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Web-based Resource Management System for Promoting Teaching and Learning: Bangladesh Perspectives

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The adoption of digital communication media, particularly the Internet, has allowed the intellectual community to access and share knowledge to enhance research competency throughout the world. Technological advancement in the field of digital information networks facilitated information professionals to manage and access knowledge resources for research and development purposes. Web-based resource management system helps scholars to preserve their research output enabling other scholars to find required information timely and accurately. The aim of this research was to explore the current practices of web-based digital resource management system in Bangladesh in the context of global access to information and knowledge management. The study reviewed related literatures published in various national and international journals and also other sources. Moreover, the study also consulted with relevant bibliographic databases especially OpenDOAR, DOAJ and ROAR. Result showed that in Bangladesh some educational, science and technology, agricultural, medical and medicine, social science and general research centre are already using and managing their in-born digital resources through their respective Institutional Repository (IR). Besides, a good number of organizations are trying to implement IR for their respective organization. The outcome of the study will be helpful for IR and non-IR providing organizations in Bangladesh to manage their digital resources more effectively aiming to promoting web-based teaching and learning.

Keywords: *Knowledge management, digital repository, scholarly communication, digital preservation, open access archives.*

Introduction

In the present information and knowledge era, knowledge has become a key resource for teaching and lifelong learning. At the same time, the introduction of Information and Communication Technologies (ICTs) has radically changed the way people learn, communicate and exchange ideas. Accordingly, higher education institutions throughout the world have been integrating ICTs in their teaching-learning process. Library and Information Centres are considered as heart of any higher education institutions. In principle, higher education and library are fundamentally and coincidently related to and co-existent with each other. Library collects knowledge from various sources in different form, process those knowledge and disseminate them as per users' demand. Library and information professionals always try to ensure maximum satisfaction of their users with their resources and services. With this view, information professionals throughout the world are also initiating and adapting appropriate knowledge management system to cope with the changing pattern of knowledge management tools and services. Internet

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technology has been created a tremendous opportunity for acquiring knowledge, ensures transparency, connects users, provides host services and enables sophisticated tools to access them. These technologies also enable library and information professionals to manage and disseminate their digital resources in more user friendly approaches. One of the most advantageous means of web-based digitized resources management system is digital repository commonly known as Institutional Repository (IR). In Bangladesh some leading organizations already hoisted IR in their respective institutions for promoting teaching and learning.

Objectives of the Study

The main objective of the study is to focus on the potentiality of web-based digital resource management system for promoting teaching and learning. The sub-specific objectives are as follows to:

1. identify the present scenario of web-based repository management systems in Bangladesh; and
2. evaluate the need of web-based central repository archiving-retrieving systems for researcher and research organizations of Bangladesh.

Methodology

The study was based on review of related literature published in various national and international journals and electronic sources. Besides, personal discussions were also made with the staff members of various organizations who are currently using institutional repositories in different organizations in Bangladesh. Moreover, the Directory of Open Access Repositories (OpenDOAR) and Registry of Open Access Repositories (ROAR) had been consulted and individual IR sites were also visited.

Web-based Education

The Internet is changing the nature of communication since its inception. The WWW technology is creating tremendous opportunities for higher educational institutions to provide an 'open for all' learning environment. The face-to-face traditional educational system is giving way to independent learning overcoming distance, time and format barriers. Moreover, implementations of Web 2.0 technologies accelerated knowledge sharing, interoperability, user-centered design, and collaboration with peers and other interested groups. Web-based education is often called online education or e-learning for being included online course content. Sometimes, web based education system may provide static pages including hypertext materials enabling access to a vast amount of web-based information. Meena (2016) described "Web-based education and pedagogical technologies solutions for learning applications provides cutting-edge research on such topics as network learning, e-learning, managing web-based learning and teaching technologies, and building web-based learning communities."

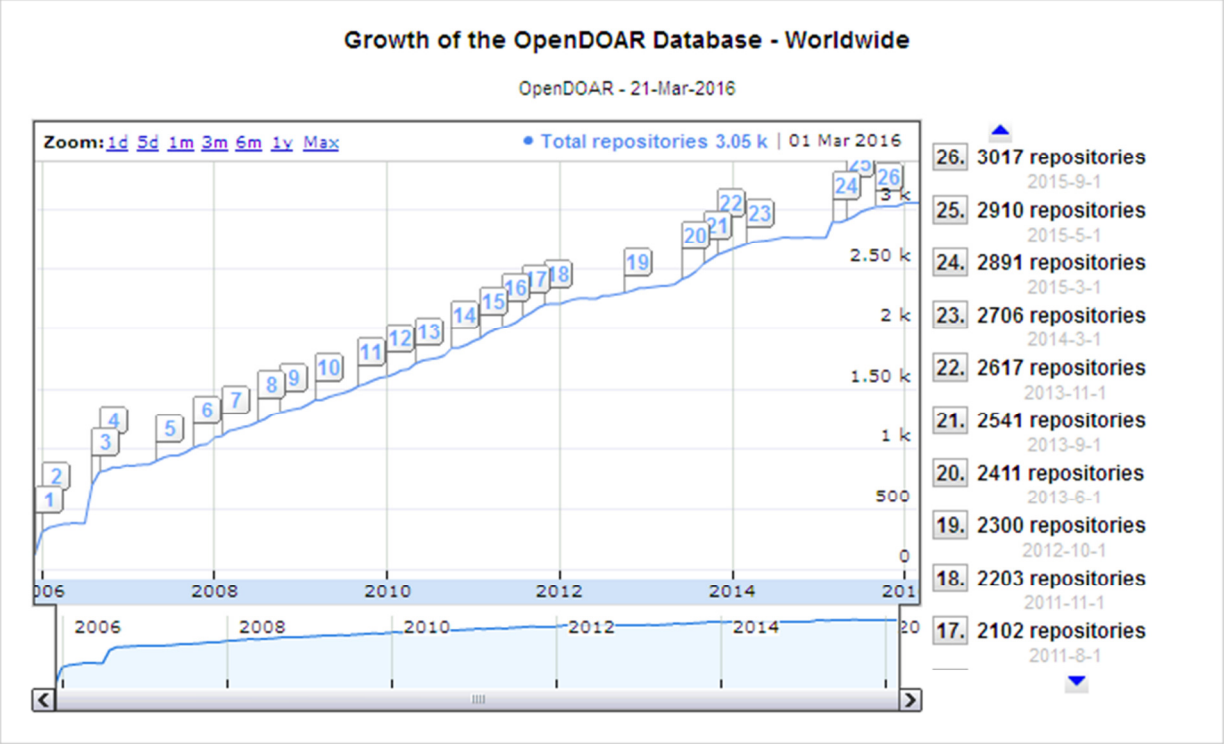
Web-based Knowledge Resource Management

Knowledge is considered as pre-requisite for promoting teaching and learning. Staying up-to-date on knowledge of relevant research areas is also equally important to enriching one's intellectual horizon and promoting research. But, due to scattered sources and an unfriendly access environment, many end-users cannot reach and use those research results for further research and development. To overcome these access barriers many higher education institution including research organizations implemented web-based repository management system. A web-based repository system is a digital assets management system or a network of systems that allows deposit and subsequent distribution of digital files over the internet. In other words, web-based knowledge resource management is a centralized machine-readable repository management system for the collection, preservation and dissemination of information, generally online or with the capacity to be put online. A well-organized web-based system can save time, money and resources by decreasing the amount of user time spent trying to find

information. A repository may be directly accessible to users or may be a place from which specific database, files or documents are obtained for further relocation or distribution in a network (Mishra, 2010). Online digital repository generally collects, preserves and disseminates intellectual output of various institutions, particularly a research institutions, organisations or departments with the help of computer and network technologies. Web-based repository management systems have been gaining popularity throughout the world. Following chart illustrates the growth of web-based repositories to global information community.

Graph-1

Growth of Web-based Repository Worldwide



Source: www.opendoar.org

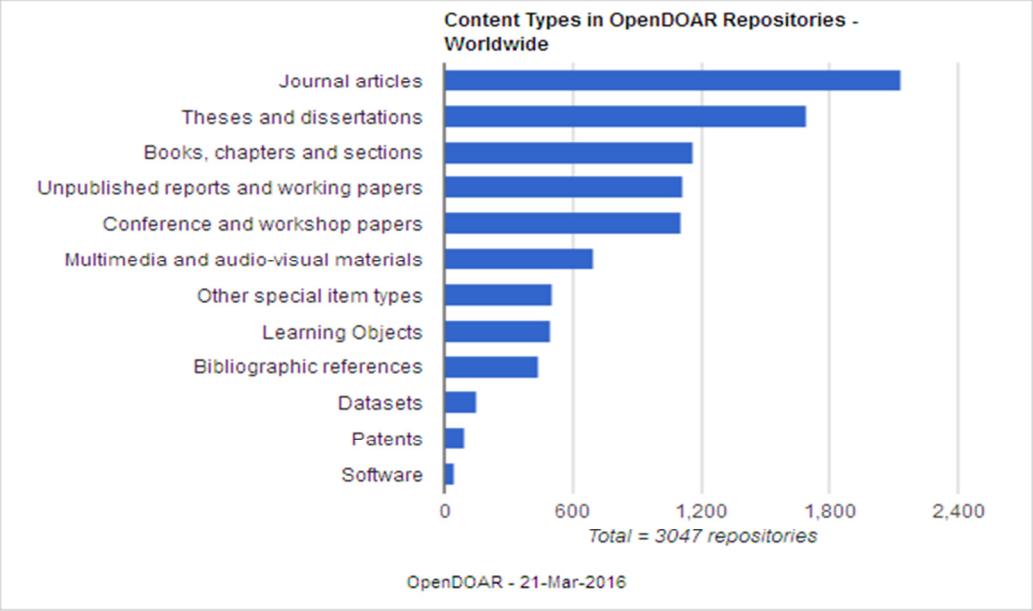
Figure-1 illustrates that the number of repository organizations are growing steadily throughout the world.

Contents of Web-based Repository

Web-based repository contents comprises of all sorts of digital resources relevant to teaching and learning. More specifically web-based repository content may includes peer reviewed journal articles, thesis and dissertation of various level, published books, book chapters, book sections, conference and workshop papers, patents, software and many more.

The Directory of Open Access Repositories (OpenDOAR) mentioned a list of content types that are deposited in the database. Following graph shows the content types of digital repository.

Figure-2
Contents of Web-based Repository

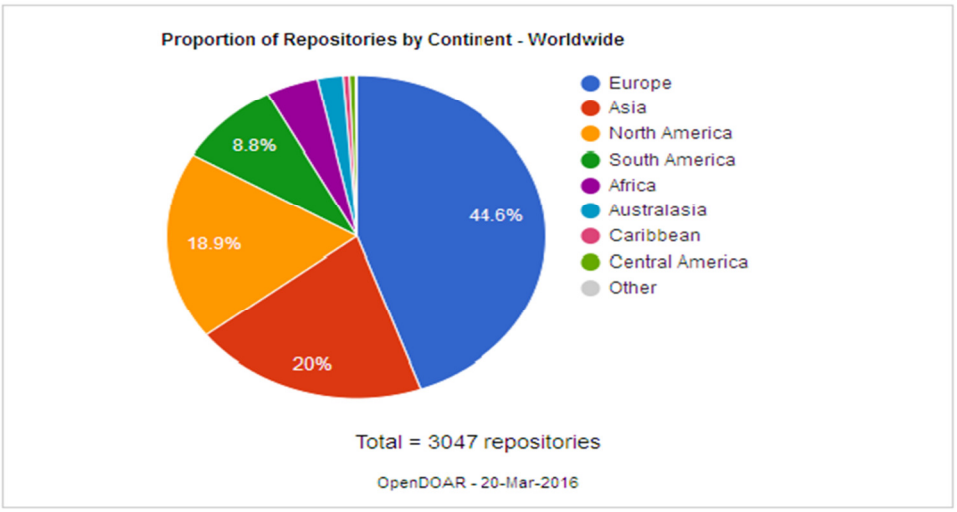


Source: http://www.opendoar.org/ Accessed March 21, 2016

Web-based Repository Management: Global Scenario

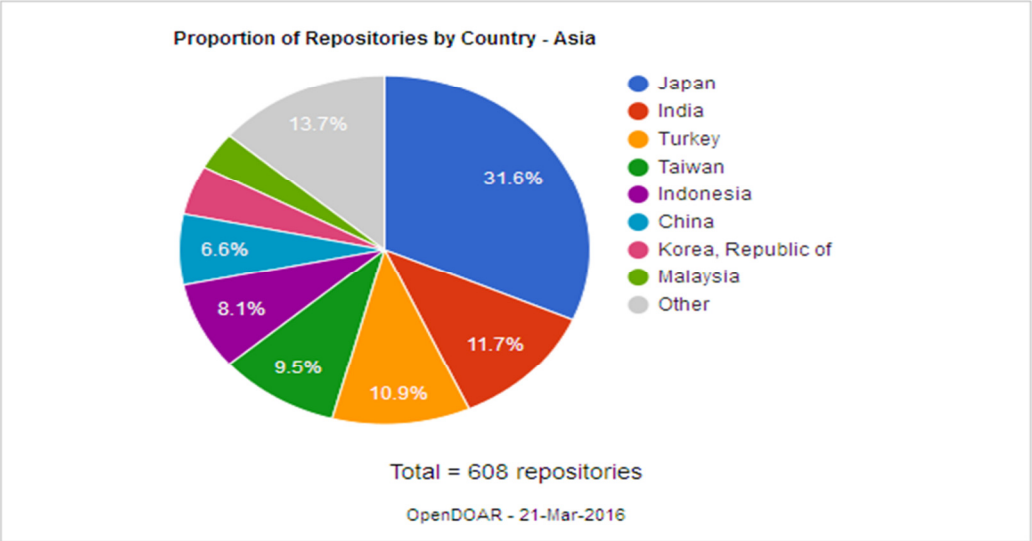
The concept of Open Access Initiative (OAI) removes restrictions to free access to scholarly output, sharing knowledge and accelerating research. Chan (2004) stated "the open-access archive as the most cost-effective and immediate route to providing maximal access to the results of publicly funded research, thereby maximizing the potential research impact of these publications". Digital repository and open access are much talked issue to the information professionals world wide. At present open access digital repositories have become widely accepted and preferred information sources in the areas of education, science and others. There are around 3047 registered open access repository organization throughout the world which are providing repository services ("OpenDOAR Charts - Worldwide," 2016). Following graph illustrates the worldwide distribution of repository content.

Figure-3
Proportion of Repository by Continent



Source: http://opendoar.org/onechart.php Accessed March 20, 2016.

Figure-4
Proportion of Repository in Asia



Source: http://opendoar.org/onechart.php Accessed March 21, 2016.

In addition to individual IR in many countries ministries of education/authorities or professional organisations have established joint repositories network for smooth operation and better service quality. In Europe, Digital Repository Infrastructure Vision for European Research (DRIVER) effort has been developed to establish a cohesive, pan-European infrastructure of Digital Repositories, offering sophisticated functionality services to both researchers and the general public ("DRIVER," 2012). There are repository networks established in Norway, Netherlands, Belgium, Ireland, India, Pakistan, Japan, Australia and also some other countries of the world. Each network has developed different lines according to their mission, vision and attributes but provides a broad-scope central database of open access content that can be added to, searched, mined, re-used, exploited for specific interest groups and built upon over time.

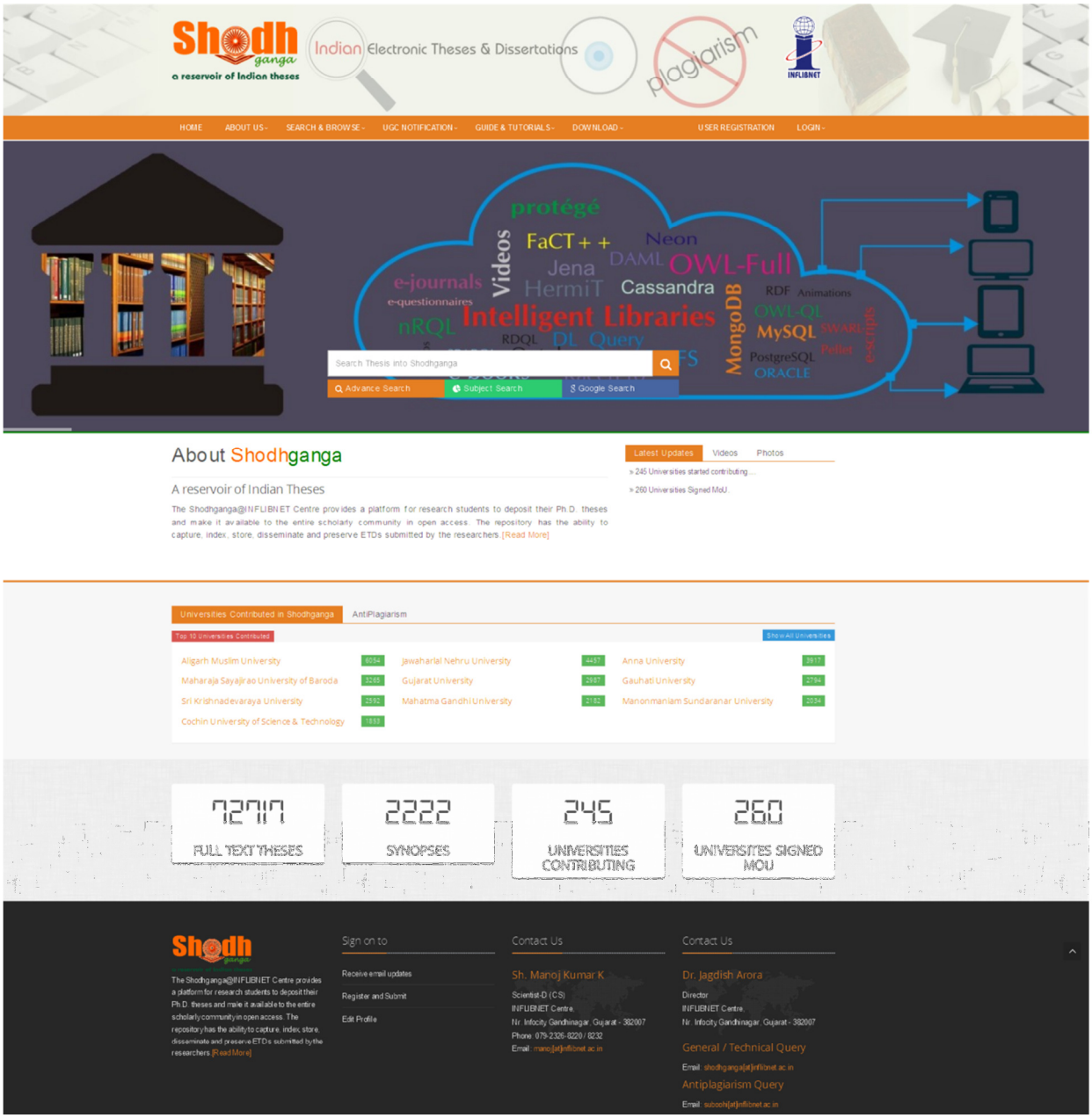
In UK, SHERPA-LEAP (London E-prints Access Project, a partner in SHERPA - Securing a Hybrid Environment for Research Preservation and Access) was established in February 2004 as a consortium of seven higher education institutions. The aims of the project was to create e-prints repositories, hosted centrally by UCL (University College London), for each of the partner institutions, and to populate those repositories through collaborative advocacy ("SHERPA-LEAP," 2006.). Besides, the Welsh Repository Network (WRN) Enhancement Project built on the technical infrastructure established during the WRN Start-Up project by investigating the potential of a collaborative, centrally managed model for accelerating the development and uptake of repository services in Higher Education Institutions in Wales and across the UK as a whole ("Welsh Repository Network," 2009).

Norwegian Open Research Repository (NORA) network consists of only four research universities at the moment but may extend to the remaining research universities and be linked to the FE sector's own network over time. Each university has a repository exposing content to OAI harvesters. NORA provides a search interface for users ("NORA," 2008). In the Netherlands, the SURF organisation set up DAREnet3 to link the institutional repositories of all Dutch universities ("NARCIS," 2004). In Australia, the top research universities have repositories that are linked to form ARROW (Australian Research Repositories Online to the World)("ARROW," 2012). The ARROW Discovery Service, developed and operated by the National Library of Australia, provides the search interface.

In India, the Shodhganga@INFLIBNET Centre provides a platform for research students to deposit their Ph.D. theses and make it available to the entire scholarly community in open access. The repository has the ability to capture, index, store, disseminate and preserve Electronic Theses and Dissertations (ETDs) submitted by the researchers (Shodhganga, 2015). As of April 2016, Shodhganga covers more than 72000 thousand full text PhD theses from 245 contributing universities. The platform ensures not only easy access and archiving of Indian doctoral theses but also help in maintaining the standard and quality of research.

Figurw-5

Web-based Repository- India

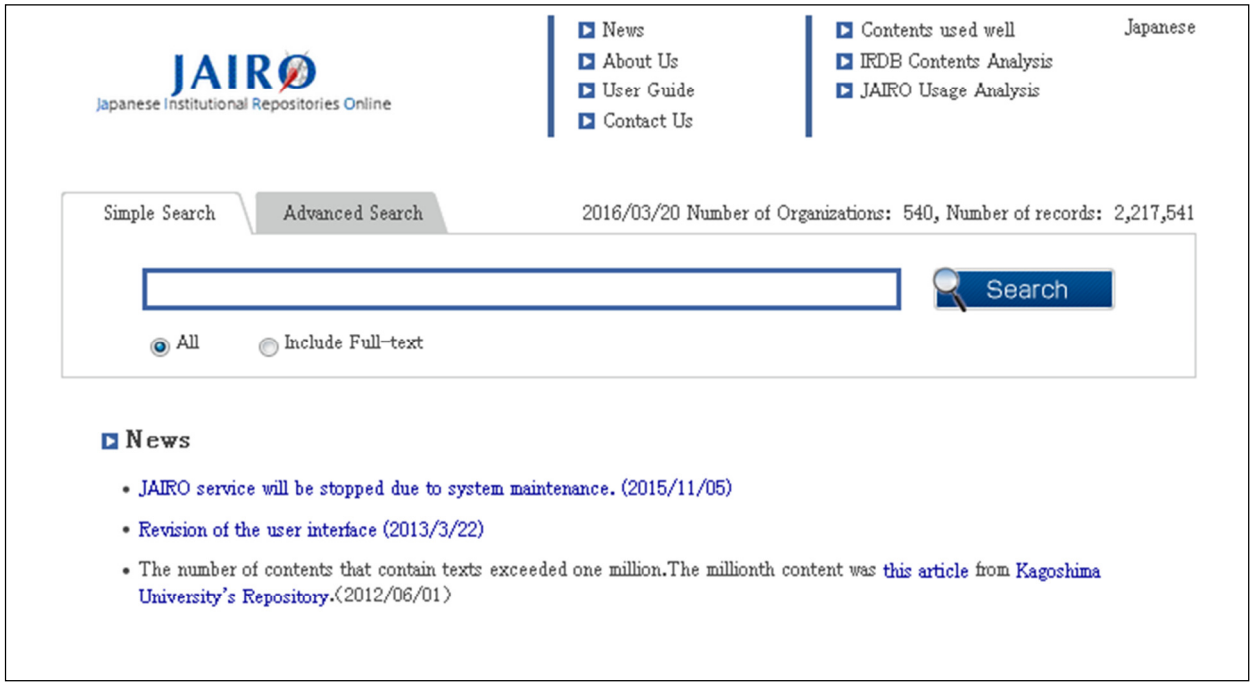


Source: http://shodhganga.inflibnet.ac.in/ Accessed April 07, 2016.

In Japan, JAIRO (**Ja**panese **I**nstitutional **R**epositories **O**nline) provides free of charge access to academic information (journal articles, theses or dissertations, departmental bulletin papers, research papers, etc.) of cross-sectional Japanese institutional repositories. The National Institute of Informatics (NII) collects metadata of institutional repositories according to an application from the person in charge of the management of the institutional repository of each institution. As of March 2016, JAIRO contains about 2,217,541 contents from 540 organizations to be searched for (JAIRO, 2016).

Figure-6

Web-based Repository- Japan



Source: http://ju.nii.ac.jp/en/ Accessed March 20, 2016.

Web-based Repository Management Practices in Bangladesh

Web-based repository management issues have become one of the major research areas to the library and information management professionals in Bangladesh. Researchers are doing research on various fields of implementing a sustainable digital repository management system in Bangladesh. Shoeb, (2010) described different stages of developing digital Institutional Repository system for a private university library in Bangladesh. Islam & Alam (2010) pointed out various issues of designing and developing IR in a public university in Bangladesh. Chowdhury, Uddin, Afroz, & Sameni (2011) made comparative analysis of two practicing IR system in Bangladesh. Mezbah-ul-Islam & Chandel (2011) summarized the core functional activities for making sustainable digital institutional repository. Rahman & Mezbah-ul-Islam (2014) described different issues and challenges of IR system in Bangladesh.

In practical, the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) initiated the first IR practices in Bangladesh in 2006. BRAC University Library is the second successive organization who is providing IR services to its clients. Later, East West University Library initiated digital library with GreenStone software in 2011. Independent University, Bangladesh (IUB) Library and East West University Library implemented IR in 2012 with DSpace software. Besides, University of Dhaka (DU) and Chittagong Veterinary University of Science and Technology also are managing their repository with DSpace.

Directory of Open Access Repository (OpenDOAR) and Registry of Open Access Repository (ROAR) provide information about the present scenario of repository management activities in Bangladesh. Following table illustrates brief overview of IR status of Bangladesh.

Table-1
List of IR Providers in Bangladesh

SL	Name of Institution	Year	URL	Software
1.	ICDDR,B Digital Repository, Bangladesh	2006	http://dspace.icddrb.org/	DSpace
2.	BRAC University Institutional Repository	2008	http://dspace.bracu.ac.bd/	DSpace
3.	EWU Digital Library	2011	http://gsdl.ewubd.edu/greenstone/cgi-	GreenSton
4.	IUT Digital Library	2011	http://lib.iutoic-	GreenSton
5.	Daffodil International University Institutional Digital Repository	2012	http://dspace.daffodilvarsity.edu.bd:8080/	DSpace
6.	Eastern University Digital Library	2012	http://gsdl.easternuni.edu.bd/greenston	GreenSton
7.	EWU Institutional Repository	2012	http://dspace.ewubd.edu/	DSpace
8.	IUB Library Digital Repository	2012	http://dir.iub.edu.bd:8081/	DSpace
9.	Dhaka University Institutional Repository	2013	http://repository.library.du.ac.bd/xmlui/	DSpace
10	RUCL Institutional Repository	2013	http://180.211.185.225:8080/	DSpace
11	NUB Digital Institutional Repository	2013	http://202.74.245.22:8080/xmlui/	DSpace
12	Chittagong Veterinary and Animal Science University Digital Library	2013	http://library.cvasu.ac.bd:8081/	DSpace

Source: http://roar.eprints.org/, www.opendoar.org Accessed April 07, 2016.

Moreover, some other well known organizations like Khulna University of Engineering and Technology (KUET), BARI Digital Library, National Museum Digital Library, Stamford University Digital Library, Banks and Financial Institutions Divisions (BFID) Digital Library, Ministry of Finance, CIRDAP, Shahjalal University of Science and Technology, Mymensingh Agriculture University, Bangladesh University of Engineering and Technology and Premier University Chittagong have also implemented repository management systems in their respective organizations. But these organizations did not register their information in any repository databases. However, it is very clear that web-based repository management has been gaining importance in Bangladesh.

Discussion and Recommendation

Bangladesh is embracing technological benefits in very quick manner. Anyone can easily see the technological influence in all spare of life. Connection with sub-marine cable enabled Bangladesh to access information super highway globally. Internet access has become easy and reached to individual's doorsteps. Besides, reduction of bandwidth charge by the government and introducing different flexible data packages of different telecom operators are accelerating the use of internet. In 2009, WiMax technology was introduced in the country which is enabling fast, secure and dedicated internet connection for all and is also breaking the barrier of not reaching the unreached (Wahed, 2009). Besides, in October 2002, the Government of the People's Republic of Bangladesh declared the first national policy on ICT known as the 'National ICT Policy 2002' with a vision for "a knowledge based society' (Islam & Alam, 2010). Bangladesh Government also approved Right to Information Act 2009 and Vision 2021:

Digital Bangladesh. Both acts makes provisions for ensuring free flow of information and people's right to information. The freedom of thought, conscience and speech is recognized in the Constitution as a fundamental right and the Right to Information is an alienable part of it (Ministry of Law, Justice and Parliamentary Affairs, 2009). Hence, access to digital information became an essential monopoly for information seekers. Accordingly, web-based education has been gaining popularity all over Bangladesh. Introducing multimedia technology in classroom teaching influenced a lot towards technology based education system in Bangladesh. Bangladesh Government also introduced Bangladesh National Web Portal containing around 25,000 websites of offices of ministries, departments, directorates, divisions, districts, upazilas and also union parishad to reduce the digital divide between different classes of peoples. All of these initiatives inspire higher education institution to provide web-based services in terms of teaching and learning.

With this view, it is observed that almost every higher education institutions in Bangladesh introduced their web portal for web-based communication including web-based content delivery system and many more. Implementation of IR system is meant of ensuring web-based access and management of digital content of that particular institution. At present although some organizations are providing web-based IR system, a lot of other similar organizations are out of the practice. Besides, it is observed that all the institution do not follow same standard in terms of policy and management system. In addition, we see different types of barriers including administrative complexity, inadequate financial support, lack of technical manpower, inappropriate infrastructural facilities hinders the growth of web-based knowledge management systems. In this regards, the study propose to initiate a national repository platform for Bangladesh namely National Digital Repository System (NDRS).

The proposed NDRS will be a multi-institutional centralized full-text database platform to collect, preserves, promote and disseminate a nation's cultural heritage, intellectual output and creative commons for promoting education and research. It is also meant to reinforce the national imperatives of fostering national identity and social cohesion. If all the research organization come under a unique platform and provide their research output to the proposed NDRS, all sorts of people will be able to access and use them which will save users' time, money and energy and will prevent duplication of work.

Besides, the NDRS may contribute in the following ways:

- An online repository with international visibility of research result originating from Bangladesh and open access to scientific literature will increase h-index of a scientist or scholar.
- A stronger repository community within research organizations will enhance the level of engagement of all stakeholders.
- Will provide the users to view the aggregated research output to all fields, groups or country.
- Collaborative provision and the shared use of expertise and experience will increase productivity in terms of preservation and distribution of research result.
- Will allow students, faculty members and researchers to search, browse and download full text report free of cost in a single platform.
- Will stimulate increase rates of researchers participation in contributing NDRS.
- Indexed by leading online search engines viz. Google and Google Scholar will increase visibility and usability of local research results.

Conclusion

Web-based open access repository may serve as an essential tool for end-users especially patrons of higher education institutions to find their required information for ensuring quality of education. Besides, an open access repository platform may help policy makers and analysts, academicians, researchers,

training institutions and government and non-government organizations to know which research is already done in his/her research topic, where to get the output or whom to contact for related information. Users will be able to search, browse and download full text report free of cost. Moreover, by collaboration with leading online search engines Web-based NDRS will increase the international visibility of research output originating from Bangladesh. It will also reflect the aggregated research output to all fields, groups or country. A Web-based National Digital Repository System for research organizations in Bangladesh will act as a national focal point for educationist, scholarly as well as individual learners which will foster research and development activities in Bangladesh. Besides, a central repository platform may ensure standard system for IR practicing organizations in Bangladesh. A unique platform may serve as a national portal for intellectual community.

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