CHAPTER 3

OPEN ACCESS REPOSITORIES: A HISTORICAL REVIEW

3.1 Introduction:

Internet with the help of harvesting techniques and search engines makes it possible for the user to discover publications of relevance if they are deposited in Open Access Repositories. Open access pattern was mainly developed in order to remove the barrier between information produced and the clientele of information. Open Access (OA) means that electronic scholarly articles can be accessed anywhere, anytime, by anyone without the limitations of time and space. OA facilitates increase in citations and flow of ideas by widespread dissemination of electronic documents that was not possible so easily with the print formats. It helps in international intellectual collaboration of ideas, knowledge and information.

3.2 History of Open Access (OA):

Simeon Warner in his presentation during symposium on “Free Culture and the Digital Library” in October 2005 traced back the history of open access to the beginning of arXiv, the first major pre-print archive in 1990s. This archive initially aimed to facilitate the sharing of pre-print articles between scholars in the high-energy theoretical physics community, expanded to subjects including mathematics, computer science and quantitative biology, as well as many other branches of physics. Email was the most common technique used to distribute pre-prints of articles between interested scholars and research groups, but arXiv provided a place where these pre-prints could be deposited, organised and subsequently disclosed to the wider community. Originally both deposit and distribution was also by email, though this was quickly followed by ftp and not long after by Web interfaced to support this interaction. arXiv proved that
Internet and the Web can be used to disseminate scholarly communication in various ways.

As mentioned by Chris Awre, "the success of arXiv stimulated similar activity in other subject fields like CogPrints, covering psychology, linguistics, neuroscience and computer science; RePEc, focused on economics; and the NDLTD, addressing the disclosure of theses and dissertations. The increasing number proved that it would be valuable for open access archives to cooperate to enable easier access across them by researchers and others wishing to access their contents. In October 1999 a meeting in Santa Fe, USA led to the Santa Fe Convention of the Open Archives Initiative, subsequently renamed the Open Archives Initiative (OAI) and its Protocol for Metadata Harvesting (OAI-PMH), now at version 2.0. The Initiative is a series of organisational principles and technical specifications to facilitate a level of interoperability between e-print archives. The underlying mechanism to enable interoperability is metadata harvesting, where metadata from different e-print archives can be harvested into a central service or services that can then be searched independently."

### 3.3 What is Open Access (OA):

a) Stevan Harnad, world's most famous Open Access Advocates states that "Open Access (OA) is free, immediate, permanent online access to the full text of research articles for anyone, webwide."

b) The Scholarly Publishing and Academic Resources Coalition (SPARC) further extended Harnad's definition as "Open Access means free, immediate, availability on the public internet of those works which scholars give to the world without expectation of payment-permitting any user to read, download, copy, distribute, print, search or link to the full text of these articles, crawl them for indexing, pass them as data to software or use them for any other lawful purpose." The definition of Open Access by SPARC explains the meaning of OA by covering various aspects of OA.
3.4 Types of Open Access:

According to Keith Jeffery, OA can be delivered in two ways:

- *'green*': the author can self-archive at the time of submission of the publication (the 'green' route) whether the publication is grey literature (usually internal non-peer-reviewed), a peer-reviewed journal publication, a peer-reviewed conference proceedings paper or a monograph

- *'gold*': the author or author institution can pay a fee to the publisher at publication time, the publisher thereafter making the material available 'free' at the point of access (the 'gold' route). The two are not, of course, incompatible and can co-exist.

The 'green' route makes publications available freely in parallel with any publication system but is not, itself, publishing. The 'gold' route is one example of electronic publishing. At present it is much more common to have non-OA electronic access to publications in a publisher's database for a subscription fee.

The second dimension to be distinguished is the timing and quality aspect: preprints are pre-peer-review articles, post-prints are post-peer-review and post-publication articles while eprints can be either but in electronic form.

A third dimension is white/grey literature. White literature is peer-reviewed, published articles while grey is preprints or internal 'know-how' material.

3.5 Benefits of Open Access:

According to Budapest Open Access Initiative (2001) “removing access barriers will accelerate research, enrich education, share the learning of the rich with the poor and the poor with the rich, make this literature as useful as it can be, and lay the foundation for uniting humanity in a common intellectual conversation and quest for knowledge.”
The benefits of open access can be studied according to the various components which will be beneficial by opting for Open Access regarding the documents. The major components of an Open Access System are Researchers (whose articles, ETDs, pre-prints, post-prints etc. are disseminated through open access), Educational Institutions (Institutions who opt for putting their organisational resources for open access), Business (organisations who work in the process of providing open access), Public and Research Funders (Institutions/organisations who fund research work).

3.5.1 SPARC explained the benefits of Open Access including all the five beneficiaries of Open Access\textsuperscript{2}:

a) Researchers
   - Increases readers’ ability to find use relevant literature
   - Increases the visibility, readership and impact of author’s works
   - Creates new avenues for discovery in digital environment
   - Enhances interdisciplinary research
   - Accelerates the pace of research, discovery and innovation

b) Educational Institutions
   - Contributes to core mission of advancing knowledge
   - Democratizes access across all institutions—regardless of size or budget
   - Provides previously unattainable access to colleges and schools
   - Provides access to crucial Science, technology, Engineering and Management materials
   - Increases competitiveness of academic institutions and students
   - Contributes to a better educated work force

c) Business
   - Access to cutting edge research encourages innovation
   - Stimulates new ideas, new services, new products
   - Creates new opportunities for job creation

d) Public
   - Provides access to previously unavailable materials relating to health, energy, environment and other areas of broad interest
   - Creates better educated population
• Encourages support of scientific enterprise and engagement in citizen science

e) Research Funders
• Leverages return on research investment
• Creates tool to manage research portfolio
• Avoids funding duplicative research
• Creates transparency
• Encourages greater interaction with results of funded research

3.5.2 Benefits of Open Access-SPARC Europe

SPARC Europe⁸ which is a membership organization for European research libraries and research organizations also mentioned the benefits of Open Access or No Restricted Access to research and data by discussing it from the point of view of various stakeholders in the system of scholarly communication.

1) Researchers as authors: immediate visibility for research output and thus increased visibility and usage of their results. Open Access may even lead to an increase of impact.

2) Researchers looking for information: access to literature everywhere, not only from a campus but also from any site with Wi-Fi access.

3) Funding agencies: increased return on investment (ROI), increased visibility.

4) Universities & research institutes: greater visibility, clearer management information.

5) Libraries: increased access for target audience, financially a more attractive model than the current subscription model.

6) Teachers & students: unrestricted access to material, enriched education, allowing equality of learning in poor as well as in rich nations.

7) Science: enhanced and accelerated research cycle.

8) Citizens & society: access to knowledge / access to the results of publicly funded research.

9) Enterprises: access to critical information.

10) Publishers: transparent business model, ultimate online article distribution, ultimate visibility for articles.
3.5.3 UNESCO’s Policy Guidelines for the Development and Promotion of Open Access (2012)

UNESCO’s Policy Guidelines provides basic explanation of Open Access and related policies. It mentioned the following benefits of Open Access:

- Open Access improves the speed, efficiency and efficacy of research
- Open Access is an enabling factor in interdisciplinary research
- Open Access enables computation upon the research literature
- Open Access increases the visibility, usage and impact of research
- Open Access allows the professional, practitioner and business communities, and the interested public, to benefit from research

3.5.4 The National Open Access Policy for Developing Countries- Bangalore, India

The Policy discusses the benefits of open access from the Researcher and Country’s point of view whose researchers submit their documents for open access.

A) Benefits of Open Access to (Country’s Name):

- [Country-name's] research will be more accessible to global researchers, hence better known and more widely used and cited. The prestige of [country-name] researchers will increase significantly.
- All [country-name] research will be open to all [country-name] entrepreneurs and the general public with Internet access. This will be beneficial both commercially and culturally.
- Access, usage and citation data on this research will increasingly become available for analysis to help shape researchers', institutions' and nations' strategies and policies.

B) Benefits of Open Access to Researcher:

- As authors, researchers benefit because their research papers are given a much wider dissemination and can be read without restriction by anyone with Internet access. This increases the impact of their research. Indeed,
evidence is accumulating to show that open access articles are cited 25-250% more than non-open access articles from the same journal and year.

- As readers, researchers benefit because they will increasingly be able to access and use the full text of all the research published in their area, not just the research available to them via the subscriptions their institution can afford. This is particularly important where neighbouring countries share common problems and need to collaborate in their research effort.

3.5.5 Benefits of Open Access by Alma Swan

Alma Swan\(^1\) identified the advantages of Open Access based on the results obtained from tests being conducted to identify the Open Access Citation Advantage for increasing the visibility, findability, accessibility of research articles in the following ways:

a) A General OA advantage: The advantage that comes from citable articles becoming available to audiences that had not had access to them before, and who would find them citable.

b) An Early Advantage: the earlier an article is put before its worldwide potential audience may affect subsequent citation patterns

c) A Selection Bias: authors make their better articles Open Access more readily than their poorer articles.

d) A Quality Advantage: better articles gain more from the General OA Advantage because they are by definition more citable than poorer articles.

3.6 Barriers to Open Access:

In spite of various benefits experienced by the researchers and institutions from open access, there are many researchers and institutions that are reluctant to deposit their documents for open access. Advocates of open access have studied the barriers that create unwillingness of researchers/ institutions to submit their research work and other documents for open access.

Keith Jeffery\(^2\) identified two major barriers to open access-
• **Loss of publisher income:** The major objection to 'green' self-archiving comes from publishers and learned societies (many of which depend on subscriptions to their publications) who fear that 'green' OA threatens their business viability. To date there is no evidence that 'green' archiving harms the business model of publishing. There is evidence that 'green' archiving increases utilisation, citation and impact of a publication. Whilst the major commercial publishers provide additional value-added services that could offset the impact of OA on current business models, the impact on learned societies may require new business models to be developed.

• **Copyright:** Copyright agreements between authors and publishers may inhibit the 'green' route. However, to date, between 80 and 90% of publication channels (the variability depends on exactly what is counted) allow 'green' author deposit although some insist on an embargo period before the publication is available for OA. In contrast some publishers of journals - of which 'Nature' is the most well-known - do not demand copyright from the author but merely a licence to publish, leaving copyright with the author or their institution.

Mathias Klang\(^{13}\) (2009) conducted action research in Lund University, Sweden to explore the barriers to open access to scientific research output in Sweden. The action research was conducted by interviewing Librarians of nine University Librarians of Sweden. The interviews reflected different areas of concern which can be divided into the following groups:

1) Copyright Concerns  
2) Research Culture  
3) Administrative Concerns  
4) University Context  
5) Legal Culture  
6) Information Needs
1) Copyright Concerns:

All the interviewees identified copyright as a major source of concern in their everyday work. The main source of trouble was the lack of information about the copyright and copyright licenses and their interpretation in everyday working of library. The concern with copyright was more serious among the libraries that had a larger amount of researchers and a well-functioning self-archiving system. However, even the smaller universities expressed concern with the complexities of copyright in relation to their everyday work.

Some of the universities also expressed concerns that they did not have access to sources of legal advice. Libraries without access to university legal departments felt that the lack of such a function was an important flaw in the organisation in relation to copyright. Libraries with access to university legal departments felt that these departments tended not to resolve the issues at hand and felt a need for a more specialized legal position dedicated towards copyright.

2) Research Culture:

The interviewees also informed about the preference of researchers to publish their research work in traditional journals rather than opting for open access. The interviewees also mentioned that the researchers used to get convinced after all the benefits of open access were explained to them. But it was difficult to reach out to the researchers since information sent via e-mail was highly ignored. Personal meetings or group meetings were much useful to make understand the benefits of open access.

3) Administrative Concerns:

Major administrative concerns identified were to motivate researchers to deposit their research work in open access system. Also, it was found that wherever data was not input by librarian, lot of errors used to take place in the metadata stage. The final administrative concern was with archiving the publications that contained copyrighted material.
4) University Context:

The differences in size, age, organization, and culture of the universities all affected the way in which the adoption of open access was proceeding at the different universities. All these factors affect the way in which the university can demand action from its researchers and the way in which the researchers will react towards the demands.

5) Legal Culture:

Universities without access to legal departments felt that they had no one to understand their needs however universities with legal departments said that no one could ever understand the library need and importance of copyright from the point of view of library. In most cases, the universities have a reliance on the copyright licenses entered into between the university and the researcher guaranteeing that the researcher has the right to archive and that all copyrightable material in the publication is there with permission. However in some cases the legal administration of these licenses is carried to such extremes that open access is possible in theory but in practice it is difficult to implement

6) Information Needs:

Many of the interviewees felt that the resources allocated towards open access were adequate. What was missing was reaching researchers and administrators with more information. It was felt that this information in itself would convince the readers that open access was a worthwhile activity.

These informational needs could be broken down into different types of information. Many interviewees felt that a copyright helpdesk was necessary; others felt that additional documentation was required to educate both librarians and researchers. Many pointed to the lack of courses and seminars that needed to be held in this area.

From the above mentioned barriers as figured out and explained by Jeffery and Klang, it can be seen that Copyright Issue is one of the major and most important factor causing barrier in depositing and disseminating scholarly information through open access. Researchers and institutions are very concerned about the
copyright infringement that takes place when the document is distributed through open access. Also, researchers especially in social sciences prefer publications in traditional print journals rather than opting for open access electronic journal. In order to prevent the infringement, plagiarism software can be deployed which will detect the unauthorized usage of research work.

3.7 Efforts towards Open Access Initiative (OAI):

3.7.1 International Efforts

A) Budapest Open Access Initiative (BOAI)-14th February 2002, Budapest, Hungary

The Budapest Open Access Initiative defined Open Access for the first time. By Open Access to literature, they meant ‘free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited’.

The initiative mentioned that removing access barriers to the scholarly literature will accelerate research, enrich education, share the learning of the rich with the poor and the poor with the rich make this literature as useful as it can be, and lay the foundation for uniting humanity in a common intellectual conversation and quest for knowledge.

The Open Society Institute, the foundation network founded by philanthropist George Soros, is committed to providing initial help and funding to realize this goal. It will use its resources and influence to extend and promote institutional self-archiving, to launch new open-access journals, and to help an open-access
journal system become economically self-sustaining. While the Open Society Institute's commitment and resources are substantial, this initiative is very much in need of other organizations to lend their effort and resources.

BOAI invited governments, universities, libraries, journal editors, publishers, foundations, learned societies, professional associations, and individual scholars who share our vision to join us in the task of removing the barriers to open access and building a future in which research and education in every part of the world are that much freer to flourish.

B) ECHO (European Cultural Heritage Online) Charter- 2002

The ECHO initiative has been motivated by the observation that, at present, information relevant to cultural heritage still plays only a marginal role in the Internet: the number one medium for current and future scientific work, communication and general archiving. The basic idea of the ECHO-initiative therefore is to establish an open-source culture of the public and scholarly exploitation of cultural heritage on the Internet. This idea comprises the promotion of content-driven technology in information management.

The long-term vision of ECHO is that of an electronic representation of the European cultural heritage on the web which will make it more widely available than ever before in its history and thus strengthen its function as a bond of the European community. In addition, this vision also includes a new perspective on the ways in which electronically represented sources of cultural heritage can be explored from a scholarly point of view, eventually overcoming traditional, medium-based boundaries between disciplines in favour of an overarching study of the underlying cultural worlds. The long-term vision of ECHO finally comprises the expectation that a content-driven innovation of information technology will provide a new driving force for technological development in Europe.
C) Bethesda Statement on Open Access Publishing- Released on 20th June 2003

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. The purpose of the document is to stimulate discussion within the biomedical research community on how to proceed, as rapidly as possible, to the widely held goal of providing open access to the primary scientific literature. Their main aim was to agree on significant, concrete steps that all relevant parties—the organizations that foster and support scientific research, the scientists that generate the research results, the publishers who facilitate the peer-review and distribution of results of the research, and the scientists, librarians and other who depend on access to this knowledge—can take to promote the rapid and efficient transition to open access publishing.

The document is divided into four sections:

1) Definition of Open Access Publication-

An Open Access Publication is one that meets the following two conditions:

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

ii) A complete version of the work and all supplemental materials, including a copy of the permission as stated above, in a suitable standard electronic format is deposited immediately upon initial publication in at least one online repository that is supported by an academic institution, scholarly society, government agency, or other well-established organization that seeks to enable open access, unrestricted distribution, interoperability, and long-term archiving (for the biomedical sciences, PubMed Central is such a repository).
2) Statement of the Institutions and Funding Agencies Working Group
3) Statement of the Libraries & Publishers Working Group
4) Statement of Scientists and Scientific Societies Working Group

D) Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities- October 200318

In accordance with the spirit of the Declaration of the Budapest Open Access Initiative, the ECHO Charter and the Bethesda Statement on Open Access Publishing, Berlin Declaration was drafted to promote 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.

In order to realize the vision of a global and accessible representation of knowledge, the future Web has to be sustainable, interactive, and transparent. Content and software tools must be openly accessible and compatible.

Open access contributions must satisfy two conditions:

1. The author(s) and right holder(s) of such contributions grant(s) to all users a free, irrevocable, worldwide, right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship (community standards, will continue to provide the mechanism for enforcement of proper attribution and responsible use of the published work, as they do now), as well as the right to make small numbers of printed copies for their personal use.

2. A complete version of the work and all supplemental materials, including a copy of the permission as stated above, in an appropriate standard electronic format is deposited (and thus published) in at least one online repository using suitable technical standards (such as the Open Archive definitions) that is supported and maintained by an academic institution,
scholarly society, government agency, or other well established organization that seeks to enable open access, unrestricted distribution, inter-operability, and long-term archiving.

E) Salvador Declaration on Open Access: The Developing Perspective, Brazil-September 2005

Participants of the International Seminar on Open Access for Developing Countries, Salvador, Brazil in September 2005 discussed various benefits of open access especially for developing countries and planned to work together to ensure that scientific information is openly accessible and freely available to all. They mentioned that,

1) Scientific and technological research is essential for social and economic development.

2) Scientific communication is a crucial and inherent part of the activities of research and development. Science advances more effectively when there is unrestricted access to scientific information.

3) More broadly, open access enables education and use of scientific information by the public.

4) In a world that is increasingly globalized, with science claiming to be universal, exclusion from access to information is not acceptable. It is important that access be considered as a universal right, independent of any region.

5) Open Access must facilitate developing countries' active participation in the worldwide exchange of scientific information, including free access to the heritage of scientific knowledge, effective participation in the process of generation and dissemination of knowledge, and strengthening the coverage of topics of direct relevance to developing countries.

6) Developing countries already have pioneering initiatives that promote Open Access and therefore they should play an important role in shaping Open Access worldwide.

The international community members urged governments to make Open Access a high priority in science policies including:
requiring that publicly funded research is made available through Open Access;
considering the cost of publication as part of the cost of research;
strengthening the local OA journals, repositories and other relevant initiatives;
promoting integration of developing countries scientific information in the worldwide body of knowledge.

F) UNESCO’s Policy Guidelines for the Development and Promotion of Open Access-2012

The Constitution of UNESCO in Article I, Clause 2 mentions that “UNESCO maintains increases and diffuses knowledge; encourages cooperation among the nations in all branches of intellectual activity and initiates methods of international cooperation.” The overall objective of the Policy Guidelines is to promote Open Access in Member States by facilitating understanding of all relevant issues related to Open Access. Specifically, it is expected that the document shall:

- Enable Member State institutions to review their position on access to scientific information in the light of the Policy Guidelines;
- Assist in the choice of appropriate OA policy in the specific contexts of Member States; and
- Facilitate adoption of OA policy in research funding bodies and institutions by integrating relevant issues in the national research systems.

UNESCO supported the development and distribution of Micro CDS/ISIS (Information Storage and Retrieval Software) and Greenstone Digital Library Software.
3.7.2 National Efforts:

A) National Open Access Policy for Developing Countries

Indian Institute of Science, Bangalore (India) organised two days' Workshop on Electronic Publishing and Open Access from 2-3 November 2006. It was supported by the Open Society Institute.

The Bangalore workshop was convened 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. The importance of access to the world’s research information for the development of a strong economy and a vibrant research capability is widely acknowledged, yet financial barriers limit access by developing countries to the research information they need. Equally, the unique research carried out in countries representing 80% of the world’s population is largely ‘invisible’ to international science because of economic or other constraints. The resolution of many of the world’s problems, such as emerging infectious diseases, environmental disasters, HIV/AIDS or climate change, cannot be achieved without incorporation of the research from developing countries into the global knowledge pool.

Building on the Budapest Open Access Initiative recommendations, and past Declarations of commitments to the strategy of Open Access, particularly the Salvador International Declaration on Open Access for Developing Countries, and recognising the benefits that Open Access will bring to the strengthening of science, participants to the Workshop agreed the following model National Open Access Policy for Developing Countries.

According to the National Open Access Policy for Developing Countries, “The [country-name] Government/Government Department expects the authors of papers reporting publicly-funded research to maximise the accessibility, usage and applications of their findings.”
To this end:
As a condition for research funding, the [country-name] Government:

a) requires electronic copies of any research papers that have been accepted for publication in a peer-reviewed journal, and are supported in whole or in part by Government funding, to be deposited in an institutional digital repository [IR] immediately upon acceptance for publication;

b) encourages Government Grant Holders to provide Open Access to their deposited papers immediately upon deposit;

c) encourages Government Grant Holders to publish in a suitable Open Access Journal where one exists.

The National Policy also discussed benefits of open access to scientific research, research institutes, universities, authors and readers (previously covered in 3.5). Also, methods to implement the policies are mentioned in form of Frequently Asked Questions (FAQs).

B) National Knowledge Commission’s Report of the Working Group on Open Access and Open Educational Resources-2005

As the world of information is relentlessly growing, India has opportunity to participate as one of the forerunners in development of knowledge and economy. This development cannot be achieved without improvement in the higher education system. To serve this purpose, the National Knowledge Commission (NKC) made few recommendations to the then Prime Minister of India. This report can serve as valuable tool to improve the access to and quality of our higher education system.

One of the many steps NKC recommends to address these pressing problems is to increase the amount of Open Educational Resources (OER) and Open Access (OA). Indian students will have access to previously inaccessible information as well as the knowledge on how to access global educational resources.
Open Educational Resources (OER):
Open Educational Resources can be defined as free and open digital publications of high quality materials organized as courses that include lectures, related reading materials, snapshots of discussions, assignments, evaluations, etc. Access to these resources radically breaks down the barriers to quality education and allows everyone to access course material that is prepared and evaluated by experts. OER material has been prepared in an open standard format and is interactive in nature.

Several universities in the United States are involved in Open Educational Resources generation. These include MIT, Utah State University, Carnegie Mellon, Yale, Johns Hopkins University, etc. Australian and Chinese universities are also participating in the development of open educational resources.

In India, the major initiatives for creating open educational tools and resources are-
- National Program on Technology Enhanced Learning (NPTEL) carried out by seven IITs, the Indian Institute of Science, and other premier institutions around the country and being funded by the Human Resource Ministry.
- Eklavya Project Launched by IIT Bombay
- E-Grid supported by Human Resource Ministry at IIT, Kerala.

The working group suggests the creation of the Institute for Virtual Knowledge Resources and Management (VIKRAM) to monitor and support the implementation, adoption and sustainability of the network-based education resources. The activity and approach recommended here engages multiple areas (IT, education, research, innovation etc.). Therefore, it is imperative that VIKRAM while having linkages to existing educational and IT organizations remain independent.

Open Access Resources:
Open Access is a term used to describe published academic papers, books, reports, and other periodicals that are electronically available to readers without financial or technological barriers. The importance of open access for fundamental as well as applied research and education cannot be over
emphasized. India has done fairly well in the Open Access area by making 81 scientific journals accessible under OA. The Indian Institute of Science, Bangalore, is coordinating the Digital Library of India project along with Carnegie Mellon University. In this project, 21 other Indian institutions are also participating and have digitized more than 450,000 books, out of which 220,000 books are now web-accessible.

The working group, after taking into consideration the current status of Open Access in India and worldwide, has the following recommendations to increase Open Access content from India, increase the public awareness and utilization of OA material.

1) On a 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. Further, as a national academic OA portal is developed, these same research articles should be made available through this portal.

2) The government should allocate specific funding to increase the current digitization efforts of books and periodicals which are outside copyright protection.

3) Separate funding should be allocated to develop a new higher quality OCR software package so that new and old fonts in many different Indian languages can be converted into ASCII code.

4) A training program needs to be developed to take the materials available under Open Access to remote towns and villages. One possible mechanism for this is to outfit a vehicle with mobile internet connectivity and a high speed printer and binder. With these resources, the “OA” vehicle could travel to rural locations, print and bind the book or material requisitioned by the users at the location, and charge the users only the cost necessary for printing and binding.

5) On a systemic level, our nation’s universities and various academic institutions need high bandwidth connections and a national backbone which will provide advanced networking capabilities. There is an urgent need to develop Indian Research and Education Network/ Knowledge Network where each connected institution will have at least 100 Mbps or 1 Gbps connectivity.
6) This level of connectivity will not only advance the OA activities nationally, but provide global connectivity as well.

The above mentioned recommendations of various national and international Working Groups and Declarations prove that Open Access movement has gained its momentum in the scholarly world. Developing countries too have stepped into the movement and are trying hard to set up a system and create awareness about the benefits of open access. Institutions across the world have joined the Open Access Revolution and the researcher hopes that very soon all the research work done will be available through open access without any embargo.

3.8 Open Access Institutional Repositories:

Alma Swan\textsuperscript{23} mentions that “Institutional repositories are digital collections of the outputs created within a university or research institution. Whilst the purposes of repositories may vary (for example, some universities have teaching/learning repositories for educational materials), in most cases they are established to provide Open Access to the institution’s research output and this is the focus here.”

According to Registry of Open Access Repositories (ROAR)\textsuperscript{24} and Directory of Open Access Repositories (OpenDOAR)\textsuperscript{25} there are currently more than 3790 institutional repositories across the world.

3.8.1 Advantages of Institutional Repositories:

In briefing paper on Open Access Institutional Repositories, Alma Swan\textsuperscript{26} mentioned the following purposes and benefits for an institution-

1) Opens up the outputs of the university to the world
2) Maximises the visibility and impact of these outputs as a result
3) Showcases the university to interested constituencies – prospective staff, prospective students and other stakeholders
4) Collects and curates digital outputs
5) Manages and measures research and teaching activities
6) Provides a workspace for work-in-progress, and for collaborative or large-scale projects
7) Enables and encourages interdisciplinary approaches to research
8) Facilitates the development and sharing of digital teaching materials and aids
9) Supports student endeavours, providing access to theses and dissertations and a location for the development of e-portfolios

3.8.2 What do Institutional Repositories Contain?
ROAR and OpenDOAR have classified the Institutional repositories according to the following types of documents-

- Articles
- Journals
- Books & Monographs
- Conference Proceedings
- Datasets
- Learning & Teaching Objects
- Multimedia
- Patents
- References
- Software
- Theses
- Unpublished
- Demonstration
- Web Observatory

3.8.3 Open Source Software (OSS) Packages Used for a Repository:

3.8.3.1 Concept of Open Source Software
OSS can be defined from different point of views to reflect string of ideas in the field. According to Chudnov27,

a. An OSS is typically created and maintained by developers crossing constitutional and national boundaries, collaborating by using internet based communication and development tools.
b. Output is generally a certain kind of ‘free’, often through a license that specifies that applications and source code are free to use, modify and redistribute it as long as all user modifications are similarly licensed.

c. Quality, not profit drives open source developers who take personal pride in seeing their working solution adopted

The Open Source Initiative (OSI) identified ten criteria for a software product to be called open source. They are:

1) Free distribution
2) Source Code
3) Derived Works
4) Integrity of the Author’s Source Code
5) No discrimination against persons or groups
6) No discrimination against fields of endeavour
7) Distribution of license
8) License must not be specific to a product
9) The license must not restrict other software
10) The license must be technology neutral

3.8.3.2 Various OSS Packages:

There are several open source software packages used for developing institutional repositories. There are 153 open source software listed in OpenDOAR, of which some of them are explained below:

1) DSpace

In March 2000, Hewlett-Packard Company (HP) awarded $1.8 million to the MIT Libraries for an18-month collaboration to build DSpace™, a dynamic repository for the intellectual output in digital formats of multi-disciplinary research organizations. HP Labs and MIT Libraries released the system worldwide on November 4, 2002, under the terms of open source license. As faculty and other researchers develop research materials and scholarly publications in increasingly complex digital formats, there is a need to collect, preserve, index and distribute them: a time-consuming
and expensive chore for individual faculty and their departments, labs, and centres to manage themselves. The DSpace system provides a way to manage these research materials and publications in a professionally maintained repository to give them greater visibility and accessibility over time.

DSpace uses a qualified Dublin Core metadata standard for describing items intellectually (specifically, the Libraries Working Group Application Profile). Only three fields are required: title, language, and submission date, all other fields are optional. There are additional fields for document abstracts, keywords, technical metadata and rights metadata, among others. According to the ROAR and OpenDOAR, 1472 institutional repositories (as on 26th July 2014) are developed using DSpace Platform. It is the most preferred open source software package for institutional repositories.

2) EPrints

EPrints is the first free and open source software package for building open access repositories that are compliant with the Open Archives Initiative Protocol for Metadata Harvesting. It shares many of the features commonly seen in document management systems, but is primarily used for institutional repositories and scientific journals. EPrints has been developed at the University of Southampton School of Electronics and Computer Science and released under a GPL License.

EPrints was created in 2000 as a direct outcome of the 1999 Santa Fe meeting. Version 3 of the software was officially released in during the Open Repositories Conference in San Antonio, Texas on the 24th of January 2007.

Other than DSpace it is the most widely used open source software used for institutional repository. According to the ROAR and OpenDOAR, 532 institutional repositories (as on 26th July 2014) are developed using DSpace Platform.
3) Bepress (Berkeley Electronic Press)\textsuperscript{32}

Bepress was developed in 1999 by UC Berkeley Professors Robert Cooter, Aaron Edlin, and Ben Hermalin. Bepress began by developing an innovative online editorial management system specifically designed to make peer-review workflow as quick and easy as possible. The statistics available in ROAR shows that all over the world 326 Institutional Repositories (as on 26\textsuperscript{th} July 2014) are developed Bepress Platform. To address the broader crisis in scholarly communications, Bepress then set out to provide authors and universities with a solution for them to share their research openly and widely. Thus Bepress pioneered Digital Commons, a software service that is now the leading hosted institutional repository (IR).

4) Digital Commons\textsuperscript{33}

Digital Commons is the leading hosted institutional repository (IR) software platform. It offers the features of a traditional IR as well as professional-grade publishing software, management tools, and individual faculty and researcher pages to promote and disseminate scholarship and serve academia. Institutional repositories, regardless of platform, require lots of customizations. Digital Commons repositories can be customized and tailored to users’ diverse needs. In addition, users are fully supported during the entire repository lifecycle: development, implementation, maintenance, and upgrades. According to OpenDOAR, 126 institutional repositories (as on 26\textsuperscript{th} July 2014) are developed on Digital Commons platform.

5) Fedora\textsuperscript{34}

Fedora digital object repository management system is based on the Flexible Extensible Digital Object and Repository Architecture (Fedora). It is a Linux-based operating system. One can use Fedora in addition to, or instead of, other operating systems such as Microsoft Windows\textsuperscript{TM} or Mac
OS X™. Fedora is sponsored by Red Hat, the world's most trusted provider of open source technology. Red Hat invests in Fedora to encourage collaboration and incubate innovative new free software technologies.

Fedora software development began in 1997 as a DARPA and NSF funded research project at Cornell University. The University of Virginia and Cornell University jointly developed Fedora with funding provided by a grant from the Andrew W. Mellon Foundation. The software is flexible enough for serving variety of digital documents with different functionalities such as digital asset management, institutional repositories, digital archives, content management systems, scholarly publishing enterprises, digital libraries etc.

First version of Fedora was released in November 2003. Recently in April 2014, Fedora Version 21 was released. According to ROAR, 43 institutional repositories (as on 27th July 2014) are built using Fedora Open Source Software.

6) Greenstone

Greenstone is produced by the New Zealand Digital Library Project at the University of Waikato. It is developed and distributed in cooperation with UNESCO and the Human Info NGO. It is open-source, multilingual software, issued under the terms of the GNU General Public License. The first version of Greenstone was made available during 1997. The use of Greenstone is very popular in developing countries as it is very easy to create collections in Greenstone as well as it has one of the important features of exporting collections on CD-ROM, this feature is found very useful since in many places there is poor Internet connectivity. It has helped libraries to carry whole collection on CD-ROM and CD-ROM collections can run on standard PC. ROAR and OpenDOAR include 53 institutional repositories (as on 27th July 2014) developed on Greenstone Software.
7) DoKS (Document and Knowledge Sharing)\textsuperscript{36}

DoKS is an open source project initiated by the library of the Katholieke Hogeschool Kempen (KHK) during 2003 for organising electronic theses and curricular vitae of Graduating students at Flemish University Colleges, Belgium. The Project was funded by the Institute for the Promotion of Innovation by Science and Technology in Flanders, private industry partners and non-profit organisations. DoKS software model is basically to organise electronic thesis collection for the students passing from any university. The software has an in-built unique feature of creating curriculum vitae of all graduating students depending on the data of student administration files. According to ROAR and OpenDOAR, 5 institutional repositories (as on 29\textsuperscript{th} July 2014) are built using DoKS Open Source Software.

8) MyCoRe\textsuperscript{37, 38, 39}

MyCoRe (MILESS Community Content Repository) is an open source project which provides a system for creating digital libraries and content repositories. It is developed at Essen University, Germany. The first official version was launched during 2004. In the MyCoRe Project a group of universities from Germany are working on the development of MyCoRe. The technical base of the system is formed of Java class libraries, XML technology and different database backend. ROAR & OpenDOAR have 8 institutional repositories (as on 29\textsuperscript{th} July 2014) listed in their directories which are developed using MyCoRe software.

9) ETD-db\textsuperscript{40}

ETD-db has been developed by one or two developers at Virginia Tech, and endorsed by the Networked Digital Library of Theses and Dissertations (NDLTD). The development of the official release of this package paused on February 2002 at version 1.7c, but it is still used as their ETD
submission, archive and search tool. During 2000-2005, it was the most widespread E-theses package in use, in part due to the support it has from the NDLTD. ETD-db depends upon the Perl programming language and the MySQL open source database system. ROAR & OpenDOAR have 14 institutional repositories (as on 29th July 2014) listed in their directories which are developed using ETD-db software.

10) Drupal

Drupal is a free and open-source content management framework written in PHP and distributed under the GNU General Public License. It is used as a back-end framework for at least 2.1% of all websites worldwide ranging from personal blogs to corporate, political, and government sites. It was developed by Dries Buytaert as a message board and became an open-source project in 2001. According to ROAR and OpenDOAR, 15 institutional repositories (as on 29th July 2014) are built using Drupal Open Source Software.

3.9 Open Access and Copyright:

The Budapest Open Access Initiative (BOAI) states that open access is completely compatible with copyright. Copyright law gives the copyright holder the right to make access open or restricted, and the BOAI seeks to put copyright in the hands of authors or institutions that will consent to make access open. Compatibility of open access and copyright is explained in more detailed way by BOAI by discussing the issue with reference to self-archiving and open access journals.

1. Self-archiving:

Authors of preprints hold the copyright to them and may post them to open access archives with no copyright problems whatever. If the preprint is later accepted for publication in a journal that requires authors to transfer copyright to the publisher, then the journal may or may not give permission for the
refereed post-print to be posted to an open access archive. If permission is
granted, then again there is no copyright problem. If permission is denied, then
the preprint may remain in the open access archive because it is a different
work from the post-print and the author never transferred the copyright on the
preprint. Moreover, the author may post to the archive a list of corrigenda, or
differences between the preprint and post-print. This is not quite as convenient
for readers as seeing the whole post-print online, but it provides them with the
equivalent of the full text of the post-print and is infinitely more useful than no
free access at all. For more details, see the section on self-archiving.

2. Journals:

Open access journals will either let authors retain copyright or ask authors to
transfer copyright to the publisher. In either case, the copyright holder will
consent to open access for the published work. When the publisher holds the
copyright, it will consent to open access directly. When authors hold the
copyright, they will insure open access by signing a license to the publisher
authorizing open access. Publishers of open-access journals will have such
licenses already prepared for authors. There are many ways to write such a
license.

The BOAI does not advocate open access for copyrighted literature against the
will of the copyright holder or in violation of copyright law. Nor does it advocate
any change in copyright law. It seeks to maximize open access within existing
copyright law, in accordance with the wishes of the copyright holders.

3.10 Summary:

The present chapter details the concept of ‘Open Access (OA)’ by giving an
overview about history of open access, defining it, types of OA, explaining its
needs and barriers to open access . The needs and barriers are explained as
mentioned by SPARC Open access document.
The development of open access roots back to various International Open Access Policies like BOAI in 2002, ECHO Charter 2002, Bethesda Statement on Open Access Publishing (2003), Berlin Declaration (2003) and Salvador Open Access Policy for Developing Countries (2005). Depending on these international policies, some national policies were also developed which promoted the open access movement in the respective countries. For example in India, open access got major encouragement due to National Open Access Policy for Developing Countries-2006 (India) and National Knowledge Commission’s Report on Open Access-2005 (India).

The next section discusses the Open Access Institutional Repositories, its advantages and the various popularly used open source software packages used for building an institutional repository.

The concluding part of the chapter presented the issue of open access and copyright based on the BOAI statement on Copyright, self-archiving and open access journals.

The next chapter expounds the concept of one of the most important type of content included in Open Access Repositories i.e. Electronic Thesis and Dissertation (ETD) and will discuss various concepts related to ETD.
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