

Promotion of Open Access through self-archiving in Sri Lanka: getting experiences from E-LIS

By J. J. G. Arachchige

Abstract

This paper explores the main features of e-LIS; one of global level subject-based open access archive on Library and Information Sciences, and discusses the potential of obtaining E-LIS experiences to form a national level e-repository of scientific and scholarly resources in Sri Lanka.

It is found that only one national level open access e-repository is available in Sri Lanka. It is NSF e-repository and is still in the beginning stage. There are some attempts to approach open access concept; that several universities and other institutions tried to provide free access to resources by setting up subject gateways, linking to free resources in the internet, building Institutional repositories of institutional publications, and providing simultaneous access to e-journals purchased under consortia programmes. The success of these attempts is not achievable because these attempts were based on personal interests rather than governing under a national programme with the help of authorities. It seems that a national level open access e-repository is essential to the country as the conventional paper mode archives are not able to satisfy the demand of teaching, learning and research community. Open access e-repository in Sri Lanka should be able to accommodate storing, diffusion and managing of knowledge output of the country. The promoting of self-archiving will be an effective mechanism to develop the national e-repository and experiences from global level e-repositories such as E-LIS can be used to form a framework for national level e-repository in Sri Lanka.

Keywords

E-repositories

Open-access archives

Self-archiving

Information sharing

E-archives

E-LIS

Introduction

The world now in the Information Age is practicing the knowledge-based economy where everything is determined on the availability of knowledge, know-how, and best practices. Every aspect of the development: Commercial, socio-cultural, educational, and political is associated with the access to information, and the sustainability of the economy depends on the level of Information behaviour of the nation. Science & Technology plays the major role in the knowledge-based economy and therefore, it requires national governments to work in collaboration with science and technology community and utilize their knowledge for the development.

Information is a vital factor to create the knowledge. “In our global networked economy and society, information is an essential resource for capacity building and social and economic development. Knowledge societies are characterized by their ability to identify, produce, process, transform, disseminate, and use information to build and apply knowledge for human development” (Said Amina 2006). Scientific research and scholarly publications provide new knowledge for the national development and hence the enhancement of access to existing knowledge will be an investment for the new knowledge. New knowledge is always based on the existing knowledge and the emergence of knowledge may combine the back and forth phenomena.

Policy-planners, scholarly community and information specialists including librarians have to make much effort in a collaborative basis to aggregate the community’s scientific and technical knowledge and facilitate the community access, share and utilize the knowledge to create new knowledge. Especially librarians can do this job better than others to accelerate the diffusion of knowledge and

provide a platform for information seekers and knowledge developers. Librarians have a great challenge to ensure the speedy, timely, and accurate access to information resources and take measures to overcome geographical and technical barriers to serve users in the networked society.

The world is enjoying the hasty development of the ICT, and all social and economic practices are based on the innovative technological environments in the “Digital era”. Administration, banking, education and communication etc. are performed in this digital background. Linking to digital sources, providing speed online access to information, transforming and transferring knowledge to develop existing knowledge etc. have become the critical factors in the development of the economy. This has also changed the information behaviour of people by leading them to practice with new searching strategies, more descriptive metadata, and effective use of information for their works. People tended to feel that they cannot depend only on the conventional form of printed information resources, and cannot depend only on bibliographic information and abstracts to fulfill their knowledge requirements.

New concepts like E-library, Digital library, virtual library, online library, open-access library etc. came to the scene while librarians extended much effort to digitize materials available in conventional form, and build up digital collections to facilitate users access to online full text materials anywhere in the world.

Commercial sector has also taken the opportunity for ‘Information Business’ and many entrepreneurs have built full-text databases for the purposes of earning profit from document delivery, providing access facilities to e-resources etc. Password login, IP range login and login through E-Mail addresses were some mechanisms used by publishers/entrepreneurs and information brokers to control the access and unauthorized use of databases. Librarians moved to practice strategies like consortia subscription to overcome issues like rising cost for subscription to e-resources. This mechanism, however, is also a kind of controlled access and is not able to satisfy the national demand for information meaningfully. Thus developing nations in the world require quick and easy access facilities to knowledge, and librarians have the challenge to fulfill the highly increasing demand for development information in respective countries amid a networked and digitized, turbulence of information super-glut.

Objectives

The purpose of this study is to discuss the necessity of facilitating open access to the national knowledge output such as research and scholarly publications in Sri Lanka. This paper aims to discuss the key features of potential national level digital repository of information resources in Sri Lanka. Best practices and experiences from global digital archives such as E-LIS are explored and attempts are also made to identify digital repositories available institutional, national, or global level among universities and other institutions in Sri Lanka. The need of encouraging scientific and scholarly community to promote open access initiatives through self archiving is highlighted.

What is Open-Access:

The concept of Open-access to literature has its roots in the deep history perhaps with the initiation of the public library concept that lent printed materials free of charge to the general public. The Open-access (OA) concept was mostly occurred in the networked environment with the aim of providing quick, easy, and free access to e-resources. Actually, this has been rapidly developed since few decades with the increasing use of the Internet. The characteristics of OA include digital availability of the document, online access, free of copyright or licensing restrictions, and ability to harvest metadata and reuse documents with proper citing. Yet some OA repositories seem to be ambiguous in certain aspects as they impose access barriers through password login, restriction of full document downloading etc.

Swan Alma (2005) states that open - access came to practice in a preprint culture that was the distribution of drafts of research articles before they have been peer-reviewed to establish commentary before final revision and submission of the articles to learned journals. While the arrival of digital age the practice of open access migrated from paper mode to electric mode.

Budapest Open Access Initiative (2002) describes the OA as “open access to this literature, we mean its 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.”

OA is expected to be based on the free availability and unrestricted use. Yet, in practice, some repositories allow derivative works and some do not. Some repositories provide the permit of commercial re-use. (Suber, Peter, 2007). The Bethesda and Berlin statements explain that for a work to be OA the copyright holder must consent in advance to let users copy, use, distribute, transmit and display the work publicly and to make distribute derivative works, in any digital medium for any responsible purpose subjected to proper attribution of authorship.

The OA movements have been initiated in the purpose of removing price barriers and permission barriers and access barriers for accessing to research documents and journal articles. O A is expected to facilitate users with immediate access rather than delayed while accessing full text but not link to abstract, metadata or summaries.

"OA is compatible with Copyright, peer review, revenue (even profit), Print, Preservation, prestige, career advancement, indexing and other features and supportive services- associated with conventional scholarly literature" (Suber Peter 2007). Following features distinguish some attributes of open-access:

- a. Availability on electronic (digital) format
- b. Online accessibility.
- c. Resources are based on the copyright holder's consent in advance to the unrestricted reading, copying downloading, sharing, printing, linking, storing, and crawling of the full text of the work.
- d. OA is mostly used and contributed by academic scholars to create impact on research process and transferring of knowledge.
- e. No price barriers

Generally researches are based on the academic perspectives and therefore open-access concept is highly prestigious to academic scholars. Academic people publish their research and journal articles not for profit or revenue earning, but for the contribution to the professional development and also to enhance the impact on research. It is different from non-academic perspective because nonacademic view focuses on selling or earning profit from publications and research information. For instance, publishers and information brokers raise their charges for access to databases while academics write article to develop the professionalism. Today subscription charges for journals are very high. "Scholarly journals do not pay authors for their articles and have not done so, since the first journals were launched in London in Paris in 1665" (Suber Peter 2007). In fact, academics have to pay when submitting and presenting papers in conferences.

Open access provide the access to peer-reviewed articles which are not commonly available in public libraries. O.A. encourages researchers, manufactures, technologists and learning community to enhance, uplift and promote their research culture. Open-access facilities are established by librarians and IT personnel through building up electronic full-text databases and providing free or controlled access. Resources for the open access databases are obtained by purchasing licenses, subscription for

toll-access, consortia purchasing or linking to free resources available in the internet. The most effective means of promoting open-access is self archiving where researchers and authors of scholarly publications deposit their works in free access repositories. Another effective mechanism to enhance OA is to sign agreements with publishers and copyright holders to release copyright barriers on OA.

Self Archiving

The development of Information Communication Technology (ICT) introduced new concepts like Digital Libraries, open-access Libraries, Virtual Libraries and e-Libraries. Consequently, librarians and information specialists moved to build up electronic resource collections instead of conventional printed collections. The practice of paper-mode archiving migrated to digital mode archiving and e-repositories were popular among researchers and scientific community. Paper-mode resources were converted in to various forms of digital formats while many modern publications were directly published in e-formats. E-repositories can be seen in the form of institutional level as well as personal level and are built up by individuals or group of people in institutions.

E-repositories can be subject-based or geographical based and can be national level or global level depending on their objectives, theme, and coverage of resources. Most of e-repositories facilitate with boulder less access and seamless searching and unlimited downloading.

Electronic repositories are built up by profit organizations too in the aim of profiting from information. The emergence of open-access concept brought academic community to seek for free search and free download of research and scholarly articles, and therefore, free archiving was the most concern. The practice of self archiving was proliferated as the online submission facilities were developed and variety of subject level and institutional level OA collections appeared immensely. "The purpose of self-archiving has its roots in the field of Computer Science, where researchers were depositing results in ftp archives some decades ago and later on, websites" (Swan Alma 2005).

According to Wikipedia the self-archiving involves depositing a free copy of digital documents on the World Wide Web in order to provide open access to it. Usually peer-reviewed research journals and conference articles and theses are deposited by the author himself/herself or any other with the consent of copyright holder in an institutional repository or any other open archive for the purpose of maximizing its accessibility, usage and citation impact. Self-archiving is a good method to promote open-access.

Swan Alma (2005) through a research found that the main reason for authors publishing their works in open-access journals are the principle of free access for all and their perceptions that these journals reach larger audience, publish more rapidly and are prestigious than the toll-access(subscription based) journals that they have traditionally in. Swan further explains that reasons for not publishing in open access journals are that they are unfamiliar with any in their field and that cannot identify a suitable one in which to publish their work.

Self-archiving is a matter of attitudes, awareness and scholarship. Authors who practice self-archiving have to concentrate on copyright issues. Mostly authors deposit their pre-print articles before publishing in peer-reviewed conventional journals. That will be the authors final version of the article and in some cases authors should have to sign copyright agreements with the publisher or funding agency. Therefore, most of post-print articles require copyright holders consent prior to deposit them in an open access archive. Many digital archives tag the article as pre-print, Post print or peer-reviewed.

"The Budapest Open Access Initiative is focussed specifically on the refereed research literature, across all disciplines. It is the authors of these articles who should self-archive them, in order to maximize the visibility, accessibility, uptake and impact of their work. The self-archiving itself, however, though rapid and simple, can be done by "proxy," by digital archivers in the researcher's

institution or its library. It can also be done in bulk, by (free) software (under development)" (Self-Archiving FAQ. URL: <http://www.eprints.org/openaccess/self-faq/#self-archiving#self-archiving>)

.E-repositories and E-LIS

E-repositories as discussed above can be in two types: institutional archives and subject-based archives. Subject based archives provide a location to deposit articles related to a discipline or a theme. Subject-based digital repositories have a specific subject area or a theme. For instance "arXIV" is an archive which houses articles in Physics, Computer science, and mathematics. "Cogprints" is for cognitive science articles and "RePEc" is for economics.

Institutional repositories aim to provide a secure location for storage of research documents of an institution. "An institutional repository is a secure storage location for working documents or research. That it becomes the mediator for one-input, many-out-puts scenario, where researcher can retrieve whichever element of his or her own research record are needed for task-in hand (perhaps writing a paper, a lecture, preparing teaching materials, preparing CV). It can also provide the home for research data that cannot be published in traditional journal format but which supports research findings and which as very large datasets, video files, graphical files of various formats, audio files and mixed media output." (Swan, Alma, 2007). Institutional archives can also provide a record of all researches of the institution. It can also serve as a marketing tool so that all research data can be published among institutional staff potential outsiders and interested parties.

Digital archives can be occupied a centralized or distributed system architecture. Centralized system archives have their own communities and concentrate on a single database and one service provider. Digital archives which are based on distributed systems provide a global network of a number of digital archives or Institutional repositories work on an interoperable manner where users can locate the original article without any disruption.

E-LIS

E-LIS is a subject-based global level digital archive related to librarianship information science and technology and related disciplines. Using the open archiving Initiative (OAI) protocol and tools E-LIS facilitates interoperability between repository services. Being a part of RCLIS (Research in Computing Library and Information Science), E-LIS was established in 2003 as the first international e-server in the LIS field. E-LIS is organized managed and maintained by an international team of Librarians working on a voluntary basis. At present E-LIS has 9072 items in the archive. E-LIS can be searched on <http://rclis.org/>.

"The purpose of E-LIS is to make full-text documents visible, accessible, harvestable, searchable, and usable by any potential user with access to the internet. It also aims to support individuals who wish to publish or make their papers available worldwide and it can be used by LIS communities in any country" (De Robbio Antonells and Subirate Coll, Imma,2005). E-LIS provides multi-lingual and multi-format depositing facilities and authors can self archive their works as a proxy service supports depositors. E-LIS mostly depends on voluntarily works of people with deferent backgrounds and it is based on non-commercial orientation, where revenue receiving or profit gaining is not expected. This archive provides a global access to research articles and academic works of professionals in Lis field. This has been popular among scholarly community of Universities, researchers, Librarians, publishers and readers.

Organizational model of E-LIS includes three main sections of its structure: Administration, Editorial and Technical. Each section uses the discussion list as the basis for action. Strategic issues, future direction, policies, user impact and dealing with other communities ect. are handled by Administration Section. Main duties of Technical section are to implement, develop and enhance software and operation within the OAI framework. The administrative sector is the core of the

organization model. And its main responsibility is to determine the international and future vision of the archive to suit the national and international needs.

E-LIS mainly includes distinguished policies such as submission policy and copyright policy.

E-LIS Submission Policy

The aim of the E-LIS is to optimize the research impact on the LIS field and promote the freedom of intellectual integrity. It has clear policies on governance of the archive. Policies are very important as they guide the administration to work within a framework compatible to its mission and objectives.

Main points included in Submission policy of E-LIS can be briefed as follows

1. Any author in LIS field can deposit his/ her article himself/ herself.
2. Author himself/ herself is responsible for the copyright of the article deposited.
3. Author should be adhered to ensure the quality of the paper deposited because authors themselves are aware that their papers are virtually evaluated by a wide community of peers.
4. Author who wants to submit a paper must register in E-LIS to obtain user ID. This is also the basis for obtaining author-view browsing facilities and usage statistics.
5. Any scientific or technical document published or unpublished on Librarianship, information science and Technology can be deposited.
6. Pre-Prints, Post prints, Conference papers, Conference posters, Presentations, tools, book chapters, technical reports, developmental working papers, theses and newspapers and magazine articles related to LIS are the types of document that can be deposited in E-LIS.
7. Submission process includes registration, metadata forming, upload and submission of the article to the archive.
8. Submitted documents first appear on the Buffer (for the approval or rejection by E-LIS staff). Approval is done by the country editor or relevant staff and sent to the main archive, (approval is based on the E-LIS policies and pertinence to the archive)
9. E-Prints (the document) may return to the author for the modification if necessary.
10. Formal Corrections are made by the editor.
11. The document deposited becomes publicly accessible within two days if there is no any correction to be done by the author.
12. E-LIS supports all languages to ensure the equality and internationality.
13. If the article is not in English, it must include an English abstract and Key words to enable all users identify the theme of the article.
14. Editor can insert an English abstract on behalf of the Author.
15. Documents once submitted cannot be removed from the archive. Yet author can control & restrict the access to the document.

16. The Supported document formats in the E-LIS archive are PDF, Postscript tex, LaTeX, (DVI), HTML, ASCLL (text) power point, Ms Word, Doc, and RTE the strongly recommended formats are HTML and PDF.

E-LIS Copyright Policy

Generally, author holds the copyright for the pre-print (before peer-reviewing) of the publication and therefore an author can archive his/her article without seeking permission from any other. "an author's works are that author's own intellectual property and they therefore own copyright and other proprietary right until an if they grant otherwise. Authors submitting to the repository are responsible for ensuring the documents they archive do not have any restrictions on their electronic distribution imposed by a third party (such as publisher). A Pre-refereed pre-print can be self archived at a time when no copyright transfer agreement exists and so the author holds exclusive and full copy right. The authour may no longer have the copyright to self archive a refereed post-print if a copyright transfer agreement has been signed granting all rights to the publisher. In general, When an article is published in a journal copyright is transferred to the publisher" (De Robbio, Antonella and Subirate, Coll, Imma, 2005).

E-LIS does not infringe the copyright and treats that all documents archived in E-LIS server are property of authors. Therefore, the author can restrict access to their papers by limiting the access to a group of registered users of E.LIS, to the depositor only, or archive staff. E-LIS follows the SHERPA database of publisher copyright policies and self-archiving. "SHERPA is a project investigating key issues in creating, populating specifically intellectual property Right (IPR), quality control, collection development policies, business models, scholarly communication culture and institutional strategies" (De Robbio Antonella and Subirate Coll, Imma, 2007).

Various publishers have different copyright policies. Some publishers allow authours to deposit their article in open access archives; some restrict it in to institutional repository or personal webpage. However, this seems to be ambiguous and the nature of the copyright depends on the agreement signed with the publisher. In some cases it is difficult to discern the definition for Open-Access concept as publishers define it ambiguous way. However, type of access whether "open access" or "toll access" depends on the policy of the archive.

E-LIS permits all users or a third party to harvest metadata from the archive but, harvesting of full content of the document depends on the author's will of access restriction.

E-LIS Editorial team

E-LIS is supported by a team of editors selected internationally on volunteer basis. Works are performed by discussion on a mailing list. Important matters such as metadata issues guidelines and promotion of e-LIS are discussed in the mailing list and a lot of editorial works are performed online.

Librarians from various countries contribute to the editorial team and their main duties are maintaining contacts with knowledge generating LIS publishers, making publicity and promoting open access concept by writing articles. Editorial of E-LIS includes coordinative editor, regional editors and country editors.

Technical Features of E-LIS

- a. E-LIS is based on OAI-PMH (Open Access Initiatives Protocol for Metadata Harvesting) which allows the public gather standardized metadata from the repository and retrieve the document if necessary. OAI framework (OAI-PMH) supports the third party to gather data

from the repository, maintain metadata standards and contributes to a network of interoperable institutional archives.

- b. E-LIS is hosted by AEPIC team of CILEA.
- c. The software used in E-LIS is GNU E-print archive software which is compliant with the OAI-PMH. this is an open software developed by electronic and computer science department of Southampton University in UK (around 2001).
- d. Software issues and its development are discussed in the mailing list of technical team.
- e. Uses JITA classification schema of Library and Information Science (<http://eprints.rclis.org.jita.html>).
- f. Searching, browsing facilities are available in three levels; quick, simple and advanced.
- g. Special function like "show all fields" in E-LIS allows user to view the full list of metadata with field labels of an item. This function is important for librarians who organize metadata for their resources.
- h. 'Para Tools' reference linking is used to parse citations. By using of this Para Tools, citations are indicated if the cited document is available in E-LIS archive. This facilitates to link which will seek the item on the web.
- i. Usage statistics are updated monthly. The numbers of hit, visits and downloads are indicated numerically as well as graphically on the statistics page.
- j. Basic metadata format used in E-LIS is Dublin Core (DC). Metadata related to documents can be seen in various metadata formats such as HTML, Dublin Core, ASCII Citation, Full Metadata, Reference Manager, DIDL, MODES, EP3 XML, Simple Metadata etc. which is very useful for librarians.

Open access in Sri Lanka

Knowledge is the basis for all categories of development in any country. The philosophy that 'new knowledge is emerged on the basis of existing knowledge' is applied to every country, every society and every environment. Knowledge is acquired through research, education, training and experiencing and all these elements are associated with information - the ingredient which is transferred to the knowledge. Knowledge seeking and knowledge generation are interrelated process that leads to the national development, and therefore, developed countries have given priority to manage the knowledge by aggregating scattered knowledge, organizing them and providing access facilities to them.

Sri Lanka is not poor in the practice of aggregating and transferring knowledge. Our education system in the history has proven that the country had a good method of transforming and transferring knowledge among the community. Yet, in the innovative technology driven global context the country cannot survive with the existing conventional methods and needs to practice new methods to aggregate scattered knowledge, organize it and transfer the knowledge among communities. Country needs to enhance the use of this knowledge for the national development.

Methodology

This study engaged in a sample survey by distributing a structured questionnaire among university librarians and Special librarians in Sri Lanka to gather data related to Digital repositories available. Investigations were also made through logging onto websites of relevant universities to seek for the availability of digital repositories linked to their web-pages.

Primary step undertaken by the author to identify available e-repositories in Sri Lanka was the circulation of a questionnaire among librarians of the mailing list of “Library Friends” (library_friends@yahoo.com) and requesting them to inform whether they have digital repositories at their institutions. Library Friends is a Yahoo user Group formed by librarians of Sri Lanka to discuss various matters related to librarianship, professional development, and for the sharing of information and view points. This mailing group is served by a majority of Librarians of Sri Lanka.

As the second step a questionnaire was distributed among 30 Special and Academic librarians in Sri Lanka. Special Libraries and Academic libraries were selected as these libraries represent government institutions, semi-governmental bodies and universities which, are quite structured with administration, and supported with clear financial allocations. Librarians were selected as they normally have contacts with other departments of the institution and mostly building of digital resource collections is potential within the library or elsewhere with the knowledge of the librarian.

The questionnaire was aimed to obtain data mainly related to the organizing and maintaining of the repository, type of the repository, subject coverage, format of the resources, language coverage, who can deposit resources, method of deposit, availability of self-archiving facilities, type of software utilized, metadata format (classification), governing authority, users, and statistics and report facilities of the repository.

Search on websites of above institutions were also made to identify and explore the availability of digital open access repositories.

Findings

04 respondents have indicated that they have a digital repository while 06 respondents have stated that they did not have any kind of e-repositories. The rest (20) have not responded and therefore, the author assumed that they do not have any kind of e-repositories based on the open access philosophy. Although 02 respondents among them have informed that they had such kind of e-repositories, they did not return the questionnaire. Author did not find any link to such e-repository on their web pages.

Table 1 explores the main features of the available e- repositories.

Table 1 - Main features of available e-repositories

Feature	Institute	Central Bank	Southeastern University of Sri Lanka	Industrial Technology Institute
Type of Repository	National level (NR)	Institutional Level (IR)	Institutional Level (IR)	National level (NR)
Subject coverage	Agriculture, Chemistry, Computer Science, Earth Science, Engineering & technology, Humanities, Library & Information Science, Life Science/Biology, Mathematics, Philosophy, Social science/Education	Social science/Education	Business and Management	Agriculture, Chemistry Engineering & technology,
Resource types	Book Chapters, pre-prints, journal articles, Theses	Central bank publications	Journal article, Guides, manuals,	e-books, newspaper articles.

	abstracts		research papers	
Resource formats	PDF, HTML	PDF	MS Word	PDF, Power point
Language/medium	Sinhala, Tamil, English	English	English	English
Governance/maintenance	Head Library and Resource Centre	Librarian/Officer in charge	Librarian	Officer in charge
Software	D space	Lotus notes/ <i>LIBSIS</i> ???	Greenstone	D space
Metadata format	Dublin Core /WINISIS	-	-	Dublin Core
Who can access the repository	<ul style="list-style-type: none"> • free access for Staff/visitors to NSF. • Paid access • Free access through the internet 	Central bank staff only (on premises)	Institutional staff (on premises)	free access for Staff/visitors to ITI (on premises)
Submission mode	<ul style="list-style-type: none"> • Online submission, • By floppy/ CD/Removable Disk 	<ul style="list-style-type: none"> • Online submission, • By floppy/ CD/Removable Disk 	Removable disks	Removable disks
Who can Deposit resources	Librarian/Author of the resource/Editor of the archive	Librarian	Librarian	Officer in -charge

Source – Research data (This table was totally based on the data provided by respondents)

According to the above table several institutions have attempted to build up e-repositories, and two institutions- National Science Foundation (NSF) and Industrial Technology Institute (ITI) have launched programmes to build up national level e-repositories. Yet, it is found that only the National Science Foundation (NSF) has launched initial steps to implement an e-repository which is based on open access concept. This is also still in the testing age and not covering wide prospect of national knowledge output. It is also revealed that NSF e-repository is still not fully accommodating the Self-archiving as its server capacity is limited.

According to respondents they have various problems encountered in the establishing and maintaining of E-repositories in Sri Lanka viz. unavailability of sufficient server capacity, insufficient support from IT personnel, inadequate training, lack of know how, and unavailability of compatible on-line payment facilities.

This study occupied a searching of websites of universities and other institutions in order to find out whether facilities for open access to resources are available. Findings indicate that, universities and other institutions specially, their libraries have made links to facilitate the access to free resources of the internet. They are also providing online access to e-resources obtained through paid subscription (toll access), consortia purchase, special programs such as PERI etc. They have arranged the access through subject gateways, links to URLs of websites, institutional e-publications, scanned documents, circulars, past papers of examinations, guide books etc. deposited in their server machines.

Some universities have established open access repositories in the Intranet to share resources among their staff. E.g. Engineering Faculty of University of Ruhuna provides tutorials, lesson plans, computer software etc. to its staff through their intranet.

This study indicates that a lot of universities and institutions have positive approaches to open-access concept where many of them have attempted to initiate open access repositories using their server machines. Almost all of these initiations seem to be based on the personal interest of the staff rather than institutional projects. The success of these attempts seems not reachable because of the unavailability of proper mechanism by authorities of institutions and due to lack of a proper plan to encourage them. Another factor that the process is hindered is the lack of positive attitudes among responsible parties toward the open access concept.

The *Sri Lanka Journals Online* (SLJOL) maintained by NSF is a good approach to create a e-repository of research and scholarly publications in Sri Lanka. The purpose of SLJOL is to provide access to Sri Lankan published research, and increase worldwide knowledge of indigenous scholarship. This covers a lot of journals published in Sri Lanka with access to full text articles. However this is a kind gateway to provide digital access to journals and not a content repository that facilitate the interoperability.

Conclusion and suggestions

Knowledge is the basis for the development in any country and the philosophy that “new knowledge is emerged on the basis of existing knowledge” is applied to every country or economy. Generally knowledge is acquired through research, education, training and experiencing and all these elements are based on the capacity of information available. Knowledge seeking and knowledge generating are interrelated as professionals, scholars, researchers and any other component of the society act dual role as consumers (knowledge seekers) as well as knowledge creators. An effective and efficient knowledge management system is essential to the country for the proliferation of scholarship and research culture. The world trend that is establishing of open-access archives seems to be one solution.

Developing nations require the access to innovative knowledge products without geographical, technical or other restrictions. Therefore, they need to overcome the issue of ‘digital divide’ which deprives the user from accessing to innovative knowledge in various environments. Developed countries have achieved their development by proliferating knowledge output in the means of diffusion of knowledge to the community in a networked environment.

As a whole, economy of Sri Lanka is governed mainly by the Government and semi-governmental organizations and the private sector as well as various Nongovernmental organizations. Approximately 45 government departments and 280 statutory bodies contribute to the handling of economy in Sri Lanka while, 17311 NGOs support the economic, socio-cultural, political and educational activities in the country.

According to the UGC website, there are 15 universities, 03 Campuses, 07 Postgraduate institutes, 04 other government universities, and 16 other institutes engaged in teaching learning, and research. There are about 13 other institutions governed under several ministries which are engaging in research and development activities, professional development and inventions in Sri Lanka. Nearly 6000 academic and academic supporting staff works in universities while 2000 postgraduate students and approximately 12000 undergraduates attached to various disciplines engage in research and scholarly activities in the university system. In addition, vocational training institutes, technical collages, tertiary education institutes and the school system of the country are parts of the knowledge based economy. All these segments contribute to the generation of knowledge in various levels in variety of quality and quantity.

Academic communities, professionals, independent researchers, subject specialists, practitioners, and general public in a broader sense contribute to the knowledge output of the country. Knowledge output represented in the form of research reports, journal articles, technical reports, work plans, inventions, tutorials, lectures, monographs, software, presentations and many more. The products created by knowledge communities seem to be unrecorded, unidentified and scattered due to unavailability of a proper system that accumulates, transfer and manage them under a national plan.

It is a good tendency that National Library and National Archive of Sri Lanka maintain national level repositories of printed resources under the theme of 'preserving the Memory of the Nation'. National Library follows positive acquisition policies to aggregate resources in two-way approach that current and retrospective collection of national knowledge output. This acquisition policy is supported by the Legal Deposit law imposed through 1839, 1885, and 1902. The National Catalogue of the National Library helps to harvest bibliographic data of printed resources available in the country.

Yet, the problem exists with this conventional archival system is the nature of 'closed access' which controls and restricts the transfer of knowledge to the community. Paper-mode conventional archival systems cannot provide simultaneous access to their resources for a large scale of community as the access facilities are available only within the respective premises. On the other hand these conventional archives are not accommodating information sources such as journal articles, tutorials, technical-reports which represent the knowledge output of the country and which are important for knowledge seeking community.

Sri Lanka as a developing country needs to establish a system that can organize and coordinate the scattered knowledge-output of the country. Open access e-repository operated in a networked environment will be a good solution for this. This can be a centralized system where all the resources are deposited and all the subjects are accommodated in a central server governed by a government authority, a university or any other institution like National library. Regional coordinators selected from institutional level can support the repository by accumulation of resources in the region, keeping contacts with authors, and implementing promotional programmes to encourage depositors to submit their articles. Editorial team should include subject specialists in various disciplines and librarians as well.

The most recommended system will be a distributed content management system where a number of institutional repositories are combined by an interoperable system and governed by a number of regional teams. The cooperation and coordination under a national programme will be much important in this regard. Network of Institutional repositories can be effective because institutional level teams can work in collaboration to identify knowledge creators, accumulate knowledge products and promote the repository in regional basis. Mostly this can be an interoperable system of a main archive and several other subordinate repositories such as national level subject-based e-repositories and Institutional Repositories.

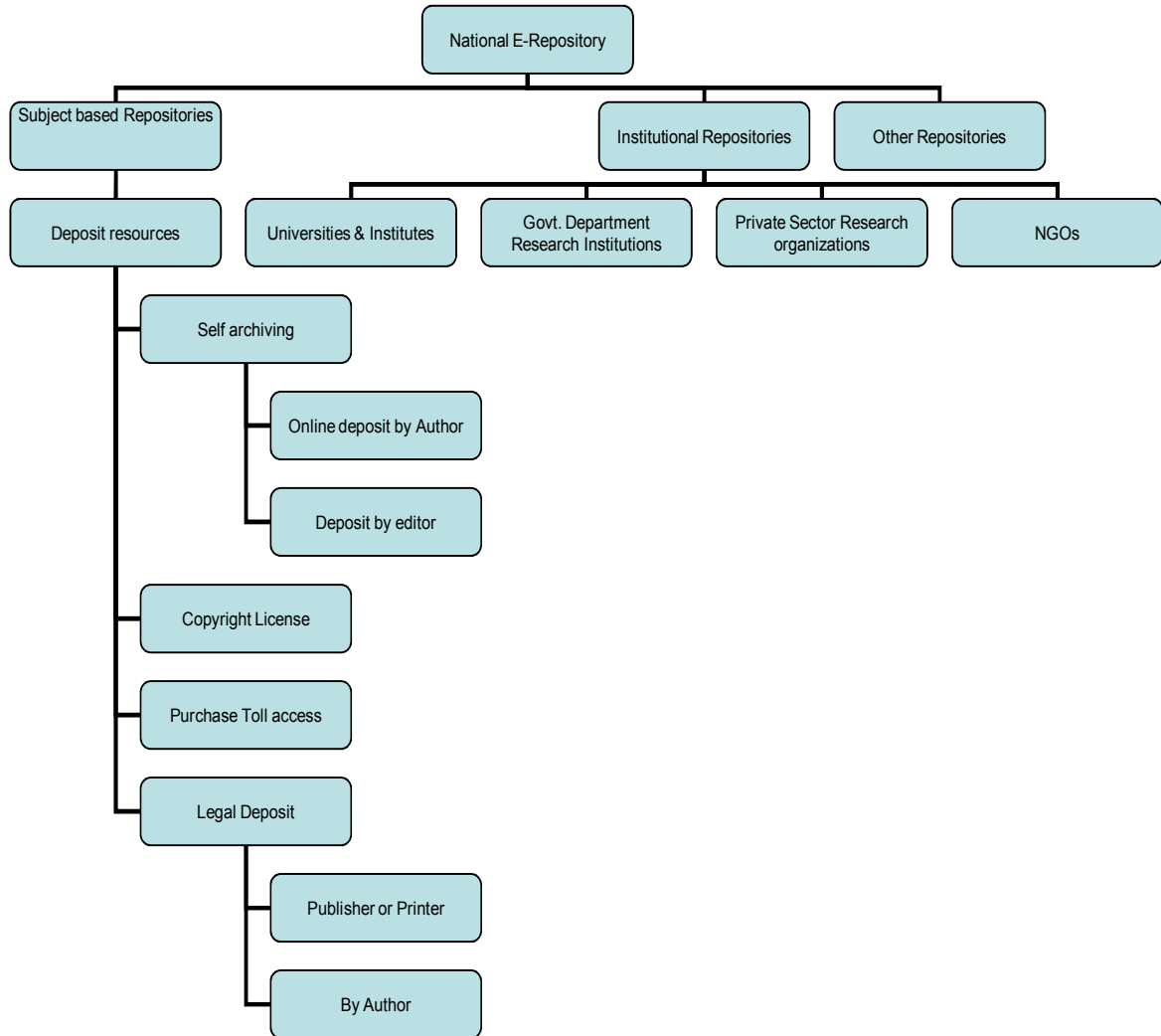
Best practices occupied in successful open-access archives can be followed in the formation of e-repository in Sri Lanka. E-LIS is a subject based centralized open-access archive which relies on a self-archiving phenomenon. Its organizational architecture, policies, governing pattern, software and technical utilities, and many other added features can be used in the formation of a model for Open Access archive in Sri Lanka. Following are some important factors to be considered when designing and establishing an open access e-repository in Sri Lanka .

- a. Identify available e-repositories among universities and other institutions in Sri Lanka and launch a programme to cooperate and coordinate them to bring them under a national level umbrella.
- b. Establish regional level e-repositories in collaboration with universities, government departments, and other institutions.
- c. Form the architecture of the governing team of the open-access archive with representations from academics, professionals, librarians, subject specialists, and IT personnel. Administrative team, editorial team, and technical team need to be represented by experts on regional /institutional basis.
- d. Support of the team should have a volunteer basis as the unlimited formal and informal support of editors, authors, publishers, technicians, professionals and other knowledge developers is essential to develop the repository.
- e. Promotion of positive attitudes towards the OA among communities is essential

- f. Funding for the project should be made by a government body such as a university, National library, National Science Foundation or any other institution.
- g. Both Legal deposit Law as well as the Self-archiving mechanism can be used to accumulate resources and enhance the content of the repository.
- h. Self-archiving requires a volunteer basis as authors' and copyright holders' consent is essential to deposit their work in public access repositories. Success of the self archiving depends on the reliability of repository, its policies, authours' attitude, and services provided by the archive.
- i. The Open-access archive should have clear policies and guidelines.
- j. The services of the archive should be noncommercial and non-profit oriented.
- k. Software and technical utilities should ensure the user-friendly format, convenient medium, and accessible type of resources. National languages like Sinhala and Tamil should be accommodated in the archive.
- l. Additional abstracts and Key words can be prepared for the documents in a common language like English so that the user can locate interested items without bothering on the medium.
- m. Suitable software should be selected. There are a lot of content management and digital archiving software freely downloadable from the internet. E-prints, Greenstone, D space are some of them.
- n. A classification system should be used to categorize and tag documents into various subjects and resource types.
- o. Content of the e-repository should cover a wide range of resources such as research, journal articles, working papers, technical reports, conference papers, presentations, lectures, lesson plans, models etc. so that professional communities can get benefits from the archive for teaching & learning, and research.
- p. Harvesting of metadata and full document should be facilitated online and download of full document can be controlled by rating the as free, paid, and non-downloadable.
- q. Author or depositor should be allowed to decide whether his/her resource in the archive be free, controlled access, or restricted.
- r. Mechanisms like IP login, Password login, or Registered-user login can be used to manage the access.
- s. Resources in the e-archive can be cover two-way approach current and retrospective. Mechanisms should be taken to digitize paper mode resources.
- t. Copyright barriers can be overcome by practicing strategies used by other global archives. E-LIS uses SHERPA, Budapest open-access initiative, Creative commons list etc. to share resources. This can give a light to the framework of OA archive in Sri Lanka.
- u. Measures should be taken to convince authours of the benefit of depositing their resources in open access repositories. There are some authours who believe that they lose ownership and commercial value of their works by depositing them in OA archives.

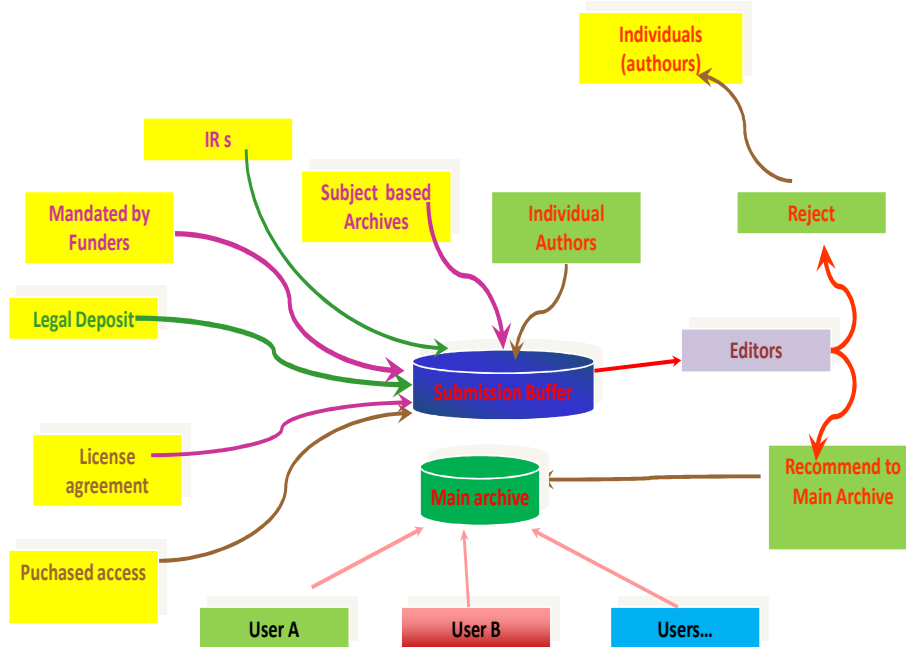
Figure -1 indicates the possible structure of the National E-Repository in Sri Lanka. Main E-Repository may be supported by several interoperable Subject Based National Repositories as well as by Institutional Repositories. Depositing of resources in the archive may be done directly by the author online or by the regional/institutional editor. Resources may be acquired through self archiving, legal deposit law, purchasing copyright license etc.

Figure 1 - Possible structure of the National E-Repository in Sri Lanka



Organizing structure of the e-archive may consist of an Editorial Team, Technical Team, and Administrative Team. Editorial Team may include Editors of Subject Based Repositories and Institutional Repositories. Their main job can be to edit deposited articles in the Buffer, send them to the main archive or return them to the author if corrections are required. Editor may also contact with authours, encourage them for self archiving, and help them to deposit articles. All the technical matters software or hardware may be done by the Technical Team. Administrative team may include the Chief Editor, other editors and technicians. The main role of the Administrative Team may be policy making, promotional activities, taking strategic decisions, trouble shooting and all the governing activities. Figure 2 outlines the possible process of depositing resources in the archive.

Figure 2 - Process of depositing resources in the archive.



There are various issues too in the initiation of E-repository in Sri Lanka

1. Majority of the knowledge output in the country is still occupied in printed mode and need to be converted into digital mode. Software should be created to accommodate digitizing of Sinhala and Tamil texts.
2. Majority of copyright holders show their reluctance to deposit their articles in free access OA archives due to fear of loosing commercial value for the resources.
3. Many authours have already published their articles in commercial publications and hence not able to deposit a copy in OA.
4. Authors are hard to convince of the benefits and research impact of their work by depositing them in OA databases.
5. Authours have fear that OA database holders collect resources and earn profit from them by selling them to commercial businesses.
6. Infrastructure and technical requirements such as server space are limited
7. Lack of expertise and know-how among librarians who are dedicated to enhance information services to the community
8. Lack of proper authority and national plan to initiate the project

References

Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities, Conference on Open Access to Knowledge in the Sciences and Humanities. 20 - 22 Oct 2003, Berlin, <http://oa.mpg.de/openaccess-berlin/berlindeclaration.html>., searched on April 26, 2009

Bethesda statement on open access publishing (2003). Retrieved on April 26, 2009 from <http://www.earlham.edu/~peters/fos/bethesda.htm>.

Budapest Open Access Initiative, (2002). Retrieved on April 25, 2009 from <http://www.soros.org/openaccess/read.shtml>, searched on April 25, 2009

Building a digital at the University of Zimbabwe: a celebration of teamwork and collaboration. Buhle Mbambo- Tata (Ed.). INASP research and education case studies 2. INASP, Oxford. 2007.

Creative Commons. URL: <http://creativecommons.org>

De Robbio, Antonella, and Subirats Coll, Imma, (2005)., E-LIS: an open archiving towards building open digital libraries., High Energy Physics Libraries Webzine. Retrieved on

E-Sharing:developing use of e-repositoriesand e-libraries for learning and teaching., Bell Viv, Rothery Andrew, University of Worchester, Uk.

Himin Bhikshu, from CBETA (Chinese Buddhist electronic Text association) Electronic Tripitaka collection to BIP and IBA

Harnad, Stevan. Maximizing research impact through institutional and national open access self archiving mandates. In proceedings of CRIS 2006. Current research information systems:Bersen, Norway. Jeffrey, K., Eds. URL: <Http://eprints.ecs.secton.ac.uk/>

Open access to scholarly information. URL: http://openaccess.net.de_en/general-informationlega-issue/sherparomeolist

Rayam Graw., “A guide to institutional Repository Software”. URL: <http://www.soros.org/>

Said, Amina, (2006). Accessing electronic information: a study of Pakistan digital library., INASP research and education case studies 1. INASP, Oxford.

Self archiving, Wikipedia, the free encyclopedia, URL: <http://en.wikipedia.org/wiki/selfarchiving>

SHERPA RoMEO, Publisher copyright policies and self-archiving. URL: <http://www.sherpa.ac.uk/romeo/>

Silveira, Teresa. How to effective use information in digital environment?. In Challengers for the New Information Professionals. BOBCATSSS 2009.

Suber, Peter (2007). Open access overview: Focussing on open access to peer-reviewed research articles and their preprints. Retrieved on April 27, 2009 from <http://www.earlham.edu/~peters/fos/overview.htm>.

Swan Alma (2005). Open access self- archiving: an introduction in consultants to the scholarly information industry. Key perspective Limited. Retrieved on February 5, 2009 from <http://www.keyperspective.co.uk>.