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Digital Preservation of Electronic Resources

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ABSTRACT

Due to huge advances in information communication technologies (ICTs), there has been an astronomical growth of e-resources—e-journals, e-books, online databases and so on; libraries spend phenomenally on acquisition of these e- resources as these are very popularly used by the students and researchers. Unfortunately, this growth is accompanied by many threats. Digital content (of the e- resources) is fragile and not durable. Its accessibility and use by future generations depends on technology which very rapidly evolves and changes. Hence, ensuring access of e-resources for future generation of users is a big challenge for libraries. The present paper highlights various problems of digital content and elaborates how digital preservation is more demanding and challenging than preserving print copies of journals. It also gives a bird's eye view of various projects initiated for archiving digital content of scholarly journals.

Keywords: Digital preservation, e-resources, digital archiving, digital library, electronic resources

1. INTRODUCTION

In the recent past, the libraries, worldwide, have increased their expenditure on e-resources phenomenally. An 'electronic resource or e-resource is defined as any work encoded and made available for access through the use of a computer. It includes electronic data available by remote access and direct access (fixed media). Remote access (e-resources) refers to the use of e-resources via computer networks. Direct access refers to the use of electronic resources via carriers) e.g. discs, cassettes, cartridges) designed to be inserted in to a computerised device or its auxiliary equipment[1].

The trend to procure and maintain e-resources has grown exponentially among the libraries. This is due to the change in the information seeking behaviour of students, researchers, and faculty members. They are showing greater interest and reliance upon e- resources; and libraries and publishers cater to their requirements by providing the same. This has been substantiated by many survey findings. The users are often content with the information which they locate online—this information may not be exactly what they want, but they are certainly saved from visiting the physical library. The users are highly dependent on these e-resources and this dependence will grow in future too.

At present, though most of the print journals have their print counterparts too. A British Library commissioned study by Electronic Publishing Services Ltd. has declared that half of all serial publications would become online by 2016[3]. The new generation students (or netizens as they are popularly called) are more comfortable in online environment for information seeking. Zogby International as mentioned by Kirchhoff[4] has highlighted that a majority of students (18-24 year) are prepared to give-up television but not the Internet. Further, they are not only consumers of digital content; they, also known as millennials, generate it too by interacting with text, computers, and multimedia[5].

2. PROBLEMS OF DIGITAL CONTENT

This all pervasiveness of digital world raises a serious question-how will access to all the e-resources subscribed by libraries be ensured over longer period of time? It is well known that an unprecedented amount of information is available on the web which is growing at an amazing rate. In some cases, the web is the only medium where such information is recorded. But it is ephemeral medium—its contents are ever changing; new information is rapidly replacing old information; this results in disappearance of large number of web pages and loss of cultural and scientific data on a regular basis. It is widely known that the digital material is fragile and its

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accessibility and use depends upon the technologies that change and evolve very frequently and continually. There may be hardware and media degradation, hardware and software malfunction, operational errors, security breaches and malicious changes which may render information and content inaccessible after some time.

Everyone is well aware that in the traditional environment of print resources, preservation is never that a serious concern, as under normal conditions of temperature and humidity, print resources can be easily stored and maintained for future use. It is an issue of concern when print resources, which are 100 years or more old are to be stored and maintained for posterity[6]. But in digital environment, the scene is completely different. Chaudhary[7] has noted that, "…the rapid developments have a negative impact; technology becomes outdated too fast…This will continue to happen in future. Therefore, we have to be very careful in preserving digital information resources; and this looks to be a continuous problem"[7].

Banach have observed that the rate of change in computing technologies is such that information is rendered inaccessible within a short span of time[7].While technology introduces and evolves portable and compact forms of storage, the life span of the medium is remarkably reduced from several hundred years in case of stone carvings or tablets to just a few days. Greenfield[8] has remarked that, "Books boot instantly, and have a very high-contrast/high-resolution display; they offer fast random access to any page, with instant visuals and tactile feedback; they are easily annotated with no need for batteries or maintenance; finally, they are robustly packaged. By contrast, laptop meets none of these specifications. The only disadvantage of books is that they convey static information, whilst computers give changing information."

An article in The Economist[9] highlights the vulnerability of digital content. 'The Doomsday Book' which has details of 13,418 places and112 boroughs of England and Wales was written in 1086 and is still available in the National Archives, London. But a new survey which was commissioned for the 900th anniversary of 'The Doomsday Book' was recorded on12-inch laser disc, is no longer available as this hardware is obsolete now. The digital era brought with it the promise of infinite memory, increased computing power and accessibility forever. But digital data has a short span of life. Accessing digital content on storage media requires hardware which has short life—commercially and operationally; for example, a scratch on DVD can make its contents totally inaccessible. This is known as hardware dependency[10]; software also has limited life span; and operating system often cannot identify and open unrecognised file formats. When software is 10 years old, running it usually requires hardware emulation.

3. NEED FOR PRESERVATION OF E-JOURNALS

Since the e-journals have become the mainstay of the academic libraries' collection preservation and the archiving is very much essential to ensure seamless, uninterrupted access to them in future. The generation of new scientific knowledge is not possible, until and unless access to already generated knowledge of past is made possible. The faculty members, researchers, and students are highly dependent on e-resources for their research work. In traditional environment, libraries are maintained as proper physical infrastructure, including brick and mortar building with racks and shelves for ensured maintenance and access of back files of journals for years together for the user community. In online environment, libraries have access to journal content, but the access is not ensured for various reasons—the publisher may go out of business, the physical infrastructure may collapse due to vagaries of nature, publisher may cease publication of journal. When libraries subscribe to e-journals, they do not have copies of content at their sites; they get access to content of journals, for limited period, held at remote servers of publishers. Once the subscription is dropped (or publication becomes a ceased one), libraries are deprived of back issues of journals.

This uncertainty of continuing access is a major hurdle which prevents libraries from moving to electronic only subscriptions[11] So libraries need to archive electronic journals before they can completely shift to e-journals only[12]. Since the libraries spent a substantial part of their budget on e-journals, they must protect the investment they make on e-resources[13]. Hence, digital archiving of back files of journals is very important in order to provide seamless access to the digital content to the future generations. The aim of archiving or digital preservation is to make available the e- resources accessible and usable to the posterity. The statement, "Urgent action needed to preserve scholarly electronic journals" endorsed by Association of Research Libraries and many others advocates that, "Libraries must invest in a qualified archiving solution. A library may itself operate qualified archive…otherwise research and academic libraries may collaborate in the form of an insurance collective or mutual assurance society. Such an entity may be governed in a variety of ways but libraries would exercise their preservation obligations in part by paying fees to support the archive"[14].

4. DIGITAL PRESERVATION: MEANING AND PURPOSE

Digitisation is being carried on large scale, worldwide to facilitate and ensure wider dissemination and access of information. Universities, worldwide, spend huge amounts of money on digitisation for long-term gains ensuring

access for long duration. So preservation should be considered an inherent part of digitisation activities. This has been stressed upon by Chowdhury[15].

Preservation is the process of ensuring sustainable access over time to critical scholarly and heritage content. Digital preservation projects are those which can guarantee both preservation and access to significant digital content in future. The preservation of digital resources is all about evolving ways to maintain digital heritage-cultural, social, and scientific, whether it exists in the form of e-journals, database records, websites, e-mails, digital images, audio-visual materials, interactive programs and so on. Libraries, on a regular basis engage with a wide variety of these resources and know it very well that these resources become inaccessible and are lost forever if computers change or links break [16]. According to Jantz & Giailo[17] digital preservation encompasses activities which are necessary for long-term maintenance of a byte stream including metadata) sufficient to reproduce a suitable facsimile of the original document; and for the continued accessibility of the document contents through time and changing technology. The Digital Library Federation[18] has defined preservation of e-journals as:

"Preservation of electronic journals is a kind of insurance, and is not in and of itself form of access. It is a way of managing risk: first, against the permanent loss of e-journals, and second, against having journal access disrupted for a protracted period following a publisher failure."

4.1 Archiving—Print Journals vs E-journals

A printed journal is a physical object; whereas an e-journal is not a physical but a logical object stored on a physical medium. A printed journal presents the information so that it is immediately accessible to the human eye and can be read directly. To view an e-journal specific functionality enabled by software and hardware is required.

Poynder[19] has described the difference as: Unlike paper or microfilm where meaning is transparently inscribed on the surface of the medium-digital documents are opaque bit streams only understandable to humans when interpreted by a machine. The hardware and software to do this interpretation, however is constantly superseded. There have, for instance, been more than 200 digital storage formats alone deployed since 1960s, with none lasting more than 10 years.

The digital publication deteriorates much faster than paper. The format of the digital object may be damaged or lost and thus become irretrievable. But even before that happens, the technology used to store the publication is likely to become obsolete. Another threat is the loss of the functionality needed to interpret, display and use information contained in the digital object; without this functionality—the provision of specific hardware/software, the information will not be available even if the bit stream of the digital object has been preserved.

In the print environment the methods of appraisal, accessioning, organising, describing, preserving are clearly defined for archiving and preserving, these are not so for digital preservation. It is a very complicated process and requires lot of innovations in institutional and business models, technology infrastructure, social and legal frameworks[20]. Preservation of e-journals is "particularly challenging due to extensive diversity and complexity of data structures in use over time and across the publishing community"[21]. The archival holdings may be accessed infrequently-several cycles of technology evolution may occur in between accesses to digital content, thereby causing corrupted files to remain unnoticed for long. Besides, the digital content may have to undergo quite a number of migrative transformations due to format obsolescence. These transformations and upgradations may change the digital content in different ways. The ways for checking integrity of the content of digital objects is based on some type of cryptographic techniques; most of these techniques become less effective with time and need to be replaced with stronger techniques.

The present status of archiving of e-journals is reflected as: "As the creation and use of digital information accelerates, responsibility for preservation is diffuse, and the responsible parties-scholars, universities and college administrators, research and academic libraries and publishers have been slow to identify and invest in the necessary information to ensure that the published scholarly record represented in electronic formats remains intact over the long-term"[22].

Since digital preservation poses lots of problems due to fast pace of technology development, fragility of digital information and computing infrastructure, a well-developed strategy needs to be formulated to attend to the following requirements:

- Encapsulation of information of content, context, structure of digital object in order to enable long term maintenance
- Efficient management of evolution and up gradation of hardware and software with proper handling of technology obsolescence
- Effective recovery mechanism from technology degradation or failure or natural disasters-fire floods, earthquakes, human-induced operational errors
- Effective ways to ensure the authenticity and integrity of content and structure of archived information

- Ability for information discovery and content access and preservation with an automatic enforcement of authorization and IP rights
- Scalability in terms of ingestion rate, capacity and processing power to manage and preserve large scale heterogeneous collections of complex objects[23].

5. ISSUES AND CHALLENGES

5.1 Selection of Content

There are an ever growing number of journals. So it is essential to decide upon the preservation priorities. The decision can be made after discussions with libraries, publishers, users, research scholars and faculty members. At this stage various issues have to be taken care of like-what content of the journals should be archived? E-journals have content like editorial boards, rights and usage terms, copyright statement, journal description, advertisements, reprint information, editorial, errata, conference announcements, various kinds of digital files . Some information is ephemeral and does not have long lasting value; decision needs to be taken about what has to be archived and maintained. Besides, the digital content may be in a variety of formats which may affect the maintenance cost. An archive may decide to normalise digital objects in some preferred formats.

For example, an archive may store all raster images in TIFF and convert JPEG or GIF image into that format. Controlling the number of file formats will lessen the complexity of format monitoring and migration. The publishers encode content in SGML or XML; besides publishers create their own DTD to suit their needs. While archiving, all marked up documents can be normalised into a common DTD. This will lessen the complexity of documentation, migration and interface software[24].

5.2 Use of Metadata

Archiving of journals' content also entails recording of vital information for using the data stored in the archive-metadata plays an important role in this regard. It helps in documenting the technical processes associated with preservation, specifies rights management information and establishes identity and authenticity of digital content.

Clifford Lynch[24] has described the functions of metadata in a digital archive, "metadata accompanies and makes reference to each digital object and provides associated descriptive, structural, administrative, rights management and other kinds of information. This metadata will too be maintained and will be migrated from format to format and standard to standard, independent of the base object it describes." It is still not clear that how much preservation metadata is adequate enough for archiving of electronic journals' content. A consensus needs to be reached among archiving community on what metadata is required. It has been suggested that no single existing metadata scheme can serve the purpose in archiving; a combination of METS (Metadata Encoding and Transmission standard) PREMIS and MODS (Metadata Object Description Schema) should be used to represent information packages in e-journal archival systems.[25]

5.3 Strategies for Preservation

There may be following different option for preserving digital content for future use:

- Medium refreshing–It is copying digital files from one storage medium to another medium.
- Data migration–It is transfer of digital materials from one hardware/software configuration to another.
- Technology preservation–It means preserving an information object together with all of the hardware and software needed to interpret it.
- Software emulation–It helps in imitation of another software to accept same data, execute same programme and achieve the same results as that of imitated system[26]

5.3.1 Continuous Management and Maintenance

Digital preservation work is constant; it should not be taken up in fits and starts. It requires continuous and active management; the digital archive requires continuous regular maintenance to keep it secured, including regular processes to check the fixity of files–find out if the content is corrupted and needs to be repaired, to ensure replications.

5.3.2 Financial Constraints

The libraries may find it difficult to convince authorities for release of funds for digital archiving. They may lack far sight to invest in digital archiving; rather they may prefer to invest in widening their resources. The administrators, policy makers need to be more sensitive and understand the importance of archiving activities. A percentage of total library budget should be allocated for archiving programmes.

5.3.3 Collaborative Efforts

Archiving initiatives/organisations should work in network. Collaborative efforts will help in sharing of resources and developing common finding aids, metadata tools, software, access mechanism and registry services; this will be definitely cost saving in nature. Granger[27] has very aptly remarked, "…digital preservation indicates the positive need for collaboration amongst interested parties and institutions. It should be obvious that such collaboration is likely to facilitate cost savings, either by

economies of scale or by other means." Besser[28] also emphasises that collaboration is an important component of national preservation plans .Coordination in content selection, documentation of standards and best practices will help all the participants. For example, the Los Alamos National Laboratory Research Library has shared its customised version of access software with OhioLINK EJC and the Ontario Scholars Portal; Kopal of DDB and KB e-Depot use IBM's DIAS (Digital Information Archiving System) software. It has been designed to store digital information, preserve and make it available in a usable fashion for 100 years or so[29]. The content delivery infrastructure of JSTOR is being used by Portico. The LOCKSS Alliance and CLOCKKS use the same software. The libraries should take efforts in developing a registry, which should record the details of various archived journals and their archiving projects such as ROAR (Registry of Open Access Repositories) and ROARMAP (Registry of Open Access Repositories Mandatory Archiving Policies)[30]

Kenney[31], *et al.* have identified seven indicators for e-journals archiving programmes:

- A clear mission and necessary mandate for long term archiving.
- Negotiate all rights and responsibilities necessary to fulfil its obligations over long periods
- Clarify about which scholarly publications it is archiving and for whom.
- Offer well defined archiving services
- Make preserved information available to libraries under certain conditions.
- Organisationally viable.
- Work as a network.

6. ROLE OF NATIONAL LIBRARIES, LIBRARY CONSORTIA AND OPEN ACCESS REPOSITORIES IN PRESERVATION

The national libraries may serve as legal deposit centers for electronic journals. Germany has enacted law that mandates deposit of German publications to the National library. The British Library, Library and archives Canada have designed electronic–deposit repositories. The legal deposit may not be the panacea for archiving e-journals; it will help considerably in developing standard submission formats for e-journals' content[32].

In UK, the Welcome Trust and the Medical Research Council have mandated that the final copies of all research which they fund be deposited to UK Pub Med Central. Research Councils, UK has advocated and encouraged all other research councils to consider submission of funded research to open access repositories[33]. In USA, efforts have been taken to mandate the deposit of copies of all NIH funded research in open access repositories[34]. In India too, UGC has mandated electronic submission of theses and dissertations and asked the universities to set up ETDs and provide open access to them. But certainly these open access repositories and ETDs cannot replace electronic journals' content archiving. The main thrust of open access repositories and ETD archives is to populate them and provide access to the information; these do not aim for long term preservation. Indian libraries have at their disposal largest collection of e-resources subscribed through various consortia such as Indian National Digital Library in Engineering Sciences and Technology (INDEST) consortium[35], Digital Library Consortium[36], Department of Atomic Energy, DRDO, CSIR, and FORSA. Even the libraries in remote parts of India are having access to e-resources. So these consortia can play an active role in preservation of e-resources.

6.1 Open Archival Information System (OAIS)

OAIS is a reference model for archiving communities and most of the archiving projects are based on OAIS model[37]. (PANDORA, LOCKSS, Chronopolis project, etc.). It specifies how digital assets should be preserved for users from the moment digital content is ingested in to digital storage area, through various preservation strategies to the creation of dissemination packages for end users. The OAIS model was adopted as an ISO standard (ISO14721:2003 OAIS). This model comprises four components-producers, consumers, management and the archive. The producers generate the information and submit it to the archive for preservation. The consumers use the preserved information. The management is responsible for laying down explicit policies and objectives of the archive. It is not responsible for day to day administration of the archive. This management is accomplished by a functional entity within the archive itself[38].

6.2 Major Digital Archiving Projects

6.2.1 Portico (http://www.portico.org)

Portico is a digital preservation service provided by ITHAKA, a not-for-profit organisation with a mission to help the academic community use digital technologies to preserve the scholarly record and to advance research and teaching in sustainable ways. Portico was started in 2002 to create a sustainable digital archive; it has collaborated with 151 publishers (on behalf of over 2000 societies and associations) and 741 libraries to archive 13,690 and 129,890 e-journals and e- books. The participating libraries are supposed to get access to dark archives after 'trigger event'' occur. These may include:

- Cessation of a publisher's business

- Discontinuation of a title
- Non availability of back issues
- Vagaries of Nature
- Failure of delivery mechanism of publisher

6.2.2 LOCKSS (http://www.lockss.org)

The LOCKSS (Lots of copies keep stuff safe) programme, started by Stanford University Libraries, is an open source digital preservation system. The participating libraries acquire digital content in their local LOCKSS Box. Through a LOCKSS distributed network, libraries cooperate with each other to ensure their preserved content remains authentic and authoritative. This collaboration measures and validates the integrity of the participating libraries' holdings. When the publisher's web site is unavailable for any reason, content is served from the library's 'LOCKSS Box' guaranteeing immediate and continuous access.

The LOCKSS delivers a copy of the original publication to authorised users in real-time, whenever it is needed. Since LOCKSS preserves the original publisher's copy of each item, it ensures that the most authoritative version persists forever. At present, the LOCKSS has more than 9000 e-journal titles from 510 publishers.

6.2.3 CLOCKSS (http://www.clockss.org)

The CLOCKSS (Controlled Lots of Copies Keep Stuff Safe) is a not-for-profit joint venture started by libraries and publishers to ensure long-term access to scholarly publications in digital format. At present, there are 164 libraries and 88 publishers who have entrusted their content to CLOCKSS for long-term preservation.

The CLOCKSS archive provides this assurance via its secure network of content that can be accessed only after a rigger event has happened. CLOCKSS is unique because it commits to make all content from the archive freely available to the world after a trigger event has happened.

6.2.4 PANDORA (http://pandora.nla.gov.au)

PANDORA (Preserving and Accessing Networked Documentary Resources of Australia) is an archive of copies of significant Australian online publications and web sites issued on the Internet. The National Library of Australia and its partners are building the archive to ensure long-term access to significant Australian documentary heritage that is published online. PANDORA has been placed on the Memory of the World Australian Register in August 2004.The NLA selects e-journals from the Australian Journal Online database for preservation in PANDORA.

E-journals are one of the six categories of online publications included in PANDORA which lists more than 2000 journals published in Australia.

6.2.5 KOPAL (http://kopal.langzeitarchivierung.de/index_ziel.php.en)

It is a cooperative development of long term digital archive of German National Library and Universitaets bibliothek, Gottingen. The goal of this project is to develop a technical, organisational solution to ensure long-term availability of electronic resources. It preserves bit streams of digital documents follows three steps of storage, migration, and emulation.

6.2.6 PubMed Central (http://www.ncbi.nlm.nih.gov/pmc/)

It is a free archive of biomedical and life sciences journal literature at the US National Institutes of Health's National Library of Medicine (NIH/NLM). In keeping with NLM's legislative mandate to collect and preserve the biomedical literature, the PMC serves as a digital counterpart to NLM's extensive print journal collection. It was launched in February 2000, and is managed by NLM's National Center for Biotechnology Information (NCBI). As an archive, PMC is designed to provide permanent access to all of its content, even as technology evolves and current digital literature formats potentially become obsolete. NLM believes that the best way to ensure the accessibility and viability of digital material over time is through consistent and active use of the archive. For this reason, free access to all of its journal literature is a core principle of PMC. It provides access to more than 250 journals from 50+ publishers. It retains all perpetual rights to archive all submitted materials and aims at maintaining the long-term integrity and accuracy of the contents.

6.2.7 Ohio LINK (Library and Information Network)

It is a consortium of 88 Ohio colleges and universities, and the State Library of Ohio. OhioLink's e-services include a multi-publisher E-journals publisher Centre which was launched in 1998 provides access to more than 7000 scholarly journal titles from 40+ publishers across different disciplines. Ohio LINK has declared its intention to maintain the EJC content as a permanent archive and has got perpetual archival rights in its license agreement.

6.2.8 e-Depot System (http://www.kb.nl/hrd/dd/index-en.html)

The Koninklijke Bibliotheek (National Library of the Netherlands) (KB) is the first national library in the world to start and own an operational system for the deposit and

long-term preservation of digital publications[40]. In 1994, the KB took the decision to include e-publications in its depository collection (e-Depot). Since then, research and development on long term digitization and archiving has been an important activity of KB. The e-Depot, an intrinsic part of Dutch National Library aims to ensure long term preservation of digital objects. The KB has developed a specific workflow for archiving e-publications. Elements of this workflow are: accept and pre-process; generate and resolve identifiers; search and retrieve publications; and identify, authenticate and authorise users. The technical heart of the e-Depot system is IBM's DIAS (digital information and archiving system). The KB ensures, libraries, publishers and end users that the information stored in the archive will outlast the transience of digital documents. In addition, the e-Depot offers publishers a durable check on archived formats as well as guidance on how to create the most durable electronic publications. The library has entered in to an agreement with 30+ publishers and libraries to archive the scholarly content. As of November 2007, the Depot has ingested more than 10 million digital objects; most of them are publications by international publishers.

6.2.9 National Digital Information Infrastructure and Preservation Programme (http://www.digitalpreservation.gov/about/backgroundhtml)

The National Digital Information Infrastructure and Preservation Programme (NDIIPP) of Library of Congress aims at collecting, preserving, and making available significant digital content for current and future generations. Library of Congress through this programme has collaborated with various libraries and organisations for preserving at risk digital content, into over 1400 collections, and built a distributed digital preservation infrastructure.

6.2.10 Data-PASS (http://www.data-pass.org/)

Data-PASS (Data Preservation Alliance for the Social Sciences) is a project supported by NDIIPP, of five major US Social Science data archives. It ensures that all at risk social science data are identified, acquired, archived and preserved for future use.

6.2.11 Chronopolis Project (http://chronopolis.sdsc.edu/)

The Chronopolis project provides long-term archiving and preservation services for digital content provided by the California digital Library and the Inter-University consortium for Political and Social Science (ICPSR). Under this project, some core archiving and preservation tools and services have been developed under a framework, popularly called ADAPT-approach to digital archiving and preservation technology. This model is based on a layered, digital object architecture which includes a set of modular tools and services, built on open standards and web technologies. The project also borrows from open archival information system (OAIS) reference framework.

6.2.12 MetaArchive (http://MetaArchive.org)

MetaArchive began in 2004 as a venture led by Emory University with Georgia Technical University, University of Louisville, Virginia Technological University, Auburn University, Florida State University, and Library of Congress. It supports, promotes, and extends collaborative approach to distributed digital preservation practices.

6.3 Commercial Publishers

The leading e-journal publishers such as Elsevier, Nature, Springer, Taylor and Francis Blackwell and so on so forth have already initiated efforts and signed agreements to archive the contents; smaller publishers will sooner or later follow suit. Oxford journals have participated in a wide range of digital preservation activities. It has made agreements with KB of Netherlands and Portico; and participates in LOCKSS Alliance. Elsevier has established official archives with independent third parties. It means that there are contractual relationships to preserve e-journals in perpetuity and make them available internationally in case of trigger events. The KoinklijKe Bibliotheek, National Library of Netherlands is the official digital archive for Elsevier journals. KB receives all Elsevier publications, including back files on regular basis.

7. CONCLUSIONS

The libraries have been slow to initiate action to preserve scholarly journals' content as they have other pressing needs and requirements to attend to. All stakeholders–librarians, publishers, administrators, policy makers and funding bodies should get together to initiate and develop a strategy for preserving electronic, scholarly journals' content for posterity. They need to take responsibility for their own archiving activities for preservation of e-journals' content. Libraries should take measures for ensuring the safety, longevity, and accessibility of collections and should be least dependent on vendors and external service providers. Concerted efforts should be taken to enact legal deposit law which would go a long way in preserving digital content of scholarly journals. The National Library of the country should take the lead in this venture of preserving e-journals' content.

Time seems right for Indian libraries to explore various options to create models for digital preservation of e-resources subscribed by them. The various consortia of

the country—INDEST, INFLIBNET should initiate digital preservation projects which may be modelled on LOCKSS and CLOCKSS. The consortia may negotiate with publishers to set up local server in order to meet the needs of Indian libraries.

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