repositories need to research and write policies and regulations for their collections. The IR needs to decide: Who is allowed to deposit materials; What types of digital documents can be deposited (e.g. Pre-prints, post-prints, working papers, theses, chapters, datasets, etc.); What digital formats will be accepted ; Quality assurance procedures; Preservation procedures; Metadata quality standards; Restricting Access; Content guidelines for submission and organisation (Barton & Waters, 2004).

3.1.1.6 Benefits of IR

The benefits of IRs are many such as: extending the range of knowledge sharing, preservation of digital content, lowering the barrier to document distribution, creating a centralised digital showcase in which research, teaching, and scholarship can be highlighted, and facilitating wider distribution etc. (Yeates, 2003).

Academic institutions would also reap these benefits. IR proponents argue that they form the infrastructure for a new scholarly publishing paradigm that wrests control away from publishers and puts it back in the hands of the academy, increase visibility, prestige, and public value of contributors, maximize access to the results of publicly funded research, and increase the number and diversity of scholarly materials that are collected and preserved by academic institutions (Crow, 2002a, 2002b; Chan, 2004).

The principal author benefits of online open access to their research pertain to enhanced professional visibility. This visibility and awareness is driven by both broader dissemination and increased use. Another related author benefit derives from the increased article impact that open access articles experience compared to their offline counterparts. Research has demonstrated that, with appropriate indexing and search mechanisms in place, open access online articles have appreciably higher citation rates than traditionally published articles. This type of visibility and awareness bodes well for both the individual author and for the author's host institution (Johnson, 2002).

3.1.1.7 Peer-review and Quality Control

Review is an essential part of the existing scientific and scholarly publishing process. Peer-review, however, is outside the scope of the repository itself. According to Day (2003) the focus of an institutional repository can be on content that is either peer-reviewed or not, the choice being left to those who develop their collection policies. In order to ensure a certain level of quality control, some institutions may decide to separate peer-reviewed e-prints from those that have not been reviewed. The importance of this varies between subject disciplines.

3.1.1.8 Intellectual Property Issues

According to Day (2003) one possible impediment to the success of institutional e-print repositories is the traditional assignment of copyright to publishers. In most

cases when a paper has been accepted for publication in a journal, the author/s then assign the copyright to the publisher or (sometimes) grants them an 'exclusive license' to publish. In many cases, these contracts expressly forbid the publication of papers in any other form, including their deposit into institutional repositories. This is despite the fact that over 90% of journals already officially supports self-archiving (http://www.eprints.org/openaccess/self-faq/).

The RoMEO project (Project RoMEO 2003) has extensively considered the rights issues of OA publishing. RoMEO created a publisher policy directory so authors could check policies before choosing a publisher. The RoMEO directory is now available as an expanded and searchable database hosted by SHERPA.

Resources such as the RoMEO directory of publisher copyright policies allow authors to check policies before they publish and encourage them to select publishers that allow archiving. They recommend the use of Creative Commons licenses to express the rights attached to individual research papers (Gadd, Oppenheim, & Probets, 2004).

3.1.1.9 Promotion

IRs, open access, and self-archiving are unfamiliar concepts to most researchers. Advocacy then becomes a crucial aspect of any IR project (Chan, Kwok, & Yip, 2005). Most institutions begin their content recruitment activities through a variety of promotional activities on campus. Most commonly, such activities include passing out brochures, conducting presentations to faculty committees, publishing articles in the library or campus newsletters / newspapers, and formally launching the repository (Mark & Shearer, 2006).

3.1.1.10 Assessment

The ability to measure usage (or output), also feeds into the evaluation of the repository itself and its content. Web sites now routinely measure “hits” and often keep track of hits by location (IP address) to measure on and off campus use. This measurement is still in its very early stages, with no consensus on what comprises a “hit”. Some repositories consider only actual viewing or downloading of documents as a measure of usage, while others will count every page that is viewed. Traffic to the

repository, whether through direct traffic or exposure through harvesting or metasearch indexes, is one way to see that the content is contributing to wider scholarship.

However hit counts are not sufficient for an IR. The ability to track citations and analyse the contributions of repository content to scholarship is an important incentive for scholars to add their research to the repository. Statistics of this sort contribute to institutional research outcomes and are powerful data to be used for individual career progress. In particular, where universities mandate the archiving of publications in the repository, it will be important to assess how this material is used and whether it increases the research visibility of the university.

The combination of input activity, usage, and citation analysis will give the full picture of repository effectiveness. These data, in turn, can be used to show evidence of the use of the repository by a variety of users and provide benchmarks of use and growth over time for university administrators and grants funders (Westell, 2006).

3.1.1.11 Challenges / Inhibiting factors

Despite the clear benefits of IRs to both institutions and authors, the road to implementation has not always run smoothly. Some of the concerns raised have included:

- Cost: The existence of free open source software for creating IRs has meant that initial financial costs may not be high (Steele, 2003, as cited in Pickton & Barwick, 2006, p. 3). Ongoing costs, however, especially staff costs (time spent drafting policies, arranging licensing agreements, developing guidelines, publicising the repository, training and supporting users and creating metadata), may be significant (Crow, 2002; Horwood et al., 2004, as cited in Pickton & Barwick, 2006, p. 3).
- Difficulties with generating content: A successful IR depends on the willingness of authors to deposit their work. Authors' existing working practices, and their attitudes and concerns, sometimes militate against this.
- Barriers to faculty participation are numerous: At the most basic level, there is a lack of awareness of the existence of IRs on campus. Copyright and intellectual property concerns, as well as additional workload required to

deposit items, also contribute to low participation rates by faculty (Shearer, 2006).

- Sustaining support and commitment: The IR is a long term commitment. Its maintenance must be an institutional strategic goal. Methods of long term digital preservation are as yet untested.
- Rights management: Materials placed in an IR are subject to intellectual property rights. These may be owned by the institution, the author, or in the case of a postprint, a publisher (Gadd et al., 2003a, as cited in Pickton & Barwick, 2006, p. 3). Despite clear evidence that many journal publishers support self-archiving (EPrints.org, 2005) concerns over intellectual property rights are a major deterrent for many authors (Heery & Anderson, 2005; Pickton & McKnight, 2006, as cited in Pickton & Barwick, 2006, p. 3).

3.1.1.12 IR system and Technical Issues

a) Software

The leading software packages, DSpace (MIT) and EPrints (Southampton) as well as Greenstone are available free under open source licenses, and there are at least half a dozen other possible packages. In theory, commercial document management or knowledge management software packages might also be suitable but are unlikely to be adopted given their costs.

According to Lynch (2006) making a decision can be complex and involves careful thought about factors such as what the repository will contain, how it will be used, the features that are wanted, and the local technical environment. It is also important to select software with the right features. However, even the 'best' software may not have every feature an institution wants.

Barton and Waters (2004) has given detail features such as Product Distribution, Customisation, File Formats Accepted, Metadata Standards, System Administration etc. to look for when evaluating institutional repository software systems.

b) Digital Preservation

Along with open access to research material, digital preservation is an important motivation for building institutional repositories – to ensure digital research materials

are available and accessible in the long term. According to Jones and Beagrie (2002), digital preservation refers to the series of managed activities necessary to ensure continued access to digital materials for as long as necessary.

There are number of preservation strategies employed to offer short or long -term preservation:

1. Bitstream Copying – or backing up data, where you make a duplicate of the digital object.
2. Durable, Persistent Media – where you preserve the physical media, or CD, on which the object is stored.
3. Migration – where you copy data from one technology to another to avoid obsolescence of both the physical media and the data format.
4. Standards – relies on recognised, long-term standards over proprietary formats.
5. Emulation – process of reproducing software and hardware environments to translate code from one computing environment to run on another.
6. Encapsulation – as part of an emulation strategy, where objects and metadata are grouped together to help decode and render object later.
7. Preservation Metadata – describes the software, hardware and requirements of the digital object to use in preserving the object (Barton & Waters, 2004).

c) Interoperability Standards

Adoption of an interoperable standard / protocol is necessary to expose metadata associated with repository's collection to external systems and search engines. “Open Archives Initiative” has developed such a protocol to facilitate efficient dissemination of repository metadata. This protocol is known as Open Access Initiative Protocol for Metadata Harvesting or simply - OAI-PMH (Open Archives Initiative. 2002). Under this model, metadata is harvested (extracted) from Data Providers (Repositories) by Service Providers (Search Engines) (Singh, Pandita, & Dash, n.d.). OAI-PMH compliance is facilitated by many IR software programs use of the same software (DSpace), other softwares are also being used and research continues on interoperability (Westell, 2006).

The immediate benefit to an institution of providing an interoperable standard compliant IR, populated with preprints and postprints etc of publications written by their academic staff and students, lies in visibility and impact. If interested parties around the world cannot see, or cannot find, the publications of Institution X, they cannot take cognisance of them or cite them (Swan et al., 2005).

Apart from OAI-PMH there are other interoperability standards such as Metadata Encoding and Transmission Standard (METS) and OpenURL.

4.1 Institutional Repository Initiatives in India

India has already made important contributions to the growth of Open Access (OA), thanks to the efforts of its tireless advocate, Professor Subbiah Arunachalam, as well as the invaluable initiatives of Professor N. Balakrishnan and the late T.B. Rajashekar, who created one of India's first OA repositories at the Indian Institute of Science, and did a great deal to encourage self-archiving by IISc's researchers (Harnad & Swan, 2008).

Professor Subbiah Arunachalam, organised a workshop on 'Open Access and Institutional Repositories' under the aegis of the M. S. Swaminathan Research Foundation, Chennai, in May 2004. For the workshop the faculty consisted of Dr Leslie Chan of Toronto, Dr Leslie Carr of Southampton, Late Dr T B Rajashekar of Indian Institute of Science, and Dr D K Sahu of MedKnow Publications. Participants were given hands-on training for uploading GNU Eprints software on to a Linux server. They also received training for preparing metadata for papers to be deposited. Subsequently, both NCSI and Dr. A. R. D. Prasad of the Documentation Research and Training Centre, Bangalore, have also conducted a few workshops. Altogether forty eight information scientists and decision-makers from various disciplines of science received training from theses workshops for installing, maintaining, and promoting OA-archives. The majority of the existing repositories in India have been established by the participants of this workshop.

A special session on OA was held at the 93rd Indian Science Congress in January 2006, which came up with the following recommendation for the 'Optimal National Open Access Policy'.

- requires electronic copies of any research paper that has been accepted for publication in a peer-reviewed journal, and is supported in whole or in part by Government funding, to be deposited into an institutional OA repository immediately on acceptance for publication;
- encourages Government Grant Holders to publish in a suitable OA journal where one exists; the Government will cover the publication costs, if any;
- encourages Government Grant Holders to retain ownership of the copyright of published papers, where possible (Sahu & Parmar, 2006).

The Government of India expects authors of research papers resulting from publicly-funded research to maximise the opportunities to make their results available for free.

Ministry of Human Resource Development (MHRD) has set up the 'Indian National Digital Library in Engineering Sciences and Technology (INDEST) Consortium' (Arunachalam, 2004). As of January 2009 there were 804 Government or Government-aided engineering colleges and technical departments in universities had joined the Consortium. The MHRD had advised all the consortium members to set up e-print archives using appropriate OAI-compliant e-print software. MHRD had also recommended that a central server may be deployed to harvest metadata from all such e-print archives (Swan et al., 2005).

Apart from institutional repositories in India, Subject specific repositories also exist that store and provide access to subject specific collections of documents. These repositories accept scholarly publications from any professional or researcher who belongs to the respective subject. *Librarian's Digital Library* (LDL) of Documentation Research and Training Centre (DRTC), Bangalore is an example of subject-specific repository for the library and information professionals. Another subject-specific repository established in India is *OpenMed@NIC*, maintained by National Informatics Centre, New Delhi. OpenMed@NIC stores and provides access to biomedical literature. Other kind of digital repositories existing in India stores and provides access to document type specific collections. Vidyanidhi of University of Mysore is an example of document type specific collection that stores and provides access to theses and dissertations (Cross institutional ETD repository). Vidyanidhi

accepts any thesis or dissertation that has been accepted in any of the Indian universities or institutions.

In mid-March 2006 NCSI-IISc had created CASSIR, a cross archive search service for Indian repositories (http://casin.ncsi.iisc.ernet.in/oai/). This service harvests metadata as per the OAI-PMH protocol (http://openarchives.org) from the registered OA repositories in India, and provide a web-based search / browse service over harvested metadata. As of March 2006 the tally was close to 7,850 papers in 13 archives. Not all of the papers were full text though (Arunachalam, 2006). CASSIR had 27378 records from 18 Indian repositories as of December 2008.

In the beginning of present research there were 16 IRs that were identified. As of today (December 2008) there are 22 repositories registered in ROAR (Registry of Open Access Repositories). Out of these 22, 15 IRs are functional. Both directories ROAR (http://archives.eprints.org/) and OpenDOAR (http://www.opendoar.org/) do not completely represent open access initiatives in India as they depend on voluntary registration. ROAR also includes archives in testing or development phase which may not be openly accessible. While ROAR can provide a graphical representation of the cumulative growth of records in Indian open access archives over the last few years, OpenDOAR has subject and content type classification potentially useful to librarians (Fernandez, 2006).

While this chapter outlined the institutional repositories and related issues, the next chapter discusses the literature consulted for the present study.

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