“If we do not plant knowledge when young, it will give us no shade when we are old”.

Lord Chesterfield
3.0 Introduction
3.1 History
3.2 Timeline of Open Access Movement (OAM)
3.3 Definitions
3.4 Features
3.5 Benefits of Institutional Digital Repository (IDR)
3.6 Institutional Digital Repository (IDR) and Digital Library (DL)
3.7 Role of Librarians in Institutional Digital Repository (IDR)
3.8 Declarations and Statements – International
3.9 Declarations and Statements - National
3.10 Major Initiatives
3.11 Major Projects
3.12 Problems and Prospects of Indian Institutional Digital Repository (IDR)
3.0 Introduction

This chapter gives the reader sufficient understanding of the area under investigation, there is an introduction to the origins, history, features, benefits, national and international initiatives, major projects etc. This section also discusses chronological development of open access movement (OAM) along with problems and prospects of Indian institutional digital repositories (IDRs). Also discusses role of librarian in IDRs environment and shows relationship with digital library (DL). This is intended to highlight discussions as to the purpose and audiences of IDRs. By looking at some of the common definitions of institutional repositories (IRs) it is hoped that the focus of the research will be more clearly defined in an area that still contains uncertainties.

3.1 History

Repositories, in their broadest sense, have existed ever since humans began collecting and storing important information and artifacts for safekeeping and long-term use. The long and rich history of libraries, museums, and archives provides the foundation for any type of repository program, but two contemporary developments in particular have helped shape the nature of today’s IDRs: the emerging knowledge management movement; and the maturing, but still rapidly advancing, technology of content or asset management in the digital information system. IDRs first appeared in 2002 as an institutional response to the increasing trend for scholars to post their research online, usually on their homepages (Johnson, 2002) but also in subject based repositories. Repositories are associated with a number of different scholarly initiatives and there is a large body of literature that describes open access repositories (OARs) and explores their role within scholarly communication and publishing. The development of OARs resulted in part from a need to address problems inherent in the present system of scholarly publishing. Few authors (Bergstrom & Bergstrom, 2004; Dewatripont et al., 2007; Tenopir, King & Association, 2000; McCabe, 2002; Falk, 2003) identified another reasons that rising cost of journals articles of commercial publishers led to the development of OARs. The other reasons behind the development of OARs are the problems addressed include the information explosion, delays in publishing and distribution inefficiencies, restrictive licenses, and copyright restrictions to authors. Jones, Andrew & MacColl (2006) have rightly identified the following elements that led to the development of IRs.

- E-thesis archives;
- Departmental e-print archives;
- Faculty practice of e-prints on personal web pages;
- Subject repositories;
- Need from institutions for preservation/presentation of research output;
Although the concept of open access (OA) has been around since the mid-1990s when the new, networked academic environment allowed researchers to communicate faster using the new digital communication channels. The knowledge management movement of the 1990’s influenced the development of IDRs in a number of significant ways in addition to establishing the nomenclature (Branin, 2005). The major driving force behind the development of IDRs has been the dramatic shift in scholarly communication especially within the past five to ten years. The basic model for scholarly communication has remained unchanged for over three hundred years. There were problems associated with the present system of scholarly publishing (Harnad, 2006c; Odlyzko, 2006). The advent of the internet in the first half of the 1990s and digital technologies has enabled information to be accessed and disseminated far more easily than ever before. As a result, traditional publishing models are shifting and new models of scholarly communication are evolving. Different open access (OA) models are being developed and OAR has emerged as a new tool to provide access, manage costs, and manage an organization’s scholarly output, especially at colleges and universities.

The history of institutional repositories (IRs) is relatively short, with the first discipline based repositories being implemented in the early ‘90s. Scientific journal was begun in 1665 to enable researchers sharing their work quickly and widely and to establish the priority of researchers investigating the same problem. Before OARs, the emerging technologies like File Transfer Protocol (FTP), Gopher, and the World Wide Web (WWW) were used to increase availability of scholarly material by lowering the barriers to distribution. The first published proposal for an institutionally focused repository was made by Okerson & O'Donnell (1995), writing for the Association of Research Libraries (ARL). Jones, Andrew & MacColl (2006) traced the first development of the idea of a repository of scholarly publications to the early 1990’s. It was Paul Ginsparg, a physicist at Los Alamos National Laboratories in the US who in 1991, for the first time founded the Internet's first scientific preprint service, arXiv, allowing scientists to share ideas prior to publication. It (arXiv) provides OA to e-prints in Physics, Mathematics, Computer Science and Quantitative Biology. Other early repositories were also discipline based, such as:

- EconPapers (Economics working papers);
- CogPrints (Cognitive psychology); and
- PubMed Central (Biomedical and life sciences).

Three years later, cognitive science professor Steven Harnad posted on the Internet (Virginia Tech mailing list in 1994) what he called a “subversive proposal,” asking researchers to immediately start self-archiving - depositing papers in a publicly accessible repository - is a landmark in the history of OA. He introduced Psycholoquy,
the first peer-reviewed scientific journal on the internet, which paved the way for free academic publishing on the web after 1993. Jones, Andrew & MacColl (2006) cite the creation of the Open Archives Initiative in 1999 as being a major factor in the rise of institution based repositories. This raises the question of whether an author should deposit their research in the institution or discipline repository. In addition, several Open Source Software (OSS) communities have formed to create successful digital repository software that is available for free. And now several digital repository software products are available on open source domain. In 2002, two seminal events occurred when the Massachusetts Institute of Technology (MIT) collaborated with Hewlett-Packard (HP) Corporation to launch an open-source institutional repository software entitled ‘DSpace’ and the SPARC (Scholarly Publishing and Academic Resources Coalition) published, “The Case for IRs: A SPARC Position Paper”(Crow, 2002a). The following are the list of key events in the history of OARs:

1999: Sante Fe Convention which resulted in the agreement upon a framework for interoperable archives, now known as the Open Archives Initiative (OAI).
2001: Launch of Eprints by the University of Southampton.
2002: Launch of DSpace by Massachusetts Institute of Technology.

3.2 Timeline of Open Access Movement (OAM)

The Open Access Movement (OAM) is a social movement. The movement traces its history at least back to the 1960s, but became much more prominent in the 1990s with the advent of the digital communications, in particular the Internet. Before the advent of internet, File Transfer Protocol (FTP), Gopher, and the World Wide Web (WWW) were used to increase availability of scholarly material by lowering the barriers to distribution. With the spread of the Internet and the ability to copy and distribute electronic data at no cost, the arguments for open access gained new importance. It has since become the subject of much discussion among researchers, academics, librarians, university administrators, funding agencies, government officials, commercial publishers, and learned-society publishers. The major initiatives in the history of OAM have been highlighted chronologically. This is a list of landmark events in the history of open access (OA). The objective of this timeline is not to include all OA journals or all OA repositories or all recommendations made time to time. This study has included only the early pioneers that helped to prove the concepts. It also ignores individual books, articles, and speeches, no matter how important.
<table>
<thead>
<tr>
<th>Year</th>
<th>Major Events</th>
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<tr>
<td>1980</td>
<td>The first online-only, free-access journals (eventually to be called &quot;open access journals&quot;) began appearing in the late 1980s.</td>
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<tr>
<td>1990</td>
<td>Tim Berners-Lee wrote the first web client and server and published World Wide Web.</td>
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<td>1991</td>
<td>The first free scientific online archive was arXiv.org, started in 1991, initially a preprint service for physicists, initiated by Paul Ginsparg.</td>
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<td>1992</td>
<td>Entrez launched by the National Center for Biotechnology Information.</td>
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<td>1993</td>
<td>CERN launched its preprint server.</td>
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<td>1994</td>
<td>Self-archiving first proposed by Stevan Harnad.</td>
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<td>1994</td>
<td>The Human Genome Project launched its open access website.</td>
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<td>1994</td>
<td>The Social Science Research Network (SSRN) launched by Wayne Marr and Michael Jensen.</td>
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<td>1995</td>
<td>D-Lib Magazine launched.</td>
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<td>1996</td>
<td>Bermuda Principles issues by participants at the International Strategy Meeting on Human Genome Sequencing.</td>
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<td>1996</td>
<td>Networked Digital Library of Theses and Dissertations (NDLTD) launched by Virginia Polytechnic Institute and State University.</td>
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<td>1997</td>
<td>CogPrints launched by Stevan Harnad.</td>
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<td>1998</td>
<td>The American Scientist Open Access Forum was launched (and first called the &quot;September98 Forum&quot;).</td>
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<td>1999</td>
<td>The Open Archives Initiative (OAI) is launched in a meeting held in Santa Fe, USA to discuss mechanisms to encourage the development of open repository solutions and the integration and interoperability among the existing distributed and scattered e-print archives.</td>
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<tr>
<td>1999</td>
<td>Harold Varmus of the NIH proposed a journal called E-biomed.</td>
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<td>1999</td>
<td>The Open Archives Initiative and its OAI-PMH protocol for metadata harvesting were launched in order to make online archives interoperable.</td>
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<td>Year</td>
<td>Major Events</td>
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<tr>
<td>1999</td>
<td>BioMed Central announced plan to offer free online access to all its journals.</td>
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<tr>
<td>1999</td>
<td>Sante Fe Convention which resulted in the agreement upon a framework for interoperable archives, now known as the Open Archives Initiative (OAI).</td>
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<td>2000</td>
<td>BioMed Central, a for-profit open access publisher, was launched by the then Current Science Group.</td>
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<tr>
<td>2000</td>
<td>BioMed central published its first free online article.</td>
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<td>2000</td>
<td>DINI, the German Initiative for Networked Information (Deutsche Initiative für Netzwerkinformation) is a coalition formed by German Higher Education Infrastructure and Service Institutions.</td>
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<td>2001</td>
<td>Southampton University released Eprints, its OAI-compliant software for eprint archiving.</td>
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<td>2001</td>
<td>The Australian National University launched its E-Print Repository, the first OAI-Compliant institutional archive in Australia.</td>
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<td>2002</td>
<td>The Open Society Institute launched the Budapest Open Access Initiative.</td>
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<td>2002</td>
<td>MIT released DSpace, its OAI-compliant open-source software for archiving eprints and other academic content.</td>
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<td>2002</td>
<td>OA1ster launched by the University of Michigan Libraries Digital Library Production Services.</td>
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<td>2002</td>
<td>Creative Commons launched by Lawrence Lessig.</td>
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<td>2002</td>
<td>The Association of College and Research Libraries (ACRL) launched its scholarly communication initiative.</td>
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<td>2002</td>
<td>The Public Library of Science (PLoS) received a $9 million grant from the Moore Foundation for open-access publishing and announced its first two open access journals.</td>
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<td>2002</td>
<td>The Howard Hughes Medical Institute committed itself to cover the publications costs when its researchers published in fee-based open access journals, apparently the first foundation or funding agency to do so.</td>
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<td>Year</td>
<td>Major Events</td>
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<td>2002</td>
<td>Project SHERPA (Securing a Hybrid Environment for Research Preservation and Access) and Project RoMEO (Rights MEtadata for Open archiving) launched by JISC-FAIR.</td>
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<td>2003</td>
<td>The Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities was drafted and the World Summit on the Information Society included open access in its Declaration of Principles and Plan of Action.</td>
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<td>2003</td>
<td>FEDORA (Flexible Extensible Digital Object and Repository Architecture) version 1.0 was launched by the University of Virginia and Cornell University.</td>
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<td>2003</td>
<td>The Directory of Open Access Journals (DOAJ) launched by Lund University with funding from the Open Society Institute (OSI) and SPARC.</td>
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<td>2003</td>
<td>The Medical Library Association issued its Statement on Open Access.</td>
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<td>2004</td>
<td>The Australian Group of Eight, the country’s eight leading research universities, released a Statement on open access to scholarly information.</td>
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<td>2004</td>
<td>Thirty-two Italian university rectors signed the Berlin Declaration on Open Access to Knowledge and released the Messina Declaration.</td>
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<td>Year</td>
<td>Major Events</td>
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<td>2004</td>
<td>Google announced the launch of Google Scholar.</td>
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<td>2005</td>
<td>Participants at the 9th World Congress on Health Information and Libraries released the Salvador Declaration on Open Access, September 23, 2005.</td>
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<td>2005</td>
<td>University Grants Commission (UGC) drafted a policy framework entitled “UGC (Submission of Metadata and Full-text of Doctoral Theses in Electronic Format) Regulations, 2005”.</td>
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<tr>
<td>2005</td>
<td>The Royal Society for the Encouragement of Arts, Manufactures and Commerce published the Adelphi Charter on Creativity, Innovation and Intellectual Property, which articulated a positive vision of intellectual property and endorsed open access.</td>
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<td>2005</td>
<td>The Wellcome Trust began implementing its new open access mandate for Wellcome-funded research.</td>
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<td>2005</td>
<td>National Open Access Policy for Developing Countries known as Bangalore declaration, declared full Open Access to publicly-funded research publications.</td>
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<td>2006</td>
<td>SHERPA launched JULIET, a database of the open access policies adopted by funding agencies.</td>
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<td>2006</td>
<td>The Organization of Economic Cooperation and Development (OECD) issued Principles and Guidelines for Access to Research Data from public funding to implement its Declaration on Access to Research Data from Public Funding.</td>
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<tr>
<td>2006</td>
<td>The European Commission and nine European research institutions launched DRIVER, a large-scale, International knowledge infrastructure built on open access repositories.</td>
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<td>2006</td>
<td>Participants in the iCommons iSummit for 2006 released the Rio Declaration on Open Access.</td>
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<td>2006</td>
<td>The University of Nottingham (UK) and Lund University (Sweden) officially launched openDOAR.</td>
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<td>2006</td>
<td>Federal Research Public Access Act was introduced in US Congress.</td>
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<td>2006</td>
<td>CERN published a report outlining its project to convert all the toll-access journals in particle physics to open access.</td>
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<tr>
<td>2006</td>
<td>The Research Councils UK (RCUK) issued its long-awaited open access policy.</td>
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<tr>
<td>2007</td>
<td>MIT Open Courseware, an initiative of the Massachusetts Institute of Technology to put all of the educational materials from their undergraduate and graduate level courses online.</td>
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<td>2007</td>
<td>India’s National Knowledge Commission (NKC) released a report recommending an open access mandate for publicly-funded research.</td>
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<tr>
<td>Year</td>
<td>Major Events</td>
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<tr>
<td>2007</td>
<td>Sage and Hindawi struck a deal to launch a new line of full OA journals, marking Sage's first foray into gold OA.</td>
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<td>2007</td>
<td>SPARC and the DOAJ announced a project to develop standards for OA journals and provide help to publishers in meeting those standards.</td>
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<tr>
<td>2007</td>
<td>JISC and UKOLN launched SWORD 1.0 (Simple Web-service Offering Repository Deposit).</td>
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<tr>
<td>2007</td>
<td>The Directory of Open Access Journals launched a membership program.</td>
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<tr>
<td>2007</td>
<td>The Social Science Research Network (SSRN) officially launched the Humanities Research Network, a collection of OA repositories in different fields of the humanities.</td>
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<td>2007</td>
<td>Lund University launched Journal Info, an online tool to help scholars evaluate journals where they might submit their work.</td>
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<td>2007</td>
<td>JISC adopted an OA mandate for JISC-funded research in the April 2007 version of its grant guidelines.</td>
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<tr>
<td>2007</td>
<td>The UK Arts &amp; Humanities Research Council (AHRC) announced an OA mandate for AHRC-funded research.</td>
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<td>2007</td>
<td>The Canadian Institutes of Health Research (CIHR) announced an OA mandate for CIHR-funded research.</td>
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<tr>
<td>2007</td>
<td>The Howard Hughes Medical Institute (HHMI) announced its long-anticipated OA mandate for research publications by HHMI employees (the mandate took effect on 1 January 2008).</td>
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<tr>
<td>2008</td>
<td>The European Research Council (ERC) released the text of its OA mandate, which it adopted December 17, 2007.</td>
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<tr>
<td>2008</td>
<td>The US National Institutes of Health (NIH) released the text of its OA mandate.</td>
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<tr>
<td>2008</td>
<td>SPARC launched a new mailing list for discussing author rights.</td>
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<tr>
<td>2008</td>
<td>SPARC Europe and the Directory of Open Access Journals launched their Seal for Open Access journals program.</td>
</tr>
<tr>
<td>2009</td>
<td>The U.K Engineering &amp; Physical Sciences Research Council (EPSRC) revealed that it had adopted an OA mandate</td>
</tr>
<tr>
<td>2009</td>
<td>Peter Suber launched the OA tracking project (beta).</td>
</tr>
<tr>
<td>2010</td>
<td>Alhambra Declaration. From the participants in the meeting, Open Access to Science Information: Policies for the development of OA in Southern Europe</td>
</tr>
</tbody>
</table>
Year | Major Events
--- | ---
2010 | Cape Town Declaration in a meeting sponsored by CODATA International and the South African National Research Foundation
2011 | Ghent Declaration. From four participants at the meeting to launch OpenAIRE
2011 | The Washington Declaration on Intellectual Property and the Public Interest
2011 | The Open Government Declaration from The Open Government Partnership
2011 | The Denton Declaration: An Open Access Manifesto from the University of North Texas
2011 | The Washington Declaration on Intellectual Property and the Public Interest
2012 | The Paris OER (Open Educational Resources) Declaration from the UNESCO World OER Congress
2012 | The Croatia Declaration on Open Access from the Faculty of Electrical Engineering and Computing (FER) of the University of Zagreb
2013 | The Tasman Declaration from the inaugural New Zealand Australia Open Research Conference

Table 3.1: Timeline of Open Access Movement

3.3 Definitions

In a general sense, an Institutional Repository (IR) can mean many things. A library, an archive, or even a warehouse that stores an organization’s records falls under the broad definition of an IR. There is no common shared vision of what a digital repository is while its formal definition has changed over the last 25 years. The seventh edition of the Concise Oxford Dictionary, 1982 defines repository as a ‘receptacle; place where things are stored or may be found, museum, warehouse, store, shop; burial place’. The term “institutional repository” may have dissimilar meaning to different people (Allard, Mack & Feltner-Reichert, 2005). As the concept is rather new, there are diverse opinions on its meaning (Bailey, 2005). Early definitions emphasize a mission to collect and preserve unique institutionally produced material. The term repository as it refers to a storage unit is in itself well-known (Fowler, Fowler & Thompson, 1995). In February, 2008, new terms were introduced, namely the concept of a ‘digital repository’ (McHugh et al., 2007) and ‘trusted digital repositories (Harmsen, 2008). The basic concept is the same. Although all repositories share common attributes, but there are several forms of digital repository apart from institutional, including learning object repositories and research data repositories (Zuccala et al., 2007). That’s why suitable definitions are needed to adequately distinguish between them for the purposes of function, administration and investigation. There are several key definitions of institutional digital repositories
(IDRs) that are widely quoted has been given by several open access advocates. Foster & Gibbons (2005) defines it as “an electronic system that captures, preserves, and provides access to the digital work products of a community”. Many formal definitions for an IDR can be found in the literature, perhaps, the most relevant being the ones given by SPARC (Crow, 2002a), Clifford A. Lynch (Lynch, 2003) and Mark Ware (Ware, 2004). In a 2002 SPARC position paper, Crow (2002a) defined an institutional repository (IR) as

“a digital archive of the intellectual product created by the faculty, research staff, and students of an institution and made accessible to end users both within and outside of the institution, with few if any barriers to access”.

He further extends the definition by referring to IRs as ‘... digital collections capturing and preserving the intellectual output of a single or multi-university community’. Crow’s definition also focuses on a service rather than a physical storage area. This definition is one of the earliest in the literature, and so is considered influential. Another advocate Lynch (2003) defines it as follow.

 “[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 organizational commitment to the stewardship of these digital materials, including long term preservation where appropriate, as well as organizational and access or distribution”.

It is clear from above definitions that Crow emphasizes on the collection of material whereas Lynch on the services provided in support of access to materials. Bailey et al. (2006a) defines an IR as means of collecting and providing access to diverse, locally produced digital materials. Donovan & Watson (2008) describe IR as a means of collecting the intellectual digital outputs of an organization. Another study by Jones (2006) attempts to synthesize the key points of definitions of IR from the literature as being:

- Institutionally defined;
- Scholarly;
- Cumulative and perpetual (i.e. continuously open and available);
- Open and interoperable (Open Access and Open Archives Initiative compliant);
- Capturing and preserving events of campus life; and
- Searchable within constraints.

Ware (2004) adds OAI-compliance in his IR definition: An 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). Another expert (Rowland et al., 2004) is in support. In addition, most would include
long-term preservation of digital materials as a key function of IRs. Crow (2002b) is in support by characterizing an IR as open, interoperable, cumulative, and perpetual, contributes to the process of scholarly communication in collecting, storing and disseminating the scholarly content.

Repositories can take many forms, and all sorts of websites and databases could be considered to be repositories. So it may be concluded that IDRs are an electronic system of digital collections that captures, organize, preserve, and make accessible the intellectual output of a single institution or a group of institutions.

3.4 Features

To define any kind of feature set for any system it is necessary to think about the scope and objectives of the system and how it will be used in its target environment. Current thinking, IDR as a part of digital library system, suggests that the institutional repository should be able to meet the following criteria (Genoni, 2004; Johnson, 2002; Lynch, 2003).

- institutionally defined;
- scholarly;
- cumulative and perpetual;
- open and interoperable;
- digitally capture and preserve many events of campus life; and
- search with constraints.

SPARC Position Paper reported that an IR has main four characteristics mentioned above (SPARC, 2002a). Another expert (Gibbons, 2004a) identified five core features of IRs: “digital content; community driven and focused; institutionally supported; durable and permanent; and accessible content. A few other authors have identified the following characteristics of IDRs.

- A wide range of materials can be included (Prosser, 2003b); and
- The collection houses material in a digital format (Costanza, 2005).

On the basis of the above study, it may be concluded that generally an IDR should have the following common features mentioned below:

1. scholarly in nature;
2. contents is in digital form in a wide variety of types (text, audio, video, images, data sets);
3. community focus, where the community determines what is included in the repository;
4. institutional support, requiring collaboration across an organization;
5. durable (persistent URL for material), permanent contents that can be migrated over time; and
6. access to contents by a broad audience.
3.5 Benefits of Institutional Digital Repository (IDR)

There are many potential benefits an IDR can achieve and these exist at various levels, from the individual researcher to the university as a whole (Olivier, 2007). Several experts discussed and explained the advantages of IDR in several angles. Kircz (2005) believes an IR can become “a research tool in itself” and, for the institution, becomes “the central metabolic organ for knowledge”. The PALS study (Ware, 2004) indicated the following main IR uses: scholarly communication, education, e-publishing, collection management, long term preservation, institutional prestige, knowledge management and research assessment exercises. Another report (Gibbons, 2004b) identifies IR benefits as: stewardship, efficiencies, a scholarly showcase, wider distribution and a response to the crises in scholarly communication. In the ARL Spec Kit Survey (Bailey et al., 2006a), the top three reasons ARL libraries give for implementing IRs are institution-centered—to increase global visibility of, to preserve, and to provide free access to the institution’s scholarship. They, in the same survey, identified three main benefits of having an IR: visibility and increased dissemination of the institution’s scholarship; free, open, timely access to scholarship; and preservation and stewardship of digital content. Another study (Heijne, 2005) reported that repositories can hold the intellectual record of the universities output, increase access to institutional research and thus its impact and provide input to national research outputs, as has been evidenced by the DARE initiatives in the Netherlands. Yeates (2003) also listed the benefits of IRs, such as: extending the range of knowledge sharing, existing investment in information and content management systems can be leveraged; and more flexible ways of scholarly communication are available. A few other researchers (Dill & Palmer, 2005; Gibbons, 2004c; Lynch, 2003; Prosser, 2003b; Crow, 2002a, 2002b; Swan, 2005) advocated that IRs are ideal for long-term preservation and can provide an interoperable preservation system for working documents or for research data. Banks (2006) argues that OARs represent an exciting possibility for both the preservation and retrieval of grey literature. To summarize, the potential uses of an IR are: scholarly communication; management and storage of learning materials, electronic publications and research collections; preservation of digital research work; building university profile by showcasing academic research work; providing an institutional leadership role for the library; research assessment; encouraging open access; and housing digitized collections (Barton & Waters, 2004). This study discussed and explained the benefits of IDR mainly in four areas mentioned below:

- Benefits to Institutions;
- Benefits to Users;
- Benefits to Researchers; and
- Benefits to the Society.
A. Benefits to Institutions

Several compelling reasons exist for why an organization would want to establish an IDR. If an IDR is right for an organization, the reasons likely include some of the following ones. For teaching institutions, the advantages of a repository for teaching and learning purposes can be highlighted – a place for the creation and stewardship of teaching materials and for their access by learners.

A.1 Raising the institutional profile

Institutional Repositories have potentially significant benefits for institutions if they are integrated holistically into university frameworks. The most prominent reason is the increase in visibility and impact of research output (Jones, Andrew & MacColl, 2006; Crow, 2002b; Gibbons, 2004b). “Institutional repositories, by capturing, preserving, and disseminating a university’s collective intellectual capital, serve as meaningful indicators of an institutions’ academic quality” (Crow, 2002a). If this increased visibility is associated with high quality, the results may be tangible benefits to the institution in the form of continued or new public and private funding, and increased applications from potential students and staff (Prosser, 2004). Bjork (2004) states that IRs can be devoted to find alternative marketing channels for universities. The other experts (Prosser, 2003a; Johnson, 2002) stress the benefits of gaining broad access, dissemination and federated research for each institution, better impact for research, visibility for institution, advertisement, funding, measurement of impact for each institution through centralization of content. The other benefits for the academic institutions are as the following (Crow, 2002a, 2002b; Chan, 2004): a new scholarly publishing paradigm that wrests control from publishers and puts it back in the hands of the academy; increased visibility, prestige, and public value; maximal access to the results of publicly funded research; increased numbers and diversity of scholarly materials that are collected and preserved.

A.2 Total intellectual output

At the other end of the publishing scale, Hall suggests that IRs may become the new university presses. In this scenario, local peer review and quality control will evolve into full scale publishing ventures (Hall, 2003).

A.3 Teaching and learning

Teaching and learning can be supported by links to IR content from virtual learning environments (VLEs) and the library catalogue (Day, 2003). Lecture notes, handouts, presentations and images are all suitable content. Course materials can be shared, ‘re-purposed’ and re-used. Crow (2002a) refers to the benefits of saving “non-ephemeral
faculty-produced teaching material’. Lynch (2003) is in support and argued for setting up an IR for improving teaching and learning.

A.4 Supporting institutional record keeping

It facilitates records management and reporting and supports the institutions obligations regarding health and safety record-keeping, freedom of information, and accountability (Heery & Anderson, 2005). Other experts (Swan et al., 2005b) suggest that the potential compilation of an ‘institutional CV’ is “one of the most persuasive points for an institution considering setting up an archive”. Another study (Prosser, 2003a) is in support by saying that it can act as a CV.

A.5 Cost savings

Librarians hope that, in the longer term, widespread adoption of OA publishing will allow savings to be made from institutions’ subscriptions to academic journals. However, this is unlikely to occur until a ‘critical mass’ of content has been achieved (Pinfield, 2002). This outcome, of course, denies the complementarily of OA and traditional publishing models. Shearer (2003) states that IR can be useful for helping developing an effective and economic scholarly communication in the developing countries. Johnson (2002) states that OARs are a practical, cost effective, and strategic means for institutions to build partnerships with their faculty to advance scholarly communication. It reduces the cost of accessing and obtaining scientific information (Dill & Palmer, 2005).

B. Benefits to Users

There are many benefits for users/or authors who utilize an open archival system such as an institutional digital repository. Here are some common ones mentioned below:

B.1 Dissemination and impact

Academic authors produce research papers to share knowledge. They do this for their careers and for personal satisfaction. Success is achieved by disseminating work widely and quickly, with the hope of achieving the maximum citation impact (Hubbard, 2003; Pinfield, 2004; Harnad, 2006c, 2006d; Pickton, 2005). Studies have shown that “the usage of open access research is 330% greater than for toll-access research” (Lawrence, 2001; Harnad, 2003), and the more an article is downloaded, the more it is eventually cited (Antelman, 2004). Conversely, the more restrictive the access arrangements, the less an article will be read (Kurtz, 2004). A primary benefit of OA archiving is increased citation to and impact of your research. As Peter Suber in an interview says, OA is the microphone of your research (Poynder & Suber, 2007)
and this view is supported by other experts (Kurtz et al., 2005; Odlyzko, 2002). Harnad & Brody (2004) explained that OA can only increase both usage and impact. Jacso (2006) believes that OARs are beneficial for all the stakeholders, including publishers, editors and authors as they can substantially increase their impact and the impact factor for the source journals. Chan (2004) opines that OARs facilitate more timely and OA to research and scholarship and maximize the potential research impact of archived publications.

B.2 IDR contents

Cervone (2004), compared with traditional print publishing, reported that the IR offers the ability to store and provide access to a much wider variety of material. Researchers produce articles and reports, but also “original art, grant proposals, maps, radio/TV interviews, motion pictures, music scores, photographs, consulting (technical) reports, technical drawings, and poster session displays”. All of these, once converted to digital format, might be deposited in the IR. Moreover, supplementary material such as supporting evidence and data, interim reports and draft versions of papers may also be stored.

B.3 Feedback and commentary

The content of a repository need not have been through a peer review process. In some disciplines it is conventional for researchers to make preprints available to their own research community in order to receive comments or assert priority (Hubbard, 2003). Repositories that serve subjects with these cultures have been found to be particularly successful at attracting content.

B.4 Added value services

IR systems can produce hit counts on papers, personalized publication lists and citation analyses (Hubbard, 2003; Pinfield, 2002). These tools can create useful post-publication quality indicators (Pinfield, 2004). For the individual, monitoring download activity provides a measure of the impact of their research (Swan et al., 2005b).

B.5 Personal and promotional uses

IR can also work as a tool for publication of research work (Foster & Gibbons, 2005). On these pages we can list our publications and showcase our work – with direct links to the full-text of our research papers in the institutional repository. It can act as an advertisement for funding sources and industrial sponsors (Prosser, 2003a).
B.6 Networked information

The IR offers advantages to both ‘academics-as-authors’ and ‘academics-as-readers’ (Gadd et al., 2003c). The same system that facilitates the dissemination of academics’ own work also enables them to gain access to the work of others. Internal and external cross-searching is invaluable to multidisciplinary subjects such as the social sciences (Crow, 2002a). Repositories that are OAI-PMH compliant are effectively networked together to form a worldwide, openly accessible resource. Lynch suggests there may be benefits in ‘federating’ IRs to enable cross repository search, backup, preservation and disaster recovery capabilities (Lynch, 2003). He envisages ‘consortial’ or ‘cluster’ IRs in which multiple universities will share the cost and workload of IR maintenance. Crow suggests that multiple mirrored and distributed repositories, varying in location and format, are the best practice model for digital preservation (Crow, 2002b). Swan et al. (2005b) suggest that a ‘harvesting’ system would be an optimal way of providing access to such a distributed network. Peters lists other advantages of the consortial approach, namely, increased economies of scale, more comprehensive subject coverage, potential for improved authority control, the avoidance of redundancy (of both expertise and computing capacity) and savings in harvesting effort (Peters, 2002).

C. Benefits to Researchers

IDRs are beneficial to all researchers and entire research community. IDRs are more flexible archives in terms of use, offering greater security and long term’s access to researcher’s own material. It maximizes research impact and access and research items get a permanent URL (Uniform Resource Locator) which

- maximise the accessibility …
- maximise the availability …
- enable the discoverability …
- enable increased functionality …
- enable longterm storage and curation …
- enable other potential benefits …

D. Benefits to the Society

As scholarship is shared, society at large is benefited. It

- provide access to the world’s research;
- provide local access to global research;
- ensures long-term preservation of institutes’ academic output; and
- can accommodate increased volume of research output (no page limits, can accept large datasets, ‘null-results’, etc.).
To summarize, Prosser (2003a) encapsulates ‘By working together we have the power and ability to change this process (scientific publishing) to the advantage of our authors and researchers, and society as a whole’. The following table (3.1) summarizes the benefits of IDRs among different stakeholders.

<table>
<thead>
<tr>
<th>Communities and Stakeholders</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutions</td>
<td>Increases visibility and prestige; acts as an advertisement to funding sources, potential new faculty, raising the institutional profile, total intellectual output, teaching and learning, supporting institutional record keeping, cost savings, unique place of resources.</td>
</tr>
<tr>
<td>Users</td>
<td>Dissemination and impact, IR content, feedback and commentary, added value services, personal and promotional uses, networked information.</td>
</tr>
<tr>
<td>Researchers</td>
<td>Provide a central archive of their work, increase the dissemination and impact of their research, more control over their work.</td>
</tr>
<tr>
<td>Society</td>
<td>Provide access to the world’s research; ensures long-term preservation of institutes’ academic output.</td>
</tr>
</tbody>
</table>

Table 3.2: Benefits of IDRs among Different Stakeholders

So there are a number of justifications for creating IDR. The argument for a repository is, of course, quite a new one. On the basis of the discussion it can be summarized that IDRs are essential for enhancement of knowledge at the academic institutions and society as a whole.

### 3.6 Institutional Digital Repository (IDR) and Digital Library (DL)

With the expression ‘IDR’ goes along the idea of creating a ‘DL’. The distinction between institutional or disciplinary is due to the scope of a repository or a digital library whether it serves a single institution or collects materials belonging to a specific discipline. The studies (Jones, 2006; Poynder, 2006) suggest that IRs is not yet well established and the only distinction given is the institutional focus of the service or collection. Several other experts (Borgman, 2003b; Amos, 2006; Lagoze, 1995) reported that IRs is firmly based within the theoretical framework of digital libraries. Another study (Jones, Andrew & MacColl, 2006) is in support and in the light of Ranganathan’s (1936) five laws of library science, they indicated that digital libraries can only be considered as within the traditional scope of libraries based on the condition of selection, i.e. materials are included in a collection subject to a
collection development policy. This opinion is in common with IR practitioners who see lack of clear collection policies as a barrier to further institutional repository development (Salo, 2008). Another study (Heery & Anderson, 2005) distinguished digital repositories from digital libraries in defining a digital repository as having the following characteristics:

- Content is deposited in a repository, whether by the content creator, owner or third party;
- The repository architecture manages content as well as metadata;
- The repository offers a minimum set of basic services e.g. put, get, search, access control; and
- The repository must be sustainable and trusted, well-supported and well-managed.

Another researcher (Jones, 2007) in his book clearly stated that major differences between these types of repository can be identified as the expectation of who will be populating the system and the scope and purpose of the collection. In digital libraries, information is likely to be added by specialist cataloguers with a professional interest whereas in IRs information is added by the author. He concluded that in digital libraries, collections are based on a topic or material type regardless of the location of the author but in IRs the collection is based on the location and or employer of the author. The other differences may be as follow:

- IDRs are organized around a particular Institutional community while DLs may be built around any number of organizing principles (often topic, subject, or discipline);
- IDRs are dependent upon the voluntary contribution of materials by scholars for the content in their collection while DLs are the product of a deliberate collection development policy;
- IDRs are mainly repositories and therefore may only offer limited user services while DLs are typically include an important service aspect (reference and research assistance, interpretive content or special resources); and
- In DLs any document which is the subject area of the institution may be uploaded whether it is belong to institution or not, but in case of IDRs only production of particular institute created by its members only may be uploaded.

So it is quite clear from the study that the IDRs and DLs differ each other by the way of description of the contents. The structure and organization is different too.

### 3.7 Role of Librarians in Institutional Digital Repository (IDR)

Librarians have always been entrusted with keeping and preserving the human record. Until recently, they have been seen as passive gatekeepers of information. They were considered as mediator of information but now are considered as knowledge generator and act as intermediaries between faculty and the development team. But the evidence of considered literature seems to stress the importance of librarians as key stakeholders: their traditional roles are extended, but there are also new commitments. However, their roles and training has not been so deeply investigated.
until the last few years. Open access movement (OAM) and the development of institutional repositories (IRs) had posed several questions about the role and skills required by librarian. Libraries and their staff play a significant role in the development of IRs. “Linking people to resources” (O'Brien, 2005) has been the task of information specialists for many years. The role and core competencies of library professionals have been the subject of recent debate (Chan, 2006; Mullins & Linehan, 2005; Sargeant & Harrison, 2004). Rockman (2005) claims that reference librarians are “natural partners to be involved with institutional repositories” because of “their service orientation, subject experience as knowledge managers, and communication skills”. Several studies (Horwood et al., 2004; Jenkings, Breakstore & Hixson, 2005; John, 2005; Krishnamurthy, 2007) discussed the role of librarians in the development and promotion of IRs. The following are the broad headings under which roles of librarians in IRs environment have been discussed.

A. **Encouraging authors to contribute contents with self archiving**

Academics are not familiar with IRs system and find it difficult to submit article to the IRs system. So academics need librarians’ help in this submission process. Several studies show that faculty members do not carry out self-submission. Swan & Brown (2005) found that the majority of authors were unconscious about the benefits of publishing their works in IR and are facing problem in taking on contents from graduate students, faculties and researchers (McDowell, 2007). Genoni (2004) stated that it is the responsibility of library staff to encourage members of the university to deposit material into the IR. He further advocated that submitting outputs of researchers on behalf of those who cannot self archive their materials is another solution to make them contribute to IRs. Bailey (2005) concentrates on reference librarian roles in advocacy of IR materials. Another study (Bell, Foster & Gibbons, 2005) is in support and lists the practical steps useful to improve faculty participation in repository projects and to increase access to grey literature for all scholars and addresses a current problem regarding faculty contributions. Another expert (Drake, 2004) remarks that librarians are taking leadership roles in planning and building these repositories, fulfilling their roles as experts in collecting, describing, preserving, and providing stewardship for documents and digital information.

B. **Promotion and marketing**

Promotion and marketing of IRs has become an established role of librarians (Allard, Mack & Feltner-Reichert, 2005). Marketing role is indeed the most recognized and agreed role for librarians, since it has a strong weight in case studies and papers (Buehler & Boateng, 2005; Phillips, Carr & Teal, 2005; Graham, Skaggs & Stevens, 2005). It is essential that librarians be familiar with the library repository to efficiently promote IRs. IRs concept may need more explanation, marketing and a multiplicity of concerns by librarians (Jenkins, Breakstone & Hixson, 2005).
C. Collection development and management

Librarians have a critical role in the collection management and development process. In managing collection, they perform a new role as collection administrator (Branin, Groen & Thorin, 2000; Lee, 2000; Pettijohn & Neville, 2003; Gibbons, 2004; Bailey, 2005). Literature also indicates that librarians are facing problems in collection management because the acquisition of collections is in the hands of faculties (Allard, Mack & Feltner-Reichert, 2005). Genoni (2004) also writes about the need for librarians to approach the task of content development in repositories by applying some of the procedures and skills associated with collection management. Because they can add authors or give permission to authors to self-archive materials in the repository (Crow, 2002a; Harnad, 2001; Lynch, 2003).

D. Policy and budget

One of the most vital and often unexplored issues of IDRs is creating policy. Several decisions related to IDRs policy need to be taken before setting up repository. Bailey (2005) concentrates on role of librarian in the creation of policies and procedures about metadata, workflow, interfaces etc. This issue has also been discussed by other experts (Allard, Mack & Feltner-Reichert, 2005). Genoni (2004) discusses copyright and journal embargo policies along with format issue. Another study (Chan, Kwok & Yip, 2005) reports that librarians help in creating IR policies and procedures for content management and contact publishers to investigate their policies and license agreements where authors refuse or fail to do it. They encourage faculty members in self-submission process and make them aware about copyright issues and new technologies (Swan & Brown, 2005; McDowell, 2007; Genoni, 2004). Other experts (Gibbons, 2004; Wheatley, 2004) identified another important issue e.g. digital preservation and discussed their role in this particular context. They know better than anyone else, how to reduce the budgets and increase the cost of resources in running an IR (Chang, 2003; Phillips, Carr & Teal, 2005).

E. Providing training for search technique

Librarians are playing a crucial role in providing training to IDRs users (Allard, Mack & Feltner-Reichert, 2005; Bailey, 2005). They help users and authors to fill content into the IRs and guide them to extract from IRs. They should teach users that how they can recruit search techniques to use the available resources (Jenkins, Breakstone & Hixson, 2005). It is essential that librarians be involved in planning, implementation and operation of IR. In the absence of a core training programme for repository managers, repository development work is now falling into the hands of reference librarians (Chan, Kwok & Yip, 2005).
F. Developing standard metadata along with catalogue and Indexing system

Selection of metadata for IDRs system is important and librarians have a role in metadata selection (Bailey, 2005; Allard, Mack & Feltner-Reichert, 2005). Abrizah (2010) pointed out creation of guidelines concerning metadata as a task for librarian. Another study (Beall, 2005; Genoni, 2004) suggests that librarians should prepare a comprehensive system for cataloging and indexing the materials in order to provide IR metadata, such as local controlled vocabularies, to be negotiated with users. Gibbons (2004) is in support by saying that they should design metadata standards for authors. Another researcher (Genoni, 2004) outlines that review the metadata of content to maintain the quality of record. They add content in databases and catalogues that will increase the chance of researcher to find their relevant resources (Jenkins, Breakstone & Hixson, 2005). Beside, providing good search tools and cataloguing the repository materials will make IR contents more accessible.

G. Review submission for quality of contents

Quality of contents is another issue in repository development and this verification is done by the librarian at the different stages of submissions (Genoni, 2004; Allard, Mack & Feltner-Reichert, 2005). Lynch (2003) believes that the IR environment would be orderly if librarians can be answerable to this role because some IRs does not want to take author’s assistance due to the need of quality checks.

H. Understanding of software and making awareness about new technologies

Literature indicates that selection of software for creating IDRs is crucial factor and librarians are the efficient person and have enough knowledge about this issue. Allard, Mack & Feltner-Reichert (2005) identifies several roles such as understanding software in order to design repositories in their libraries. Another study (Abrizah, 2010) is in support by saying that they provide training authors use of IR software. Another group of authors (Swan & Brown, 2005; McDowell, 2007; Genoni, 2004) indicate that they make authors aware about new technologies. There is no doubt to entrust this responsibility to librarians since history shows librarians have navigated the way in using and designing new technologies. Librarians are expert in adjustment with new changes and professional in development of the environment (Branin, Groen & Thorin, 2000).

So it seems logical that librarians would be strong advocates for establishing IDRs as they are the main designers, promoters and maintainers of IDRs. IDRs development has resulted in new responsibilities for academic librarians in planning, management, and technical development. To meet these demands, some established positions have been modified; additional technical lines, such as research programmers, have been added; and new types of positions have been created, such as: repository coordinator;
intellectual property specialist; data research librarian. They revise or expand standards and procedures and introduce new informational products and services for the users. They teach users how they can recruit search techniques to use the available resources. They help in building search interface for searching and accessing the materials in repositories. They create controlled vocabularies and thesauri; create preservation methods and techniques; and select, organize, review and filter the repositories e-content quality. So whatever may be environment/or platform their roles will remain the same as it was before in traditional library.

3.8 Declarations and Statements - International

The following section briefly overviews some of the key IR initiatives and projects worldwide arranged alphabetically. This overview does not intend to be exhaustive as globally there are currently many repository development projects. The aim is to provide an overview of some of the major initiatives, in particular those that have led the way and served as an example for other repository projects. In order to popularize the OA initiatives amongst the various stakeholders, some important declarations and statements have already been made during the past decade where the world’s leading research institutions representing from developed and developing countries have agreed upon the OA mandate. The following declarations have demonstrated that the OAM has continued gaining momentum from library and information associations, research funding agencies, scholarly societies, and institutions of higher education.

A. Association of College & Research Libraries (ACRL)

ACRL, a division of the American Library Association, is a professional association of academic librarians and other interested individuals. It is dedicated to enhancing the ability of academic library and information professionals to serve the information needs of the higher education community and to improve learning, teaching, and research. ARL released its Principles and Strategies for the Reform of Scholarly Communication, endorsing open access (http://www.ala.org/ala/mgrps/divs/acrl/about/whatisacrl/index.cfm).

B. Association of Learned and Professional Society Publishers (ALPSP)

The ALPSP is the international trade association for not-for-profit publishers. It was formed in 1972. Today it is the only international trade association representing all types of nonprofit publishers, and is the largest trade association for scholarly and professional publishers. Its mission is to play an active part in shaping the future of academic and professional communication, promoting 'Scholarship-Friendly Publishing'. It serves, represents and strengthens the community of not-for-profit
publishers, demonstrating their essential role in the future of international academic and professional communication (http://en.wikipedia.org/wiki/Association_for_Learned_and_Professional_Society_Publishers).

C. **Australian Research Council (ARC)**

The ARC encourages researchers deposit their research in a repository within a six-month (6) period. Any research outputs that have been or will be deposited in appropriate repositories should be identified in the final report (http://www.arc.gov.au/pdf/DP08_FundingRules.pdf).

D. **Australian Research Information Infrastructure Committee (ARIIC)**

The ARIIC was established by The Hon Brendan Nelson MP, Minister for Education, Science and Training, to advise on the development of research information infrastructure for Australia. Its role is to advise the Government on the information infrastructure requirements of the Australian higher education sector and their intersection with the wider information and technical infrastructures used by the scholarly and research community. In order to produce high quality research, researchers must have access to research data, including large specialised data sets, and to the products of research, including scholarly publications (http://www.dest.gov.au/NR/rdonlyres/1765E617-B428-4A84-8678-4357ED448EB1/5571/ARIIC1.pdf).

E. **Berlin Declaration**

The Declaration came out of a three-day conference hosted by the Max Planck Society in Berlin in October 2003, where Germany, France and Switzerland signed what has become known as the “Berlin Declaration”. ’The Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities’ is a clear commitment to encouraging European researchers to change their publishing habits. The Berlin Declaration promotes the Internet as a functional instrument for a global scientific knowledge base and human reflection and to specify measures which research policy makers, research institutions, funding agencies, libraries, archives and museums need to consider." The Berlin Declaration emphasis on promotion of the new OA paradigm to gain the most benefit for science and society and also intend to make progress by encouraging researchers to publish their work according to the principles of the OA paradigm" (http://oa.mpg.de/lang/en-uk/berlin-prozess/berliner-erklarung/).

F. **Bethesda Statement**

The following statements of principle were drafted during a one-day meeting held on April 11, 2003 at the headquarters of the Howard Hughes Medical Institute in Chevy Chase, Maryland. It resulted in the “Bethesda Statement on Open Access Publishing”,

85
which extended the definition of open access. It is the statements of principle about the steps for all parties involved to take to promote the transition to open access publishing. The Statement also introduces the requirement that open access documents be deposited in digital repositories in "well-established" organizations, as opposed to author home pages or digital archives whose long-term prospects are in doubt. These repositories will engage in "long-term archiving." In other words, they will digitally preserve open access documents (http://www.earlham.edu/~peters/fos/bethesda.htm).

G. Bermuda Principles

One of the first international statements on open access is the Bermuda Principles, published in 1996. The Bermuda Principles, developed by scientists involved in the International Human Genome Sequencing Consortium and their funding agencies, establish a basis for the rapid and free sharing among scientists of pre-published data on gene sequences. Their intent was to make entire genome sequences freely available in the public domain for research and development, in order to maximize benefits to society (http://eprints.qut.edu.au/9671/1/9671.pdf).

H. Budapest Open Access Initiative (BOAI)

In December 1-2, 2001, the Open Society Institute (OSI) organized a meeting in Budapest; the outcome of this meeting was the Budapest Open Access Initiative (BOAI). It is a worldwide coordinated movement to make full-text online access to all peer-reviewed research free for all. The purpose of the meeting was to accelerate progress in the international effort to make research articles in all academic fields freely available on the internet. It is at once a statement of principle, a statement of strategy, and a statement of commitment. The BOAI recommends two complementary strategies e.g. Self-Archiving and Open-access Journals (http://www.soros.org/openaccess). The initiative states that by Open Access they mean: “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” (http://www.soros.org/openaccess/read.shtml).

I. European Commission (EC)

In January 2006, the European Commission (EC) recommended that research funding agencies have a central role in determining researchers’ publishing practices. Following the lead of the National Institute of Health (NIH) and other institutions, they should promote and support the archiving of publications in open repositories (http://ec.europa.eu/research/science-society/pdf/scientific-publication-study_en.pdf).
**J. European Research Consortium for Informatics and Mathematics (ERCIM)**

ERCIM - the European Research Consortium for Informatics and Mathematics - aims to foster collaborative work within the European research community and to increase co-operation with European industry. Leading research institutes from nineteen European countries are members of ERCIM (http://www.ercim.eu/). ERCIM provides advice and strategic information to the EC and to member states, coordinates much IS/IT research across Europe and runs R&D projects. ERCIM also acts as the European host of W3C, the World Wide Web consortium (http://www.stfc.ac.uk/Sites%20and%20Facilities/3599.aspx).

**K. Ghent Declaration**

The Ghent Declaration, an initiative of the reviewers of the OpenAIRE project, encourages a move from open access to research and scholarship towards the creation and use of open data, open source software and open educational resources. The declaration was written in the context of OpenAIRE's launch event and first year's review held on December 2-3, 2011, in Ghent, Belgium. The partners of OpenAIRE welcome the declaration and will undertake all efforts to support full deposit of articles according to the OA mandate (http://www.openaire.eu/en/component/content/article/76-highlights/223-seizing-the-opportunity-for-open-access-to-european-research-ghent-declaration-published?format=pdf).

**L. Information Access Alliance (IAA)**

The Information Access Alliance (IAA) was formed in 2003 by leading US national library organizations to address problems in the scholarly and legal publishing markets, which are characterized by insupportably high prices, accelerating industry consolidation, and anti-competitive practices by some large publishers. IAA supports a competitive, vibrant, and diverse academic publishing marketplace in which the interests of research, academic institutions, and the public are well served (http://www.informationaccess.org/about/index.shtml).

**M. International Consortium for the Advancement of Academic Publication (ICAAP)**

The ICAAP was launched as a research and development organization within Athabasca University, devoted to the advancement of electronic scholarly communication. Its mission includes technological support, production, publication, and enhancement of scholarly journals and educational resources, with the goals of greater accessibility, recognition and communication within the academic
community. The ICAAP web site offers a searchable database of journals (http://www.icaap.org/about.php).

N. International Federation of Library Associations and Institutions (IFLA)

IFLA recognizes that achieving affordable, global access to scholarly information and research documentation will require a great deal of commitment and a variety of strategies. IFLA strongly supports the Open Access movement and welcomes the launch of many OA compliant publications. IFLA is committed to ensuring the widest possible access to information for all peoples in accordance with the principles expressed in the Glasgow Declaration on Libraries, Information Services and Intellectual Freedom. IFLA recommends that publicly funded research data should be openly available through internet free of cost (http://archive.ifla.org/V/cdoc/open-access04.html).

O. International Open Source Network (IOSN)

IOSN is an initiative of APDIP (Asia-Pacific Development Information Programme) and supported by the International Development Research Centre (IDRC) of Canada. It promotes the adoption of free/open source software, open standards, and open content for sustainable human development in the Asia-Pacific region. IOSN, initiated in 2003, is a network with a small secretariat based at the UNDP Regional Centre in Bangkok and three centers of excellence – IOSN ASEAN+3, IOSN PIC (Pacific Island Countries), and IOSN South Asia, based in Manila, Suva and Chennai respectively (http://www.apdip.net/projects/2003/iosn).

P. National Institutes of Health (NIH)

In the United States, the National Institutes of Health (NIH), the world’s largest funder of medical research, strongly encourages their funded researchers to submit their articles to PubMed Central as soon as possible after publication. The NIH urges all the researchers it funds to make their research articles publicly available in the NIH digital repository. The NIH Public Access Policy ensures that the public has access to the published results of NIH funded research (http://grants.nih.gov/grants/guide/notice-files/NOT-OD-05-022.html).

Q. Organisation for Economic Co-operation and Development (OECD)

The OECD provides a forum in which governments can work together to share experiences and seek solutions to common problems. The said organization work with governments to understand what drives economic, social and environmental change. The mission is to promote policies that will improve the economic and social well-being of people around the world. It measures productivity and global flows of
trade and investment. It also analyses and compare data to predict future trends (www.oecd.org/documents/0,2340,en_2649_34487_25998799_1_1_1_1,00.html).

R. Public Library of Science (PLoS)

The Public Library of Science (PLoS) is a nonprofit organization of scientists and physicians committed to making the world's scientific and medical literature a public resource, founded in 2000. The goals are providing unlimited access to the full text of latest scientific research to scientists, librarians, publishers, physician, patient, or student anywhere in the world (http://www.plos.org/about/index.php).

S. Salvador Declaration


- to promote broad and equitable access to national and international sources of information and knowledge, strengthening the necessary infrastructure through movements such as "open access";
- to establish solutions that respond to the needs of broad and equitable access to goods and services of information and intellectual property rights; and
- to strengthen health systems and services to enable the access and application of knowledge in an efficient, effective and socially just manner.

T. Scholarly Publishing and Academic Resources Coalition (SPARC)

SPARC, is an international alliance of academic and research libraries working to correct imbalances in the scholarly publishing system. It was developed by the Association of Research Libraries (ARLs). SPARC serves as a catalyst for action, helping to create systems that expand information dissemination and use in a networked digital environment while responding to the needs of academe. Its pragmatic focus is to stimulate the emergence of new scholarly communication models that expand the dissemination of scholarly research and reduce financial pressures on libraries (http://www.arl.org/sparc/about/index.shtml).

U. Scottish Declaration

The project work overlapped with the signing of the Scottish Declaration on Open Access by the University of Stirling, and this emphasized the importance to the University of providing access to the research that the University produces. The Declaration states that: ‘We believe that the interests of Scotland will be best served
by the rapid adoption of open access to scientific and research literature.’ The declaration supports the general principles of open access and encourages researchers to deposit copies of their work including PhD theses in an IR (http://scurl.ac.uk/WG/OATS/declaration.htm).

V. UK Research Councils

The UK Research Councils (RCUK), the public agencies funding research in all disciplines, issued its “Position Statement on Access to Research Outputs” in June, 2005. The draft policy calls for mandating the RCUK grantees to deposit the results of their research, published articles and conference presentations, in open repositories at the earliest opportunity. Research Councils UK has undertaken extensive consultation with key stakeholders and aims to be able to publish an updated position statement in early 2006 (http://www.sqw.co.uk/file_download/171).

W. Washington D.C. Principles

Founded in March 16, 2004, a statement by 48 non-profit publishers (including many scientific professional societies) committing to "providing free access and wide dissemination of published research findings." Many scientific societies who were also publishers of scholarly journals became alarmed over the OA movement, these societies created the “D. C Principles,” which support some degree of free access, but not to the extent of immediate access as required by the Bethesda and Berlin Statements (http://www.dcprinciples.org/statement.htm).

X. Wellcome Trust Position Statement

It is a strong endorsement of OA from a major UK funding agency and the World's largest private funder of medical research, October, 2003. The mission of the Wellcome Trust is to foster and promote research with the aim of improving human and animal health. The main output of this research is new ideas and knowledge, which the Trust expects its researchers to publish in quality, peer-reviewed journals. It supports unrestricted access to the published output of research as a fundamental part of its charitable mission and a public benefit to be encouraged wherever possible (http://www.wellcome.ac.uk/About-us/Policy/Policy-and-position-statements/WTD002762.htm).

Y. World Summit on the Information Society (WSIS)

United Nations had organized a World Summit for Information Society (WSIS) in two phases. The first phase was organized in December 2003 at Geneva and the second and final phase was organized in November 2005 at Tunis. The Summit stressed the importance of access to information and knowledge for global welfare. The objective of the World Summit on the Information Society (WSIS) was to
formulate a common vision and understanding of the global information society. It is expected to adopt a Declaration of Principles and an Action Plan to facilitate the effective growth of the Information Society and to help bridge the digital divide (http://www.wougnet.org/WSIS/wsiscgc.html).

3.9 Declarations and Statements - National

Many influential groups have made statements and formal resolutions in response to changes and challenges in the realm of scholarly communication (SC) and publishing. These have included prominent universities, professional associations, public and private funding agencies. Most such statements include the posting of scholarly works in institutional or discipline-based repositories as a positive response to the SC crisis. Moreover, funding agencies are beginning to recommend or to mandate self-archiving of work paid for by their research funds. Many initiatives have already been taken by the different Ministries of the Government of India and research institutes for universal access to the outcome of the scholarly literature produced out of the public funding. Ministry of Human Resource Development (MHRD) has set up the ‘Indian National Digital Library in Engineering Sciences and Technology (INDEST) Consortium’ (Arunachalam, 2004a). In this direction the different organizations have made marvelous recommendations on OA initiatives. Thanks to Professor Subbiah Arunachalam, Professor N. Balakrishnan, and the late T.B. Rajashekar, who created one of India’s first OA repositories at the Indian Institute of Science (IISc), Bangalore. 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. As per ROARMAP (ROARMAP, 2012) database, nine Indian institutes have registered their IR in this database and have declared their open access policy. The following are the major Indian initiatives described below:

A. Bharathidasan University

As of November 2006, Bharathidasan University has made it mandatory for all faculty members publishing in refereed journals to send their papers to the University Informatics Centre (matram AT bdu.ac.in) for deposit in the university's IR. The university believes that the repository will increase the citation of its publications and will boost interdisciplinary research collaboration among the faculty (http://www.eprints.org/openaccess/policysignup/fullinfo.php?inst=Bharathidasan%20University%2020). The university stands second only to the National Institute of Technology, Rourkela, in implementing OA in India and it has taken the lead among general universities.
B. Council of Scientific and Industrial Research (CSIR)

CSIR is in favour of OA to public funded research and duly approved the implementation of the following recommendations of the "Group for Open Access to Science Publications (GOASP) of CSIR" (http://roarmap.eprints.org/114/):

- All research papers published from all CSIR laboratories be made open access either by depositing the full-text and the metadata of each paper in an institutional repository or by publishing the papers in an open access journal in the first place;
- All the CSIR published journals to be made open access; and
- Each laboratory sets up its own interoperable institutional open access repository.

C. Mahatma Gandhi University

In India the first university to take initiative for making its research results OA is Mahatma Gandhi University. The launching of the Mahatma Gandhi University (MGU) Open Access Digital Archive of PhD Theses (www.mgutheses.org) in 2008 by Former President of India Dr. A. P. J. Abdul Kalam the live presence of the archive in the Web for the last two years is a success story among Indian universities (http://roarmap.eprints.org/308/). It is accessible from anywhere at any time through the URL (http://www.mgutheses.org) since its launching in 2008.

D. Madurai Kamaraj University

The university advocated that result of the public fund research should be made publicly available and accessible online free of cost. The university has adopted Open Access policy (i.e. Support Immediate-Deposit & Optional-Access" (IDOA) policy) model recommends (http://openaccess.eprints.org/index.php/?/archives/71-guid.html):

- immediately upon acceptance for publication
- deposit in the university’s Institutional Repository
- the author’s final accepted draft (not the publisher’s proprietary PDF)
- both its full-text and its bibliographic metadata (author, date, title, journal, etc.)

Most of the institutions are therefore designing this type of policy. Most new institutional and funder policies are of this type.

E. National Institute of Oceanography

National Institute of Oceanography (NIO) mandates its researchers to provide the post-reviewed manuscripts for archiving at its institutional repository "Digital Repository Service" (DRS). After the publication of the items, the pre-print or post-prints are to be archived based on the publishers' policy. The purpose of DRS is to give immediate, permanent and free access to its published research. The institute
believe in enhancement of the visibility to the published literature thereby attracting citations to the articles and maximizes research impact (http://roarmap.eprints.org/325/).

F. National Knowledge Commission (NKC)

The NKC’s (National Knowledge Commission, 2007) Working Group on “Open Access and Open Educational Resources and Working Group on Libraries” have strongly recommended for open access and advocated that, on policy level, all research articles published by Indian authors receiving any government or public funding must be made available under Open Access and should be archived in the standard OA format on his/her website. The Commission has therefore made few recommendations to ensure sustained attention to development of libraries. Further, as a national academic OA portal is developed, these same research articles should be made available through this portal (http://knowledgecommission.gov.in/downloads/documents/wg_open_course.pdf).

G. National Institute of Technology, Rourkela

All research papers by faculty and students, M. Tech (Research) and Ph. D. thesis is to be self-archived in Dspace@nitr or it should be submitted to the librarian for archiving, so that others interested may benefit by referring to these documents. The Administration may use this archive for assessment of faculty performance when needed (http://www.eprints.org/openaccess/policysignup/fullinfo.php?inst=National%20Institute%20of%20Technology%20Rourkela).

H. National Open Access Policy for Developing Countries

A special session on OA was held at the 93rd Indian Science Congress in January 2006, which is known as Bangalore declaration. The workshop was conveyed by the Indian Institute of Science, the Indian Academy of Sciences and M.S. Swaminathan Research Foundation. It was supported by Open Society Institute (OSI). In 2006, participants in Bangalore conference which was held in November 2-3, 2006, drafted a model National Open Access Policy for Developing Countries (http://www.ncsi.iisc.ernet.in/OAworkshop2006/pdfs/NationalOAPolicyDCs.pdf). The main objective was to bring together policy makers and research scientists from major developing countries to agree a path forward towards adopting full Open Access to publicly-funded research publications. It came up with several recommendations for the ‘Optimal National Open Access Policy’ (Sahu & Parmar, 2006).
I. University Grants Commission (UGC)

Another major recommendation in support of open access made by University Grants Commission (UGC, 2005) and drafted a policy framework entitled “UGC (Submission of Metadata and Full-text of Doctoral Theses in Electronic Format) Regulations, 2005”, to strengthen national capability of producing electronic theses and dissertations and to maintain university-level and national level databases of theses and dissertations. This Regulation proposed two sets of planned actions, such as:

- Creation of Indian national Theses Databases; and
- Submission of PhD Theses in Electronic Form.

It has already developed a policy document on building University level IDR (http://www.ugc.ac.in/new_initiatives/etd hb.pdf) in India. It has also recommended that all the universities should set up theses repository to facilitate e-submission, archiving, maintenance and access to these repository at the university level.

In addition, MHRD has also advised all INDEST members to set up IR using OSS. In this area an initiative has been taken with the establishment of Open Source Software Resource Centre (OSSRC) in India. This is established with a joint agreement of IBM India, CDAC and Indian Institute of Technology, Delhi. The Indian government expects authors to make their works accessible preferably free of charge if they are the result of publicly funded research. And ‘The Right to Information Act’, which came into effect in 2005, has had an impact on publicly financed research: since this act was passed, all citizens have had the right to know the results and social benefits of this type of research. Another group of authors (Chan, Arunachalarm & Kirso, 2009) reported the recent announcement by the CSIR in India, urging the establishment of IRs in each of its more than 35 laboratories as well as conversion of all their journals to open access.

3.10 Major Initiatives

Diverse initiatives targeted at improving access to science, technology, and medical research in the developing world has arisen from the 1990s onwards. The following are the most high profile international initiatives mentioned below:

A. Access to Global Online Research in Agriculture (AGORA)

Access to Global Online Research in Agriculture (AGORA) is an initiative to provide free or low-cost access to major scientific journals in agriculture and related biological, environmental and social sciences to public institutions in developing
countries. Launching in October 2003, AGORA will provide access to over 400/1900 journals from the world's leading academic publishers. Led by the Food and Agriculture Organization of the United Nations, the goal of AGORA is to increase the quality and effectiveness of agricultural research, education and training in low-income countries, and in turn, to improve food security. Researchers, policy-makers, educators, students, technical workers and extension specialists will have access to high-quality, relevant and timely agricultural information via the Internet (http://www.aginternetwork.org/en/about_agora/).

B. Deutsche Initiative für Netzwerkinformation (DINI)

DINI, the German Initiative for Networked Information (Deutsche Initiative für Netzwerkinformation), established in 2000, is a coalition formed by German Higher Education Infrastructure and Service Institutions. DINI Certificate for Document and Publication Repositories aims at networking document and publication repositories in Germany by promoting the use of standards, interoperability and cooperation between German Higher Education institutions running digital repositories. The Certificate can also be used as an instrument to support OA. The primary objective of DINI is to create recommendations for standardized and interoperable information services and communication networks in and between universities (http://conference.ub.uni-bielefeld.de/2006/proceedings/dobratz_scholze_final_web.pdf).

C. European University Association (EUA)

The European Association, in January 2007, established a “Working Group on Open Access” in order to raise awareness of the importance of open access issue to the university community and to develop a common strategy for the university sector on key selected issues to be presented to the policy makers. The Working Group recommendations seek also to provide support to European level initiatives promoting IRs in Europe. Its mission is dual-fold: (i) to raise awareness of the importance of the OA issue to the wider university community, both in terms of its impact upon the research process and its financial implications for university libraries; and (ii) to develop a common strategy for the university sector on key selected issues to be presented to policy-makers (http://www.eua.be/Libraries/Page_files/EUA_WG_open_access_1.sflb.ashx).

D. Health InterNetwork Access to Research Initiative (HINARI)

In January 2002 the World Health Organization (WHO) launched HINARI as part of a wider scheme to improve communication between researchers. HINARI provides free or reduced-rate access to over 2000 medical, biomedical and social sciences journals for researchers working in designated countries, via an interface with publishers' websites (http://www.firstauthor.org/Downloads/openaccess.pdf).
E. ICRISAT

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), in collaboration with the Food and Agricultural Organization (FAO) of the United Nations, has launched an initiative to promote open access information sources in agricultural sciences and technology in India. The initiative was launched at the first AGRIS workshop on open access in agricultural sciences and technology: Indian initiatives organized at ICRISAT headquarters at Patancheru on 6 and 7 November, 2006 (http://www.moneycontrol.com/news/business/icrisatpartners-launch-open-access-informationagri_250502.html).

F. International Network for the Availability of Scientific Publications (INASP)

INASP, a UK-based charity, has worked with partners across the world to facilitate access to online publications through workshops, training, library capacity building, and skills development. INASP also recognizes the importance of outreach programs to rural communities, particularly in view of agricultural research and health interventions (http://www.inasp.info/file/3d034b8bae0a3f7e1381979aede356a9/about-inasp.html). It’s mission is to enable a sustainable network of stakeholders that owns and drives access, use, dissemination and communication of research information (http://www.apc.org/en/about/funders/international-network-availability-scientific-publ).

In addition, a few research funding organizations in both the public and private sectors have adopted international OA principles to mandate or encourage researchers to deposit funded research results in OARs. There are an increasing number of individuals who actively advocate the adoption of OA principles and practices, among the best known of whom are Dr Peter Suber, Professor Steven Harnad and, in Australia, Professor Arthur Sale. All have long played central roles in the advocacy of OA, particularly through their writings on OA developments worldwide, newsletters, blogs and journal articles.

3.11 Major Projects

This section discusses the major projects related to the OARs development worldwide. The main objective is providing a brief overview of those projects having international importance and significant contribution in the open access to knowledge movement worldwide.
A. Academic Research in the Netherlands Online (ARNO)

In the Netherlands, ARNO (Academic Research in the Netherlands Online) was a project that ran from 2000 to 2002 in order to design and implement digital archives to preserve university output. The ARNO project aimed to develop and implement university document servers to make available the scientific output of participating institutions (http://www.uba.uva.nl/arno). It is funded by IWI (Innovation in Scientific Information Supply). Its main goals were (i) to couple document servers to international distributed digital archives and to the Dutch national information infrastructure, (ii) to couple the developed infrastructure to the production processes of scientific publishers and form a basis for peer review, and (iii) to connect it seamlessly to digital learning environments (http://www.h-net.org/announce/show.cgi?ID=127076).

B. Australian Research Repositories Online to the World (ARROW)

The Australia is another country with important national IR projects. ARROW project is a national demonstrator project funded by the Australian Commonwealth Department of Education, Science and Training, under the Research Information Infrastructure Framework for Australian Higher Education for the support of digital repositories of Australian content (http://en.wikipedia.org/wiki/Australian_Research_Repositories_Online_to_the_World). ARROW project identified and tested software solutions for building repositories to handle eprints, electronic theses and dissertations, e-research and electronic publishing. The project also developed and now offers the Arrow Discovery service that uses harvested metadata from all the ARROW repositories. It aims to provide easy free access to full-text research output which has been deposited into individual repositories at universities, the National Library of Australia and other research agencies such as Australian Policy Online (http://www.intute.ac.uk/cgi-in/fullrecord.pl?handle=sosig1134559530-9424). The main objectives of the ARROW Projects are mentioned below (http://metadata.cetis.ac.uk/implementations/repositoryServices):

- to identify and test software to support best-practice institutional digital repositories at the ARROW Consortium member sites to manage e-prints, digital theses and electronic publishing; and
- to develop and test a national resource discovery service using metadata harvested from the institutional repositories by the National Library of Australia.

C. Canadian Association of Research Libraries (CARL)

In 2002, CARL began a project to implement IRs at several Canadian research libraries—ensuring that Canadian institutions remain at the leading edge of innovation in scholarly publishing. The CARL project aims to facilitate the sharing of
best practices and lesson’s learned for building and implementing IRs at Canadian libraries (https://dspace.ucalgary.ca/handle/1880/360).

D. Data Providers for Academic E-content and the Disclosure of Assets for Learning, Understanding and Scholarship (DAEDALUS)

The DAEDALUS Project, funded by the FAIR (Focus on Access to Institutional Resources) Programme in the United Kingdom, aims to set up a range of IRs. DAEDALUS is a project concerned with the establishment of a range of OAI-PMH-compliant digital collections at the University of Glasgow. It runs until July 2005. The project aims to establish a network of OAI compliant collections at the University of Glasgow. It has two strands: service development and advocacy. It will also address issues such as quality control, intellectual property rights and institutional support (http://eprints.gla.ac.uk/115/).

E. Digital Academic Repositories (DARE)

DARE (Digital Academic Repositories) is a collective initiative by the Dutch universities to make all their research results digitally accessible. The objective of this project is to make digitally accessible the research results of Dutch universities and research institutes by building distributed archives (http://www.surf.nl/themas/index2.php?oid=18). These archives are to be connected with each other and with international initiatives using the OAI protocol. DARE run from 2003-2006. Between 2003 and 2006, DARE worked to coordinate repository development on a national scale and linked all thirteen Dutch universities and three major academic institutions to form DAREnet. In 2003, the main goals were to (i) implement a basic infrastructure of repositories and (ii) to stimulate the supply of scientific research material.

F. Dataset Acquisition, Accessibility, and Annotation e-Research Technologies (DART)

The Project DART is a Commonwealth Department of Education, Science and Training (DEST) funded project to develop and assess new e-research collaboration tools and infrastructure. The specific goal of the DART project is to support and enable researchers, end-users, and appropriate computer systems to manage the creation and collection of data and to gain greater access to data and documents, by gathering, managing and archiving data and documents and managing their access, so that researchers are more easily able to perform their work and do so at a much higher level of insight and productivity than was previously possible, and so that the Australian public has greater visibility of, and access to, publicly funded research (http://ausweb.scu.edu.au/aw06/papers/refereed/treloar/paper.html). The project investigated the most appropriate response to the challenges inherent in new forms
and producers of raw data, new forms of collaborative research activity, new forms of publication, and new forms of research validation.

G. Digital Repository Infrastructure Vision for European Research (DRIVER)

It is an EU (European Union) funded project that sets out to build a test bed for a future knowledge infrastructure of the European Research Area, it has ten partners from eight EU countries, and is the largest initiative of its kind. The project aims to provide a unified approach to manage a challenging and evolving Digital Repository landscape by building an infrastructure for sharing content and functionality (http://en.wikipedia.org/wiki/Digital_Repository_Infrastructure_Vision_for_European_Research). It is a multi-phase effort whose vision and primary objective is to create a cohesive, robust and flexible, pan-European infrastructure for digital repositories, offering sophisticated services and functionalities for researchers, administrators and the general public (http://www.driver-repository.eu/).

H. Focus on Access to Information Resources (FAIR)

The FAIR programme - funded by the UK Joint Information Systems Committee - consists of 14 major projects, bringing together over 50 UK universities. This programme is inspired by the vision of the Open Archives Initiative (OAI), that digital resources can be shared between organisations based on a simple mechanism allowing metadata about those resources to be harvested into services. The objectives of the project are to investigate the technical, organisational and cultural processes involved in providing access to institutional digital resources.

I. Rights Metadata for Open Archiving (RoMEO)

The RoMEO (Rights Metadata for Open Archiving) project aimed to find out how the rights status of open-access research papers might be communicated digitally through rights metadata. The project focused mainly on copyright issues related to self archiving eprints. The main aim was to understand stakeholders’ needs in relation to intellectual property issues that arise with self archiving and OAI-PMH. An important product was the creation of a database of copyright policies from commercial publishers. This product, know as RoMEO, is now run by SHERPA and is a valuable tool for repository managers, summarizing the permissions that are normally given as part of each publisher's copyright transfer agreement. A particular focus was to find out how rights metadata might be disclosed and harvested under the Open Archives Initiatives Protocol for Metadata Harvesting (OAI-PMH). RoMEO argues that the best way of dealing with the important rights issues created by the open archives, and illustrated by their research, is to develop machine-readable metadata schemes, compatible with OAI-MHP, to describe ownership and usage rights in the article and in the metadata itself (http://www.lboro.ac.uk/departments/ls/disresearch/romeo/).
J. Securing a Hybrid Environment for Research Preservation and Access (SHERPA)

The SHERPA project has been set up to encourage change in the scholarly communication process by creating open-access institutional e-print repositories for the dissemination of research findings. The project aimed to develop and promote a favourable environment for the UK’s research output (namely e-prints) to be made available. One of the main outcomes was the production of a large body of repository advocacy material that has been widely used by start up repository projects. Currently, as SHERPA Plus, the project is aiming to provide a proactive national information pointon IRs, offering seminars, courses, email discussion lists, among others. It is the successor of the RoMEO project. The outcomes of the project will be to advice on the building and maintenance of IRs, guidelines on IPR and copyright issues, quality control, collection development policies, business models and advocacy material to publicise an institution’s repository. It aims to set up OAI-compliant e-print repositories (using EPrints software) at each of the partner sites. It focuses on the development of OARs of research output (http://www.sherpa.ac.uk/). The focus is on institutionalization and scaling up open access experiments (http://www.sherpa.ac.uk/).

K. Simple Web-service Offering Repository Deposit (SWORD)

It was developed with funding from the JISC, and was made available in March 2007. The project arose through discussions about the lack of a standard mechanism for deposit. SWORD will allow for deposit into multiple repositories from remote locations in a standard way and has been developed to include use within generic java server, DSpace, Fedora and EPrints environments (http://www.jisc.ac.uk/whatwedo/programmes/reppres/tools/sword.aspx). The project aims to improve the efficiency and quality of repository deposit and to diversity and expedite the options for timely population of repositories with content whilst promoting a common deposit interface and supporting the Information Environment principles of interoperability (http://www.ukoln.ac.uk/repositories/digirep/index/SWORD).

L. Targeting Academic Research for Dissemination and Disclosure (TARDis)

The TARDis project, run by Southampton University, is planning to develop a multidisciplinary institutional e-print archive and assess and evaluate the activity within a library-led infrastructure. It is designed to tackle head-on the major problem faced by IRs, namely the lack of participation by faculty: It will investigate and report on strategies to overcome the technical, cultural and academic barriers, which currently restrict the development and particularly the acquisition of content of institutional e-Print archives. It will develop a working model of a multidisciplinary institutional archive.” The archive will be accessible through the University Library’s Web Portal as part of an integrated institutional and subject-focused information
resource. The potential for delivery through an external service provider will also be assessed (http://www.jisc.ac.uk/whatwedo/programmes/fair/tardis.aspx). The project investigated the social and technical issues for setting up a repository. In particular it enhanced the EPrints software package and addressed issues related to metadata and multidisciplinary requirements for IRs. The project was led by the University of Southampton and led to the creation of the institutional repository e-Prints Soton.

M. Making Institutional Repositories A Collaborative Learning Environment (MIRACLE)

The MIRACLE Project is funded by the IMLS (Institute of Museum and Library Services) and investigates the development of institutional repositories in colleges and universities to identify models and best practices in the administration, technical infrastructure, and access to repository collections. This project began in 2005 and was originally scheduled to finish in 2008. The results of this census of IRs in the US (Rieh et al., 2007b) are reviewed in a subsequent section Content and item types in IRs. Their project plan indicates that they are currently involved in investigating how people search, retrieve, and use IR resources through an analysis of transaction logs and experimental search test tasks. However, this stage of the research project is not scheduled to be finished until August 2009, so the results cannot be reviewed.

3.12 Problems and Prospects of Indian Institutional Digital Repository (IDR)

Setting up of an IDR needs a planned approach for the implementation tasks defined by their governance structure, management framework, operational strategies and a well documented workflow. Adoption of the standards and choice of models are critical factors for developing an IDR system. More than two thousands IDRs have been set up in the world, and India with eighty (80) IDRs as listed in ROAR (ROAR, 2012) database leads the developing countries with in this regard. Most of the IDRs particularly in India have neither preferred the governance and management structures nor documented the procedures and practices. A good number of institutions in India have already set up IDR but did not make the contents OA due to various reasons. The barriers are various and derived from the different stakeholders such as organization, funding body, publishers, academicians, administrators, and the governmental policies. In addition, several other technical and non-technical issues are considered as barriers of developing IDRs. The following are the major problems of Indian IDRs along with the tentative suggestions to overcome the problems.
A. Problems

India has seen rapid and drastic growth in digitized and born digital data. The main barrier to OA in India is undoubtedly the absence of a national mandate on OA publishing. University Grants Commission (2005) and National Knowledge Commission (2007) recommendations include a statement of OA in its report but six (6) years after the recommendations no formal move has been made towards OA mandates. On the contrary it is still the belief that resources such as research articles in OA are not standard and do not have the authority stamp of 'peer reviews'. Among the reason for this are lack of awareness of citations (Arunachalam & Muthu, 2011), poor subscriber base and preference of the scientists to publish in foreign journals that have much higher impact factor that the Indian counterparts. Lack of funding and mandate towards publishing in IDRs could be one more reason. This section summarizes problems of India IDRs and discusses barriers to implementation. The major problems are summarized and discussed under the following six (6) major groups/or headings:

A.1 Problems related to Policy

The growth and success of any digital repository systems depend on proper policy documentation. As stated in section 4.2.1 of chapter 4, majority of the repositories do not have well defined policy (vide Table 4.2 of chapter 4) regarding organization and management of resources, document types or contents, archiving, submission, workflow, legal contributor, access to contents, quality of contents, versioning, publicity and branding, copy right and licensing, embargo period, preservation and data backup, file formats, metadata, removal or withdrawal of contents, etc. There is no initiative to setting up Registry of Indian repositories in line with ROAR and OpenDOAR registries.

A.2 Lack of Institutional Mandate at National Level

There is as such no mandate to dictate that publicly funded research should be reported in OA journals and repositories. There is no legislative provision at national level to make it mandatory to submit research output into IDR. Though UGC and National Knowledge Commission made recommendations (vide section 3.9 of this chapter) include a statement of OA in its report but no formal move has been made towards OA mandates.

A.3 Problems related to Stakeholders

Scientific community is yet to be fully aware of the potential of open access to scholarly information. Advocacy attracts contributors as well as stakeholders. Ignorance or lack of knowledge of repository seems to be one major issue to the development of OARs in
developing countries. Different parties are involved with the repository system in an organization such as researchers, faculties, authors, users, administrator, policy makers or government etc and their active involvement and participation is essential for smooth running of a repository system. It is only when this ignorance is tackled that any meaningful progress can be made. In addition, professional organizations like DELNET, INFLIBNET have major role in making awareness of open standard, open source, open access followed by academic organizations and government organizations respectively. The key findings can be summarized as below -

- Lack of support from author side in publication process due to simple and user-friendly depositing process;
- Lack of awareness-raising efforts among the academics;
- Lack of awareness among user and IDR team in absence of appropriate literacy program;
- No proper training for users, researchers, academicians, authors and administrators;
- Lack of an institutional accountability policy;
- Lack of financial support from national funding body; and
- Lack of coordination among higher authorities.

A.4 Access related problems

In order to increase acceptance, access and impact, it is not enough to simply upload content on servers. There are many problems related to the non-availability of the facility to download full text OA articles. Repositories do not provide full text access to their resources and only metadata is searchable. Even repositories follow different access policy for different type of users (vide section 4.2.1.5 of chapter 4). Another problem is non-availability of non-textual objects such as learning objects, multimedia, software, patent etc. (vide section 4.2.1.3 of chapter 4).

A.5 Problem related to Multilinguality

As stated in section 4.2.1.8 of chapter 4, this study recommends that repository system should be Unicode-compliant and multilingual in nature in order to support processing and retrieving of Indic-script based languages. But repositories are not Unicode compliant and major portion of their collections are based on English language (vide section 4.2.1.3.1 of chapter 4). The key findings are

- Non-availability of documents other than default English language;
- No such provision for multilingual information processing, searching and retrieval;
- No such provision for multilingual interface for end users;
- No such provision for metadata for multilingual texts;
- Lack of standard encoding format for documents; and
- No mechanism for translating Indic script base languages.

A.6 Technological problems

Majority of the IDRs initially faces the problems regarding software such as installation, up-gradation, customization; maintenance and back up databases.
‘Technological obsolescence’ is also big challenge for repository system. The other key findings are

- Lack of proper quality control mechanisms;
- Lack of review and technical evaluation of the document;
- Non availability of IDRs in World Area Network;
- Lack of expertise or lack of technical knowledge in handling open source IR software;
- No proper mechanism for harvesting metadata from OAI-PMH compliant repositories;
- No standards exist for access statistics;
- No system for feedback mechanism;
- No such provision for incorporation of social networking software (e.g. Blog, RSS etc.);
- Repositories do not support OAI-PMH verb;
- Lack of search services as provided by national and international gateways;
- Lack of integration with other national and international systems;
- Vocabulary control along with authority control; and
- Lack of comprehensive and up to-date selection tools for preservation of digital documents.

A.7 Problems related to Standard

Generally digital library system is based on distributed network that is compatible with globally agreed upon standards. It is essential to follow standards in the domain of automated and digital library systems. But majority of IDRs do not follow global standards and specifications in the following areas -

- Domain-specific metadata schemes to describe non-textual objects;
- Interoperability;
- Resource discovery and identification;
- Software;
- Encoding;
- Data formats;
- Import/export;
- Network;
- Vocabulary; and
- Citations.

Any of these failures mentioned above can result in the failure of repository, disruption of access, or worse, total and permanent loss of material stored in the institutional repository.

B. Suggestions

While there is a progressive growth of digital libraries and IDR in several developed countries like USA, UK, Germany, Australia and many countries in Europe, India is witnessing moderate growth. India has adopted the Open Access model much ahead than other developing countries.
Indeed, many ETD initiatives are from institutes of national importance. Universities and other academic and research institutes are lagging behind in this direction. However it can be said that OA acceptance is growing both in public sector information as well as in academic institutional mandates. A set of minimum requirements of a repository is formulated. At the same time BURA makes recommendations highlighting foreseeable developments that might turn into future requirements. Further research is required to finalize the model and based on the findings of this study, the following recommendations are made to overcome the problems –

B.1 **Formulation of Policy**

Formulation of policies is the key to success of repository system. It is essential to have a well defined policy (vide section 4.1.1 of chapter 4) for any IDR system. Several experts recommend formulation of policies in different key areas as stated above for smooth running of the system. So, formulating policy in the line of global recommendations and best practices is another key to success of the system.

B.2 **Promotional and awareness raising programme**

People are not much familiar with the term OA and OARs. So promotion and marketing of repositories in order to create awareness among different stakeholders (e.g. authors, academicians, researchers, policy makers etc.) has become an essential role for repository manager or administrators. Arranging awareness raising campaign, workshops, conferences, seminars and providing hands on training to stakeholders for creating expertise in setting up repositories is essential to solve the problem. There is a need for raising awareness within the community about the IDR and to encourage wider contribution of contents to the IDRs. In this regard, Government should come forward to pass the legislation in parliament for enabling open scholarship of publicly funded research. There should have a cordial relationship among all parties including government and other professional organizations like INFLIBNET, DELNET etc. involved with the system.

B.3 **Establishing Nation-wide Network**

Repositories should network and interconnect. Still now, Indian IDRs are working in isolation as because there is no network at national level. This interconnection can be on different levels, e.g. regional or state-wide, national or international. It is essential to set up a registry of Indian IDRs like ROAR and OpenDOAR databases so that organization can register their repository. In addition, it has to be integrated with other national and international systems.
B.4 *Technological parameters setting*

Developing repository using software (commercial or open source) is not the solution. Several other parameters such as operating system, hardware, network components, web server etc. (vide section 4.2.1.17 of chapter 4) has to be properly considered. Software is to be customized to meet the local requirements and there should have

- Provision for incorporation of domain specific metadata schemas;
- Provision of persistent identifier for unique identification of documents;
- Provision for supporting OAI-PMH verb;
- Provision for proper mechanism for access statistics;
- Provision for incorporation of social networking tools;
- Provision for developing federated search option for multiple OARs;
- Provision for inclusion of Indic script based subject access system; and
- Provision for development Unicode-compliant interface.

At the end, software architecture is to be designed in such a way where all the supporting software can be integrated seamlessly with the proposed model.

B.5 *Application of Open Standards*

Achieving technical interoperability is one solution to make the contents searchable globally. It can be done through following open standards, open technologies and open source software. Seamless integration and sharing of knowledge resources can only be possible if standards are properly followed. Once it is done, Indian repositories will work in a networking environment and will be part of the global knowledge system.

B.6 *Multilingual document processing and retrieval*

As stated earlier, India is a multilingual country having different regional languages with many variations of dialects. So incorporation of multilingual documents into IDR and provision of browsing, searching, processing and retrieving Indic-script based documents is mandatory for Indian IDR.

Though IDR are at a critical point in their development but there is scope for developing a 'Best Practice Guidelines' for Indian IDR. Recently there is a growing trend of establishing IDR throughout the world and governments including universities and funding bodies are taking key roles in promoting open access to public funded research outputs. To bring them to greater success it is necessary to standardize further developments. It is necessary for India to have a network of National Digital Library centers to spearhead the process of ETD movement. To reach this goal it is necessary to network document and publication repositories. It is deemed important to develop this according to international standards and to use
proven technology. The public-private partnership in this movement is also growing and national movement is being initiated at this juncture to create awareness about the IR. The major research funding agencies in India like AICTE, CSIR, ICMR, UGC, and other organizations are insisting their affiliated bodies to design and develop an IR and mandating compulsory submission of research data. So, it may be concluded that if the strategies are implemented, policies are formulated in the line of global recommendations, standards are followed in a calm and orderly way, Indian repositories are expected to be more successful. If properly implemented with the existing practices, IDRs has the potential to fulfill many unmet expectations.