

ROLE OF OPEN ACCESS E-REPOSITORIES OF SRI LANK IN THE COMMERCIAL E-REPOSITORY ENVIRONMENT

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Abstract

Although information business in the world is dominated by commercial resource suppliers today, users of academic libraries expect free access to information they need. High subscription prices and various access restrictions of commercial e-repositories hinder the library's effort to provide free information for their patrons. This issue is specially occurring in developing countries due to budgetary restrictions and unavailability of modern technology. In this circumstance, Open Access (OA) concept has been popular among scholarly communities and many institutions today have initiated OA e-repositories to serve the users under a sharing basis. This movement in Sri Lanka still seems in the developing stage and is getting more attention from users as well as librarians. Open Access e-repositories have a great role to play in order to save the user from hands of commercial profit oriented information providers and to serve the people with free access to information. Scholarly communities, librarians and funding agencies need to collaborate to make this process easy and successful. Poor content, lack of proper policies, and lack of awareness were found as barriers to this process.

Introduction

Access to knowledge is a crucial factor in the Information Age - the era of knowledge based economy prevailing today. The continuous explosion of knowledge in a huge bulk has occurred not only in the Science, technology and medicine (STM) areas, but also in the fields such as Social Science, Humanities, culture, entertainment, tourism and economics. Being compatible with this explosion, publishing industry too has had a huge development.

Apart from the traditional and conventional means of publishing in the information industry, various types and formats of information sources have emerged in the market. It requires users have a basic knowledge and a training to use these resources. Libraries as the main agents who provide information to the society, have to play a wider and a rather complex role in identification, accumulation, organization and dissemination of knowledge to individuals in a way their requirements are met effectively and efficiently. The struggle of librarians to deal with the deteriorating budgets and the increasing demand for newest information are being hardening due to the rapidly increasing prices of information resources and the difficulty to be adjusted with the innovative technology emerging in the information service sector.

As information is an essential element to create new knowledge in every area of concern like education, research and industry, information services sector has to play a vital role in the knowledge business. Economies those have much information in the world tend to dominate the world with the power of information. Information leads to knowledge and knowledge is the most powerful element in the modern world. Hence, information earns much demand and it seems to appear a wide gap

between information rich and information poor in the economies today. To narrow this gap, measures should be taken to transfer information and knowledge throughout the world without restrictions like cost, access control and undue censorship. One of ways to support this process is the facilitating of the free flow of information.

Due to the emergence of information products and services in high volumes and multiple formats in the global setting; the information retrieval process that is identification, filtering and accessing to a bulk of information has become much difficult. Much support has been facilitated in order to overcome the barriers such as geographical dispersion, language based localization, and diversity of formats of sources through networking, developing of translation software and implementing of digitizing and format compatibility mechanisms.

As a result of these innovations, a large market has been emerged in the field and large profit commercial publishing companies in the information industry have been able to grab a large portion of the available market. Moving from print mode to electronic mode, they tended to build up huge databases which have a potential to earn a big profit with a minimum cost of expenditure. Being competitors with each other and in some occasions having joint ventures as well; commercial vendors, aggregators, publishers and intermediaries have intervened the information business in a large scale.

Although a number of databases and full text e-repositories are available in the market with sophisticated access facilities to their contents, users of libraries have happened to seek for librarians support because of the high access fees and lack of expertise to properly locate, filter, evaluate and retrieve information they need. "Users want free and unfettered access to information from anywhere, anytime. Commercial vendors must charge a fee for and restrict the access to the value-added bundling of electronic library resources and delivery system they provide" (Covey 2003, p.579).

Information seeking behavior of users and their expectations has also been changed with the use of the Internet. The common trend in the modern information seeking behavior is to search the Internet first and then search the library to find more precise information relevant to the task. Even in using the library, most users prefer to login to the library remotely without physically entering into the library building. The modern complex social behavior of people compels them to access information online quickly and on the spot when it is needed.

Consequently the role of the library also has been changed as the librarians (specially academic and special librarians) have to face many challenges with the issues of fulfilling user expectations. "User satisfaction is multi dimensional, occurring within a framework of expectations comprised of the information seeking task, the functionality of the retrieval system used, the assistance provided to users own abilities and immediate goals, and the information retrieved" (Covey 2004, p.5).

Librarians' challenges occur not only in the accumulation and dissemination of knowledge but also related to the mechanisms and format required by users. Librarians have to build up e-resource collections by converting the existing printed materials into electronic form, purchasing access license to commercial databases, and creating of digitally born resources on their own. Users mostly require free access to information and librarians need to request more funds from parent organization and finally bargain with aggregators, vendors and publishers for affordable prices when signing

agreements. The current trend in this regard is to establish Open Access initiatives in the library and encourage the knowledge creators and governments to contribute to open access process.

This paper attempts to explore the role of Open Access e-repositories in Sri Lanka in the prevailing information service environment dominated by commercial e-repositories today. The paper observed the conceptual analysis as the method and the existing OA e-repositories in Sri Lanka were explored by searching the Internet and logging to the URLs of particular Institutional Repositories (IR) listed in National Science Foundation website. Emphasis was made on content, structure, links, subject coverage and policies of OA e-repositories.

Electronic publishing

Publishing process involves the production and dissemination of literature, music or information and is the activity of making information available to general public. As the traditional print-base information sources can no longer satisfy the present demand for information, many publishers in the world tend to publish their information products in electronic form while some others tend to maintain hybrid mode publishing: print and electronic. As a result of electronic publishing a variety of e-resources came in use through last three decades. Now, anyone can enjoy e-books, e-pubs, digital magazines, e-newspapers and so on.

The emergence of e-information services was caused to open new gateways for researchers, scholarly communities and information industry. Electronic resources setup in the networked environment has enabled the user overcomes the territorial, geographical and time barriers associated with the access to information.

In comparison to print resources, e-resources have several advantages viz. easy access to resources, simultaneous access by several users at a time, prospective as well as retrospective searching, speedy access across territories, augmentation with hypertext, hypermedia and multimedia and variations in layout.

Electronic publishing is mostly popular in scientific publishing. Many of peer reviewed scientific journals appear in the form of e-journals and e-proceedings. Millions of e-publications are added to the information market every year and now it is common that books, magazines, and newspapers are distributed to customers in tablet reading devices. Electronic publishers are also popular as they can provide quick gratification for late-night readers and provide books that are not found in standard book retailers and books written by new authors (Singh 2013 p. 251).

Two types of publishers can be seen in the industry: non paid publishers and paid publishers. Non paid publishers do not charge authors to publish his/her work and the ownership of the publication and the copyright of the creation is retained with the publisher. Paid publishers charge the author to publish his/her book or article and the author has the full right to sell or market the publication. This type of publishing also called 'vanity publishing' (Wikipedia).

Commercial e-repositories

Content industry has been matured in last two decades in scale as well as scope (Feijoo, et al. 2013). Business oriented companies including dominant publishers, database vendors and information aggregators build up e-repositories for profit purposes. The content of their repository is enriched with e-books, journal articles, research reports, proceedings and manuscripts obtained through

signing copyright agreements with authors, and purchasing of access licenses from publishers etc. Some of these e-repositories have powerful search tools and training kits for users.

Today it is popular that libraries individually or as a group subscribe to e-resources packed and bundled by aggregators to suit the requirement of the particular library. Consortia subscription is practiced among them as a strategy to tackle with budget limitations.

Many databases are commercial electronic information services that people reach through the Internet. The information packager or reseller is referred to by such names as *online database*, *online service*, *interactive service*, *information provider*, *service provider* or *content supplier*. These online services sell data and information to their clients and deliver the information through the Internet. The computer storing the seller's information is referred to as a host (Curtis 2011).

Commercial e-repositories can be purely subject-specific or multidisciplinary and can be of various types depending on the natures of contents. Some repositories cover only metadata while some others provide abstract and full-text of the document. Thus there are indexing databases, citation databases and full-text databases in the market.

While anyone can download, or electronically copy, information from the Internet, businesses with data for sale see protection of their copyright material as a necessity. To protect their intellectual property, companies sometimes go so far as to encrypt the data they sell via the Internet. To make that information useful, they provide decoding keys to buyers of the data. Of course, that scheme alone doesn't prevent buyers from then repackaging and reselling the data (Wikipedia).

As Wikipedia describes commercial online service operators offer their customers access via the Web. To obtain access from home or office, a researcher navigates the Web to the database's home page. Typically, an authorization number and password are required to enter a publisher's commercial database.

Searching tools and access mechanisms may also vary from repository to repository. Many access providers provide online login through password access and some provide IP level access to facilitate the institutional subscription. "Access restriction is the only way in which vendors disappoint libraries and contribute to reduction in service quality. Many vendor products are not easy to use and it requires a sufficient training. Users sometimes won't be able to use the repositories without training. Some vendors have training tools too included in the package" (Covey 2003).

Library's role in the commercial environment

Libraries of institutions and organizations need to subscribe to commercial e-repositories in order to provide the access facilities to users free of charge. A large portion of annual allocation should be left aside for this purpose and the rapidly increasing journal (subscription) prices and deteriorating annual library budgets make this process worsen. "Librarians are doing what they can to remove barriers and facilitate convenient easy access to and use of quality resources. However, they can't do it alone. They need the support from commercial vendors from whom they license online resources" (Covey 2003, p.580).

Today librarians are much privileged to subscribe to hundreds of e-databases and thousands of e-resources instead of buying huge volumes of printed resources. Electronic resources relevant to one's need are mostly available through the Web and users have 24 hour access to them. Vast amount of

indexing databases, abstract and full-text databases and cross link facilities to navigate information through computers and even with mobile phones are available for users.

Information requirements of users are time based and task oriented, and users cannot afford to purchase each and every piece of information they need. Therefore, they have to come to a central facilitator like library to seek for information with less cost or no cost. Thus the librarian's role is prominent in the information business and his/her main role is to provide information to the patrons of the library through purchasing, subscribing or any other means without giving price burden to users.

Emergence of Open Access movement

The issue of access to scientific resources was not new as it involved the practice through which copyrights are transferred from authors to publishers. This created publishers' monopoly of access control (Machado, 2013, p. 120). High subscription price, control of access, ownership control, restriction to reuse etc. are some limitations that users encounter in the commercial e-resources business. Generally in commercial repositories environment, the subscriber, although he/she has paid for the particular period to use with archival access, he/she is not allowed to download the entire content he/she needs. When the subscription period is over, all the access privileges will collapse and the subscription fee paid for the access leaves nothing. This is a big issue when the library amends the subscription list on user requests. There are so many other hidden restrictions in the subscription agreement. In such a context librarian is trapped by the commercial access provider and is compelled to continue paying to the commercial repository in order to continue the access while the vendor increases the fee year by year. In such a circumstance, librarians and individuals who use commercial e-repositories happen to seek for other sources alternatively to enrich the scholarly communication process. The Open Access (OA) concept was emerged in this context. "OA is a global issue, highlighted by inequalities between developing and developed nations, and largely fueled by financial disparity. Current levels of access in the developing world are insufficient and unstable, and OA has the potential to foster the development of stable research ecosystems" (Jonathan, et al. 2016, p.19).

Researchers, scholars, and scientists create their knowledge products often not for profit purpose but for the increasing of impact for their research. Their financial benefits however, are achieved by commercial publishers and business ventures which collect information products from individuals such as researchers, authors, and scientists. Practically in the publishing industry, it is difficult for a new author to sell his/her manuscript for a good value. Renowned publishers purchase authors manuscripts in cheap prices and they earn a huge profit after printing a bulk of books and selling e-copies to commercial e-repositories. In most cases the author himself has to pay for his manuscript to be published and publisher sells it. For a fact, in conferences normally the author has to pay for registration and other charges to get his research findings published in proceedings. Copyright is automatically transferred to the publisher after submitting the article to the journal. Finally when they are gone to the commercial e-repository – to a second hand vendor, the author may have to pay again to access to his/her own resources.

According to the Budapest Open Access Initiative (2002) open access means its free availability on the public internet. "The new technology is the internet. The public good they make possible is the world-wide electronic distribution of the peer-reviewed journal literature and completely free and unrestricted access to it by all scientists, scholars, teachers, students, and other curious minds.

Removing access barriers to this 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” (Budapest 2002, p. 1).

OA concept is supported by digital printing. “The shift from print to digital is likely to accelerate greatly. The delivery of information might become more important than ownership. Open Access business models might become more attractive to avoid the costly venues of commercial publishers” (Henderson & Boch 2010, p. 36). OA permit any user to read download, copy, distribute, print, search or link to the full text document and use for any lawful purpose. The only requirement is the ethical consideration that when one is going to reproduce or distribute he/she should properly acknowledge of the author’s work.

OA initiatives intends to the removal of price and access barriers in accessing the full text apart from that to abstract and bibliographic information of the document. (Budapest 2002, Betesda 2003, & Berlin 2003). Van & Born (2006) assert that “Buying and selling of electronic journals continued apace, while the posting and crawling of every kind of free content on the web captured the imagination of the scholarly world. The former was overshadowed by the latter and no wonder... Robust growth of Open Access repositories and the drift toward author self-archiving combined to populate the web with a surprising amount of free content that was initially available only through subscription” (Van & Born 2006, p.39).

Open Access (OA) concept in such an environment gave another direction to the author to rethink of the scholarly communication process. 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 and distribute derivative works in any digital medium for responsible purpose subject to proper attribution of authorship (Suber 2007).

Bethesda Statement of Open Access Publishing describes the expected process of OA archiving is 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 (Bethesda 2003). This encourages authors to contribute to OA.

OA literature finds two types: Gold OA and Green OA. The process of the author pays publishing fee and make the resource available for free access to the public is the Gold OA. This is normally the articles delivered by journals. Green OA is the archiving of digital resources and making them public access free of charge. Green OA resources come mostly from self-archiving as preprints in archival repositories or depositing authors copy after printing. The OA movement has been initiated for the purpose of removing price barriers, permission barriers and access barriers to research documents and scientific journals. OA is expected to facilitate users with immediate access rather than delayed while accessing full text but not accessing to links to abstract or metadata (Arachchige 2009).

As a new trend, there are some commercial e-venders to move to OA by releasing a few e-resources open to the public apart from their fee based business models. Anderson (2012) expresses that Elsevier has made some moves to enter OA space, including launching of 25 OA journals and

publishing 1200 journals with hybrid arrangements in which authors can opt to pay to make their articles OA. Other commercial and not –for-profit publishers have been adopting for a while, including Wiley, Springer, Nature, SAGE, OUP, PLOS and more. This is good approach however commercial venders’ purpose here is to promote their commercial databases. Many of these trends seem to practice as a marketing strategy of their databases businesses in order to increase the visibility of their commercial e-resources. In some cases OA can make some challenge to commercial e-resource business, specially, to the price control purpose. According to Suber (2007), OA journals are economically sustainable because the true cost of per view, manuscript preparation, and OA dissemination are considerably lower than the price we currently pay for subscription based journals.

OA is not to punish or to undermine expensive journals, but to provide an accessible alternative and to take full advantage of new technology – Internet for widening, distribution and reducing costs. It is meant to motivate authors to deliver wider and easier access to a large audience of users. Widen the impact of authors. “The benefits of open access are numerous, for both researchers and the general public, and legal problems can be avoided by proper rights management” (Pappalardo, 2008, p. 28). OA serve the interest of various groups of information seekers, authors, readers, teachers, students, libraries, universities, journals, and publishers funding agencies, governments, citizens etc. Thus encouraging of OA is essential in grounds of social welfare rather than commercialization.

OA in Sri Lanka

Use of Open Source software and searching for free resources on the Internet are common examples for use of OA resources today in Sri Lanka. Scholarly communities and research personnel in Sri Lanka used to use OA resources for a long time. Wijetunge (2017) finds that 65% of librarians use OA resources and 33% of them use OA materials for their research and 60% believes that OA resource fulfill their needs. She agrees that factors like inability to access databases from home, absence of full-text, lack of relevant materials, lack of sufficient subject coverage, lack of computer facilities, lack of time, training and motivation are caused to hinder the use of e-resources.

However, literature related to OA movement in Sri Lanka seems to be rare. Arachchige (2009) has made an attempt to propose a framework for a national level OA repository in Sri Lanka applying lessons learnt from E-LIS – a global level OA e-repository in Library and Information Science and technology.

According to his study, a number of University and Special libraries have attempted to build up digital collections in their libraries during last two decades. At the initial stage they had tried to set up links to free Internet resources on their web pages, store digitally born documents in their servers, and prepare subject gateways to support different interest of their patrons. Access points to subscribed journals and links to e-contents provided by programmes like INASP/PERI were facilitated through their OPAC in later stages. Attempts to build up digital libraries were seen after 2006 and now a number of university and special libraries maintain several servers for different purposes such as OPAC, E-mail, and e-repositories.

Arachchige (2009) in his study identified four institutional level e-repositories and the National Science Foundation (NSF) of Sri Lanka found to make a successful attempt to build up an Institutional e-repository among them. Perera (2013) explaining the NSF’s contribution to initiate

OA e-repositories in Sri Lanka reveals that there are 21 OA e-repositories in the country at present. Among them there are 3 national level e-repositories (NR), 2 subject repositories (SR) and 16 Institutional Repositories (IR). These IRs include 6 universities and 10 research and other institutions. Apart from these e-repositories there are 49 OA online journals which provide full text articles under Sri Lanka Journal Online (SLJOL). The above OA repositories are now in developing stage and many of them are covering fulltext research papers and postgraduate theses apart from metadata and abstracts. Uploading of full text contents seem to be less in quantity due to lack of awareness among scholars.

In the initiation process NSF contributed to OA by hosting several training programmes on Dspace and Greenstone software, where a number of librarians from universities and government organizations participated. Under its National Digitization project, NSF is hosting university and special libraries to digitize their local Science and Technology (S&T) resource collections by providing technical support to convert printed resources to digital form, and providing virtual servers who cannot maintain their own servers.

Under the support of SIDA /SAREC project University of Colombo library organized a foreign training programme for university librarians in order to encourage them to initiate digital e-repositories in their institutions.

Adopting to the e-culture various education, research and industrial organization are using OA resources. Thus OA is an essential element for communities in Sri Lanka. According to a recent study 97% of university academics use e-resources for their scholarly works. 29% of them are using commercial e-repositories while 70% of academics seek for information from OA repositories. (Arachchige & Karunaratna 2013).

According to the NSF website (<http://dl.nsf.ac.lk/ohs/>), following OA e-repositories are available in the country:

- NSF National e-Repository
- National Library of Sri Lanka
- Sri Lanka Medical Index

- Central Environment Authority
- Coconut Research Institute
- Department of Census and Statistics
- Department of Irrigation
- Geological Survey and Mines Bureau
- Hector Kobbekaduwa Agrarian Research & Training Institute
- ICTA Digital Repository Content
- Industrial Technology Institute
- International Water Management Institute, Open Archive
- Mahaweli Authority of Sri Lanka
- National Aquatic Resources Research and Development Agency
- National Engineering Research and Development Centre of Sri Lanka Repository
- National Institute of Fundamental Studies
- Rubber Research Institute
- Tea Research Institute

- [Open university of Sri Lanka Digital Archive](#)
- [Postgraduate Institute of Agriculture - University of Peradeniya](#)
- [Rajarata University](#)
- [Ruhuna University Digital Repository](#)
- [South Eastern university](#)
- [Sri Jayawardanapura University Scholar Bank](#)
- [University of Colombo Digital Archive](#)
- [University of Colombo, Faculty of Medicine](#)
- [University of Jaffna](#)
- [University of Kelaniya](#)
- [University of Moratuwa Digital Library](#)
- [University of Peradeniya Digital Library](#)

- [Sri Lanka Institute of Information Technology](#)

Libraries in Sri Lanka are still forced to depend on subscribed journals and commercial databases as OA potential is not sufficiently developed so far. For a fact, in regard to universities, in 2008 library system as a whole has subscribed to 1787 journals and 10 databases in addition to 1977850 printed books. The cost for periodical subscription was LKR 83,516,465 (Jayatissa 2009). In 2013, university libraries have spent around Rs.60 million for subscription to periodicals inclusive of approximately Rs. 4.5 million for printed journals and nearly Rs. 13.5 million for subscribing to databases. When we consider the subscription cost of information sources spent by other research institutions and government bodies this figures may be much larger. However, it is discern that allocation for electronic access is becoming larger and access to print materials is getting lesser. Managing the licensing is also a challenge to the library. Effective local licensing requires the adaptation of clear policies and responsibilities.

Thus, in the commercial e-repository environment prevailing in the world with their invasive characteristics, it has been difficult to sustain for libraries in the field. This situation compels the librarians and other authorities to rethink of the available information service structure they practice, and seek for a much cooperative, sustainable and interoperable information service model mostly based on sharing of knowledge between creators and providers with less cost or no cost at all. Open Access e-repositories are highly important and have to play a great role in this regard.

Role of e-repositories

The e-repositories mentioned above were examined to ascertain the role they play at present to facilitate users with OA. Following is a summary of features found in the investigation:

National Science Foundation (NSF) e-repository and all university e-repositories have tried to build up multi disciplinary collections while other institutions have concentrated on depositing resources related to their institutions only. In regard to the types of e-resources NSF and university repositories have a variety of types like journal articles, theses, research reports, proceedings, past papers, tutorials etc. while other institutions deposited reports of their institution. The number of items seems to be quite limited in all repositories.

All the e-repositories have used the Dspace as the software for the construction and, many variations were seen in the arrangement of communities of the repository. The structure of organizing resources was different from each other. Mostly the categorization of collections differed from each other based on the subjects, types of resources, faculties and categories specific to the institution. The arrangement was mostly based on librarians view rather than user's point of view. Interface of the e-repository seemed to be complex and mixed up with additional links not related to the OA concept in some repositories. Searching tools also were different from each other and seemed to be no uniformity among them. However many of them have setup advanced search and browsing tools.

E-repository should strategically develop relationship with other OA repositories, commercial publishers and scholarly communities. Signing agreements with publishers and organizations which produce knowledge products is essential to develop the content in IRs. There should be clear policies to guide depositors as well as users. Many of the above e-repositories had no policy documents and even the available policy documents were found not clear and comprehensive.

The lacking part of the all e-repositories was the marketing. No programmes found to develop the awareness among scholarly communities, publishers or users. When considered as a whole, the OA e-repositories of Sri Lanka are still in the initial stage and need much effort to develop them in very many ways. The role of e-repositories should be extended in areas such as contents improvement, structural development, strategic application and marketing.

Conceptually as well as theoretically commercial database providers and OA repository play different roles. Commercial environment is operated on profit purposes and OA environment is focused on social welfare. Thus several features of commercial information providers distinguishable from OA repositories can be identified as follows:

- Commercial information providers operate on profit purposes.
- They use various restriction mechanisms to avoid free access to information resources.
- They are mostly aggregators and deal with knowledge creators to exploit their knowledge and earn profit via intermediation.
- Commercial information providers collaborate with authors, publishers and librarians on a marketing base rather than promotion of scholarly publications.
- The autonomy of decision making, pricing and restricting of access to resources is in hand of the entrepreneur.
- They sometimes abuse OA concept for commercial purposes.

According to Reinsfelder (2012), OA concept depends on a 'complex network of relationships and interdependencies'. The relationship among researchers, librarians, publishers, and academic administrators is essential to the success of OA. They also can act as barriers. Reinsfelder further identified how the above categories of stakeholders can contribute to the development of OA.

Researchers of the institution can contribute to develop the Open Access publishing by: (1) submitting work for publication in peer-reviewed open access journals or serving as editors or reviewers, (2) negotiating copyright terms that favor an author's control over their own work, (3) archiving copies of published work on a publicly accessible website or in an online database or repository, (4) encouraging other authors to consider open access publication, and (5) adopting policies such as those listed in Registry of Open Access Repositories Mandatory Archiving Policies (ROARMAP) that either encourage or require authors to make their work available through open access (Reinsfelder 2012, p.9).

Librarians can contribute to increase of OA by: (1) serving as advocates for open access and educating faculty, administrators, and other librarians about open access issues, (2) negotiating with publishers to provide users with greater access to scholarly research, (3) developing programs and services to support faculty publishing activities, (4) creating and maintaining an institutional repository where authors can make their work freely available online, and (5) working with faculty and administrators to develop policies and practices that support the open access model (Reinsfelder 2012, P.11).

Reinsfelder (2012, P.12).also emphasizes that publishers also can contribute to increase the open access by: (1) updating products, services, and business models to support open access and (2) negotiating copyright agreements with terms more favorable to authors.

Academic administrators can contribute to increase the OA by: (1) creating university-wide committees or task forces to investigate new practices, (2) committing specific resources toward the development and support of new and open modes of disseminating faculty scholarship, (3) creating or supporting policies/procedures related to enhancing the open access of faculty scholarship, and (4) partnering with representatives of other institutions to publicly support open access.

Conclusion

Open access has influenced on the forces such as rivalry, bargaining power of suppliers and bargaining power of buyers (Harms, 2016). Contents of the OA repository rely on the objectives and the scope of the repository. In most cases OA Institutional repositories give priority to deposit scholarly articles. Scholarly articles are the articles that describes the fruits of their research and that they give to the world for the sake of inquiry without expectations of payments (Budapaste 2002). However content can be included datasets, power point presentations, tutorials, spreadsheets, photographs, audio-files, diagrams, charts and so on which can be used for the community. Resources for the OA repository can be accumulated by volunteer self archiving, as a mandatory rule of funding, Legal deposit Law and harvesting from other OA repositories.

A bulk of information sources including research reports, monographs, educational materials, patent etc. are added to the literature every year in the Sri Lanka. According to the National Survey on Research and Development and Inventions (NSF 2013), the expenditure on research and development in 2008 was Rs.5047.7 million. In 2006 it was Rs. 5119.2 and in 2004 it has been Rs. 3807.5 million. This indicates that investment by funding bodies for research and development is increasing and there should be a good amount of knowledge output as a result of this investment.

Higher education sector and industries make the highest contribution to the knowledge output of the country. Higher education sector includes government universities, semi governmental higher educational institutions, and private sector universities. Many researches are undertaken in these institutions through government and private sector funds. A large amount of foreign funds are used by individuals as well as groups of government /private institutions to do research. As a result there are a lot of publications published locally and overseas. However, visibility for these publications seems to be insufficient due to unavailability of a coherent plan to accumulate them in public access repositories. OA repositories have a high potential to identify these publication and can deal with publishers to obtain free copies from them. Therefore, one of major roles of OA e-repositories in Sri Lanka is to identify these resources and thrive to increase the visibility of them while making available a rich resource collection.

Authors have different attitudes toward publishing. Some authors prefer to obtain financial benefit by submitting their products to commercial publishers and there are scholars and scientists who wish their products have a greater visibility and impact on them. Yet, they might not aware of OA repositories available for them to deposit their publications. Therefore, another important role of OA repositories is to encourage authors to deposit the e-copies of their products in OA repositories that can be accessed by the public free of charge. This e-copy may be preprint, post-print or author-copy before peer reviewing. Sometimes it can have an embargo period imposed by the publisher. Here it is essential to develop authors' attitudes and help them protect their copyright and intellectual property rights in a legal background.

In this case, OA can adapt to the author right movements practiced in the world. Some of them are **Creative Commons License Chooser** (<http://creativecommons.org/choose/>), **Scholar's Copyright Addendum Engine** (<http://scholars.sciencecommons.org/>) and **SPARC Guide to Author Rights/SPARC Author Addendum** (<http://www.sparc.arl.org/resources/authors/addendum/>). Author or depositor should be allowed to decide whether his/her resource in the archive is free, controlled or access restricted.

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 (Arachchige 2009).

OA e-repository should have a common language of governance and should be accommodated the depositing of articles written in national languages such as Sinhala and Tamil. Additional abstracts and Key words for the document can be added in a common language like English, so that the user can locate interested items without bothering on the medium.

Organization of resources is much important in the OA repository. Just access to the content is not sufficient for a smart researcher. Researchers seek for discovery tools so that they can trace other related information. Although the articles are not in best quality, links provided in Wikipedia are important for users as they can locate peer reviewed articles at the end.

Normally OA repositories should facilitate discovery services such as harvesting resources from other OA repositories. Hays (2005) views that if repositories are to support institutions, and their staff and students, in achieving their objectives, then they must be able to interoperate with other systems (administrative systems, portals, other repositories), and they must not lock their contents into systems from which it is difficult and expensive to extract. Leslie and Barbara (2002) observed that one important international movement is the Open Archives Initiative (OAI), which aims to develop and promote the use of a standard protocol, known as the Open Archives Metadata Harvesting Protocol (OAMHP), designed for better sharing and retrieval of e-prints residing in distributed archives. With the OAI harvesting protocol, articles in OAI compliant servers will form a global library that facilitates searching, data retrieval, cross-linking, as well as stable long-term archiving.

Categorization and classification of resources in the repository should follow a user-friendly and a standard structure. Easy to upload as well as easy to download facilities are essential in a friendly user interface.

OA policy is an essential part of the repository to guide authors as well as users aware of how to use the repository for their purpose. The types of resources, how to deposit, how to download, how to prepare metadata, access rights, authorities, limitations and restrictions etc. are included in the OA policy.

Finally the OA e-repositories alone cannot do the information service job. Rather than fighting with commercial e-repositories OA repositories can maintain a close connection with commercial publishers. User wants the full text as well as bibliographic details to locate the resource he needs. At least harvesting of metadata will be important. OA repositories should not underestimate the cost for publishing. “ Commercial publishers need to give their share holders a return on investing while muddies the waters when it comes to consider OA” (Harris 2012). On the other hand commercial e-repositories cannot survive with the new trend of OA. Therefore they seek for the visibility for their contents through OA too. Some commercial e-repositories have OA part too as a strategy for their survival.

OA e-repositories can do a great job to control the increasing subscription prices of commercial e-repositories. Collaboration with scholarly communities, librarians and funding agencies helps this process easy and successful. OA e-repositories in Sri Lanka are still in initial stage. The library system of the country is also not capable of providing information through commercial e-repositories because of the high prices and hidden access restrictions behind the subscription. The information gap might be fulfilled with OA. Thus there is a huge role to play.

The role of the OA e-repositories can be summarized as follows:

- a. Identify the knowledge output in the country
- b. Accumulate the knowledge sources
- c. Quality control of resources
- d. Facilitate free access to resources
- e. Develop the awareness among communities

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