

CHALLENGES AND INITIATIVES OF DIGITAL LIBRARY SYSTEM AND INSTITUTIONAL REPOSITORY: BANGLADESH SCENARIO

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Abstract

This paper focuses on the basic concept of digital library system and highlights the purposes and features of digital libraries and institutional repositories. It explores the core challenges and initiatives taken by the leading libraries in Bangladesh for setting up digital library/institutional repositories. This study also highlights the present status of institutional repositories and consortium in academic and special libraries in Bangladesh. A glimpse of what has been done and what are expected to be done for developing digital library system in Bangladesh is presented. This paper finally recommends necessary guidelines to develop digital libraries and institutional repositories in Bangladesh.

Keywords

Digital library, Institutional repository, Challenges, Initiatives, Bangladesh

Introduction

We are passing through an era, which can be aptly called as an era of “Information Explosion”. Access to information is vital for the socio-economic progress of a country like Bangladesh. The wave front of information is expanding at a terrific speed and it is becoming increasingly difficult for an individual, scientist or research worker to keep himself abreast or informed of the latest thoughts in his field of specialization in any part of the world. In this respect, more effective and responsive initiatives for digital library system would play a leading role for ensuring the free flow of information and development of our country and nation as well as empower users in the digital environment. In today’s ICT based environment, digital library plays an important role for preservation and dissemination of digital information.

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Proper initiatives must be undertaken for delivering right information to right user at right time in an access mode of 24x7. Specially, the academic and special libraries in Bangladesh are trying hard in establishing digital libraries through the process of computerization of their library and information centers.

Objectives

The paper concentrates on the following key issues:

- To present an overview of digital library system and its various features;
- To explore the present status of digital library initiatives in various libraries in Bangladesh;
- To highlight the digital collection building procedure through library consortia, and developing institutional repository (IR);
- To compare the functions of digital library in respect to traditional library;
- To envisage the core competencies and skills needed for library professionals of Bangladesh; and
- To gauge the proposed course titles for digital librarian in Bangladesh

Literature Review

The literature review covers digital library initiatives and status of digitization worldwide, digitization and institutional repository of medical university and special libraries at national, regional and international levels especially for Bangladesh. Secondary data were searched from print and online resources. Literatures on this topic were very limited, though foreign literature on digitization of public or private universities were many but digital library status in medical colleges of Bangladesh is very little and some of these had been highlighted in this study.

The initiatives for digitization and institutional repository in academic and special libraries have been a major research area for more than three decades. There have been numerous studies on digital library system in libraries in developing countries.

In 2012, Shuva conducted a study on “Building digital libraries in Bangladesh: A developing country perspective” to trace out the ways used to build digital libraries in Bangladesh as well as the problems that might be encountered during digital library system development. It shows the present state of digital library development, specially the field of digitization in Bangladesh as well as government initiatives to build digital library system.

The need and importance of digital information resources has been realized by a number of libraries in Bangladesh. The theoretical framework and beginning to

acquire the digital information resources has been started though the rate of adopting ICT & modern technology in library is very low. However, the scenario of digitization and digital collection maintenance is obscure. Based on the literary evidences, it is anticipated that the initiatives for online full text and bibliographic databases, indexing databases, cloud computing (the practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer), ICT (Information and Communication Technologies) based networking and communication activities are at the nascent stage at the maximum number of the university libraries of Bangladesh (Islam, 2010).

Chowdhury in 2013 carried out a study on “Database management systems and use of digital resources in some selected public university libraries of Bangladesh: an overview” to find out the existing condition of database management practices and utilization of electronic resources of five selected public university libraries of Bangladesh.

In 2013, Islam conducted a study on “Library Digitization in Bangladesh: A Developing Country Perspective” to explore the exact scenario of library digitization practices in Bangladesh.

In 2004, Bhattacharya carried out a study on the digital library initiatives in India with examples, the initiatives of the government of India and state governments towards digital library activities, and the policy of the Government of India towards digital library development.

Rahman MM in 2014 investigated a study on Issues and strategy of institutional repositories (IR) in Bangladesh to identify various institutional repository (IR) initiatives taken by Bangladeshi institutions, including identifying prospects, exploring strategies, and framing guideline for building IRs in Bangladesh (Rahman MM & Mezbah-ul-Islam M, 2014).

Methodology

This study is based on qualitative method for collecting necessary data. A widespread literature search has been accomplished by the authors of this paper in order to search out enhanced understanding and apparent concept on Digital Library and Digital Librarian. An extensive literature search has been conducted through Google, Yahoo, Ask, Alta vista, Bing and Google Scholar platform to find out various journal articles of the aforementioned topic. General phrases and Boolean search techniques have been applied. The following search terms were used: “Digital

Library AND Bangladesh”, “Institutional Repository”, “Digital Library AND Institutional Repository”, “Institutional Repository Initiatives”, “Institutional Repository AND Bangladesh” etc. In addition, a variety of grey literature was collected and reviewed including different project proposals, reports, book chapters, conference proceedings, and others. Finally, personal contacts and discussions with information professionals, researchers, and librarians have also been carried out in order to discover significant information for this study.

Concept of a Digital Library

The term ‘digital library’ in print may have been first coined in a 1988 report to the Corporation for National Research Initiatives. The word ‘digital library’ was first proliferated by the NSF/DARPA/NASA Digital Libraries Initiative in 1994. Very simply, digital library incorporates the functions and services that should be executed automatically or digitally and data must be transmuted in the form of bit (0, 1).

The Digital Library Federation (2004) defined digital libraries as:

“Organizations that make available the digital resources, including the expert staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities.”

Borgman (1999) provides a more complex definition of digital libraries as below:

“1. Digital libraries are a set of electronic resources and associated technical competencies for generating, searching and providing information. In this sense they are an extension and enrichment of information storage and retrieval systems that manipulate digital data in any medium (text, images, sounds; static or dynamic images) and exist in scattered networks. The content of digital libraries includes data, metadata that describe various aspects of the data (e.g. representation, creator, owner, reproduction rights) and metadata that consist of links or relationships to other data or metadata, whether internal or external to the digital library.

2. Digital libraries are constructed, collected and organized, by (and for) a community of users and their functional capabilities support the information needs and uses of that community. They are an element of communities in which people and groups cooperate with each other, using data, information and knowledge resources and systems. “

In the US, the Digital Libraries Federation (DLF) is an organization of research libraries and various national institutions formed in 1995. The stated goal of DLF is "to establish the conditions necessary for the creation, maintenance, expansion, and preservation of a distributed collection of digital materials accessible to scholars and the wider public." After considerable work, DFL agreed on a "working definition of digital library," representing definition of the practice community:

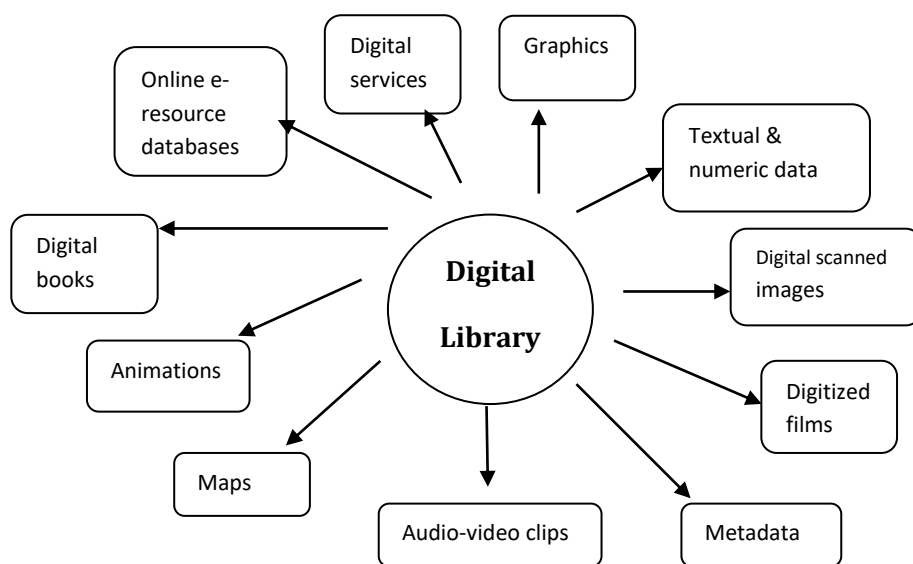


Figure 1: Basic contents of a digital library

The unlimited storage space at a much lower cost, enhanced information retrieval, unlimited physical boundary, round the clock availability, multiple accesses, and universal accessibility are the core benefits of digital libraries. So, we can say that, digital library is the system of providing users with comprehensible and 24x7 access to a very large, sophisticated, organized and digital storehouse of information which are captured, stored, distributed and retrieved e-resources digitally or electronically. Digital libraries may be treated as repositories of huge amounts of high-quality digital information content in digital/electronic form in multiple servers on different layouts authorizing access over different electronic networks in a distributed or shared environment (Jeevan, 2004).

Digital Library: Key Elements

The key elements of a digital library are listed below:

- Electronic resources—digital data in any medium;
- Computerized networked library systems;
- Information retrieval;
- Metadata;
- Skilled library professionals;
- Digitization devices and techniques;
- Information storage devices;
- Digital library software; and
- Community of users—their information needs and uses

Digital Library: Architecture

Digital library encompasses the empowering technology which maps the functionality and networking capability offered by the library into hardware and software content. This is where the technologies are brought together to produce the functionality with the content. The architecture is termed as a ‘technological stack’ (Dahl et al. 2006).

Figure 2 presents a minimum standard for digital libraries, whether the digital content is housed physically or virtually. In addition to the network and server hardware, the stack consists of other software technologies which play an important role in the functionality and manipulation of digital library content (Anunobi & Ezeani, 2011).

Further to the attributes shown in Figure 2, (Dahl et al. 2006) explain that the present-day digital library should have among its attributes:

- Integrated library system;
- Electronic resources management; and
- Repository of locally created digital content.

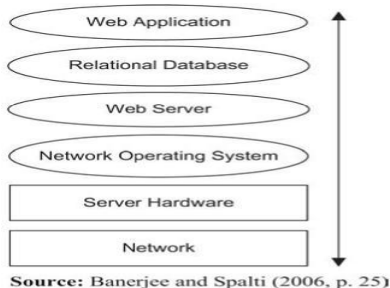


Figure 2: Technology stack of the digital library

Digital Library: Purposes

The rapid pace of development of Information and Communication Technology (ICT) and the manner in which information and knowledge will be disseminated using these technologies will play a major role in the evolution of digital library in the present century. Some of the purposes of the digital library identified by the different ongoing projects were (The Association of Research Libraries, 1996):

- To assemble, preserve and shape information and knowledge in digital form;
- To uphold economic and competent distribution of information;
- To leverage the significant investments in computing/communications framework;
- To empower communication and collaboration between research, business, government and educational communities; and
- To add value for lifelong learning prospects.

Digital Library Vs. Traditional Library

The Digital Library enriches the efficiency and capacity of the modern library services and also solves feasible elucidations to difficulties of the print-based collections in traditional libraries. The Digital library reduces floor space requirements as compare to conventional library to store and maintain the books and periodicals. The Fifth Law of Library Science of Ranganathan i.e. "Library is a growing organism" has always been putting pressure on traditional libraries for finding more and more physical space to accommodate new arrivals in the Library. This problem is completely solved in a digital environment. The traditional library model and a digital library model differ in terms of the layout of information and tools for acquiring, organizing, preserving, and providing services. Thus, the organization of digital technologies and digital libraries within traditional library systems has many magnitudes for organizational structure, staff resources, workload, and accessing e-resources and print resources (Wilson, 1998). A comparative analysis between digital library and traditional library is given below:

Table 1: Comparative analysis between digital library and traditional library

Capability	Digital Library	Traditional Library
Capture	The contents of books, journals etc. are captured in web-form	Acquisitions and collection development
Catalog and Index	Metadata is used to develop	General cataloging rules

	computerized cataloging and indexing	and bibliographic control
Data access	Multiple users can access the Digital library simultaneously with a guarantying continuous availability of documents	One user for one document at a time
Remote locations	The Digital library enables greater access to digital contents which can be managed from remote locations and delivered a way to enrich the academic and research environment	The user has come to library physically for retrieving his document
Storage	Accessibility of cutting-edge cloud storage technologies in reasonable cost which enable storage of large amount of contents	Stacks, inventory management and shelf lists
Search	A specific search term or method or query is used in order to search a database and have to design search engines to selectively search and access the e-contents	Traditional card catalogue
Authentication	Using password in order to protect unauthorized access from the database	Patron privileges and circulation rules consistent with public law and policy
Retrieval	Digitally retrieved information using Internet	Loan management and inter-library loans
Search engines	The library needs software for database management, Web servers, content authoring/editing, etc., and developmental software (Visual studio, C + +, Java & Internet Tools etc.).	This is not available in traditional library
Dissemination	The e-contents may be made accessible through a functional Internet and Intranet or leased line connection from VSNL or other internet service providers (ISPs)	Library resources are accessible through manual loan management system.

Digital Library (DL) Initiatives: Bangladesh Perspective

The concepts of 'Digital Library' and 'Digital Librarian' are still new among the information professionals of our country and these two concepts are not much clear to many of us. Digital libraries are in progress during the 1970s in the developed countries, but perhaps it started its journey in the mid-1980 with the adaptation of library automation system in Bangladesh. In 1993, Internet revolution has made good shape for digital library development in Bangladesh. The overall digital library initiative in Bangladesh is not at a satisfactory level so far. Though some leading private university libraries and special libraries have been made significant attempts towards digital library initiatives such as getting databases on CD-ROM, developing Institutional Repositories, integrating library systems, subscribing to e-journals and online databases, networking through library consortium, scanning a few documents, or creating Adobe Acrobat files and installing these on an Intranet. So, the library professionals of Bangladesh are now facing new challenges and opportunities that demand library professionals with skills and competencies in areas such as digital technology and digital preservation system.

DL can advantage transfer a nation towards apprehending the enormously powerful vision of any timely-access to the best and the state-of-the-art of human thought and culture, overcoming all geographical barriers so that no faculties, students, researchers and above all library users are isolated from knowledge resources. In Bangladesh few institutions, as well as universities, both private and public have initiated national and regional level capacity building initiatives on digital libraries (Begum, Rashid, & Mahamud, 2012). The Internet originated to Bangladesh with e-mail beginning in 1993 and Internet Protocol connectivity in 1996. In mid-June 1996, the Very Small Aperture Terminal (VSAT) base data circuit was introduced for the first time in the country. Upon VSAT commissioning, Internet connectivity was set up, and its services were made available to the public (Nafiz Zaman Shuva, 2014). The Atomic Energy Commission first time in Bangladesh started the use of computers in 1964 with the installation of IBM 1620 model computers (Bangladesh Association of Software and Information Services (BASIS), 2005); however, libraries in Bangladesh started using computers only in the 1980s. The icddr,b (International Centre for Diarrhoeal Disease Research, Bangladesh) Library and the AIC (Agricultural Information Centre) are considered pioneers in introducing automation activities in Bangladesh in 1985 (Khan, 1989) with CDS/ISIS (Computerized Documentation System/Integrated Set of Information Systems) software. In addition, AIC used to provide services through the Food and Agricultural Organization's (FAO) CD-ROM databases – AGRIS (International System for Agricultural Science and Technology) a worldwide public database

delivering agriculture related bibliographic information. Further, icddr,b Library offered full text and bibliographic databases on CD-ROM namely Medical Literature Online (MEDLINE), Population Literature Online (POPLINE), and Asian Health, Environmental and Allied Databases (AHEAD) respectively from 1989, 1993, and 1994 (M. H. H. Chowdhury & Khan, 2011).

Table 2: Major core initiatives for digital library system of Bangladesh

Contributing Institution	Core initiatives	Year
Dhaka University Library (DUL)	Digitizing its 30,000 handwritten manuscripts, 20,000 rare books, 5,000 microfilms and many special materials.	2000
National Archives of Bangladesh	Digitized the District Records Collected from 1760- onto 1000 DVDs	2002
North South University Library	Subscribed JSTOR, IEEE, ACM & 39 titles of other online Journals	2002
BRAC University Library	Subscribed JSTOR	2002
World Health Organization (WHO)	Accessed to Hinari platform for first time in Bangladesh with a zero cost (accessing up to 13,000 e-journals of STM publishers in 45 different languages, 56,000 e-books, and 120 other information resources)	April 2003
IUB and icddr,b Library	Subscribed JSTOR	2003
North South University Library	Offered “Certificate Course in Digital and Online Librarianship”	2004
icddr,b Library	Developed its Institutional Repository (IR) using DSpace Software for the first time in Bangladesh	2005
Bangladesh Academy of Sciences	Formed Bangladesh INASP-PERii Consortium (BIPC)	2007

Contributing Institution	Core initiatives	Year
International Network for the Availability of Scientific Publication (INASP)	Developed Bangladesh- published journals in all disciplines i.e. BanglaJOL	September 2007
BSMMU Library	Developed Institutional Repository (IR) by DSpace	2007
BRAC University Library	Developed Institutional Repository (IR) by DSpace	2008
Daffodil International University Library	Developed Digital Repositories by procured software Bright Soft (Malaysia)	2008
BANBEIS	Developed modern facilities to the user of the BANBEIS by digitizing the important & rare materials and available them	December 2008 to December 2009
East West University Library	Set up digital library system by using the Greenstone Software	2010
BRAC University Library	Launched Integrated Library System (ILS) using Koha (Open Source) software	2010
Government Public Libraries	Developed digital public libraries by providing ICT support to 64 government public libraries in Bangladesh	2010
Higher Education Quality Enhancement Project (HEQEP) of UGC, Bangladesh	Enrichment of BSMMU Central Library	2010
Higher Education Quality Enhancement Project (HEQEP) of UGC, Bangladesh	Enhancing Teaching and Research Capabilities through Library System Automation at Khulna University of Engineering Technology (KUET)	2010

Contributing Institution	Core initiatives	Year
Department of Information Science and Library Management, University of Dhaka	Organized a national seminar on DLs entitled “Building Digital Libraries for Digital Bangladesh”	2010
Dept. of Information Science & Library Management, University of Rajshahi	Introduced “Digital Library” course in Masters Level	2011
Library Association of Bangladesh in cooperation with the Department of Information Science and Library Management, University of Dhaka and the Department of Information Science and Library Management, University of Rajshahi	Organized an international conference on “Vision 2021: Role of Libraries in Building Digital Bangladesh”	2011
Higher Education Quality Enhancement Project (HEQEP) of UGC, Bangladesh	Total Computerization of Shahjalal University of Science and Technology (SUST)	2011
Dept. of Information Science & Library Management, University of Dhaka	Introduced “Digital Library System” course in Masters Level	2012
Higher Education Quality Enhancement Project (HEQEP) of UGC, Bangladesh	Built an e-resources access center and RFID-based library management system at North South University (NSU) Library	2012
University Grants Commission (UGC) of Bangladesh funded by the World Bank’s Higher Education Quality Enhancement Project (HEQEP)	Formation of UGC Digital Library (UDL) consortium	June 2012
Shahjalal University of Science & Technology (SUST), Independent University, Bangladesh (IUB), Rajshahi University of Engineering &	Developed Institutional Repository (IR) by Dspace/GSDL	2012-2014

Contributing Institution	Core initiatives	Year
Technology (RUET), Bangladesh University of Professional (BUP), Eastern University, (EU)		
Library Association of Bangladesh (LAB)	Organized an International Seminar on 'Digital Libraries for Digital Nation'	2012 (October 17-18)
Higher Education Quality Enhancement Project (HEQEP) of UGC, Bangladesh	Digitalization of Central Library of BUET	April 2012 to March 2014
Higher Education Quality Enhancement Project (HEQEP) of UGC, Bangladesh	Modernization of Central Library and Establishment of an E-resource Centre at CVASU (Chittagong Veterinary and Animal Sciences University)	April 2012 to March 2014
Higher Education Quality Enhancement Project (HEQEP) of UGC, Bangladesh	Establishment of IT Network and Digital Library in Sylhet Agricultural University	April 2012 to March 2014
Ministry of Cultural Affairs	Developed a digital library infrastructure at National Library of Bangladesh and facilitate full-text digital conversion and preservation of collections; and Create a digital Repository of National Library collections	2013
Dhaka University Library	Developed Institutional Repository (IR) by DSpace	2013
Bangladesh Central Public Library	Created online Digital Repositories of 1169 books by using customized software	2014
Bangladesh Secretariat Central Library	Developed Digital Repositories of its all Govt. Circulars, Gazettes, Reports, etc. (3 lac pages) by using customized software	2015

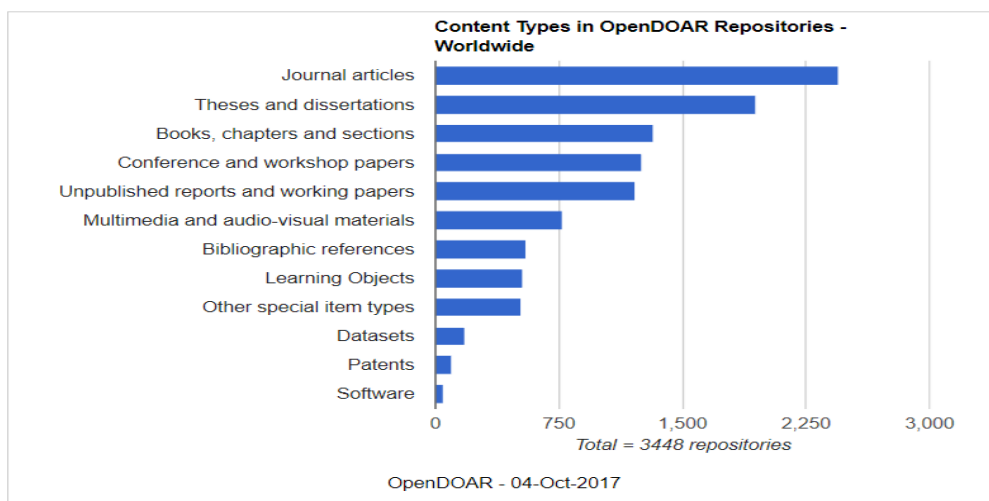
Contributing Institution	Core initiatives	Year
Bangladesh Association of Librarians, Information Scientists and Documentalists (BALID)	Organized a national seminar on ‘Cross-talk of Digital Resource Management: Step Towards Digital Bangladesh’	2015 (22 August)

Status of Institutional Repository (IR) in Worldwide and Bangladesh

Another possible solution for the libraries of Bangladesh to increase their digital collections/digital information resources is to create “Institutional Repository”. A digital Institutional Repository may be treated as any collection of digital/electronic materials administered, maintained or organized or disseminated by an academic or research institution. A specific form of Institutional Repository is; a digital archive of the intellectual outputs created by the faculty, research staff and students of an institution and accessible to end users both within and outside of the institution. In the term Institutional Repository (IR), ‘institution’ refers to the library’s parent organization. The growth of the IR is a pioneering form of scholarly communication within the digital environment. The IR refers to scholarly publications digitally such as journal articles or research data, e-thesis, e-books, and teaching materials, e-documents or any other research outputs such as theses and dissertations created by the scientists, research staff members, faculties and students of an academic, research or other such organizations and accessible for end users both within and outside of the organization.

Content: There are various types of content that may be preserved in an IR, such as monographs; peer-reviewed journal articles; book chapters; working papers; newsletters; research reports; theses and dissertations; statistical reports; audio/video; technical reports; preprints; conference proceedings; technical documentation; news-clippings; bulletins; memorandums; bibliographic references; patents; and so on. The below figure shows content types of OpenDOAR repositories around the world.

Content Types in OpenDOAR Repositories - Worldwide



N.b. Most repositories hold several Content Types.

Figure 3: Content types of repositories

Source: Available at: http://www.open_doar.org (Accessed on 04 October 2017)

Software: Software is one of the most crucial factors of building IR for an organization. According to the OpenDOAR database as of October 04, 2017 most of the IR institutions (44.2 percent) use DSpace followed by EPrints as 13.6% as their IR software (OpenDOAR). Figure 4 illustrates the usage of IR software worldwide.

Usage of Open Access Repository Software - Worldwide

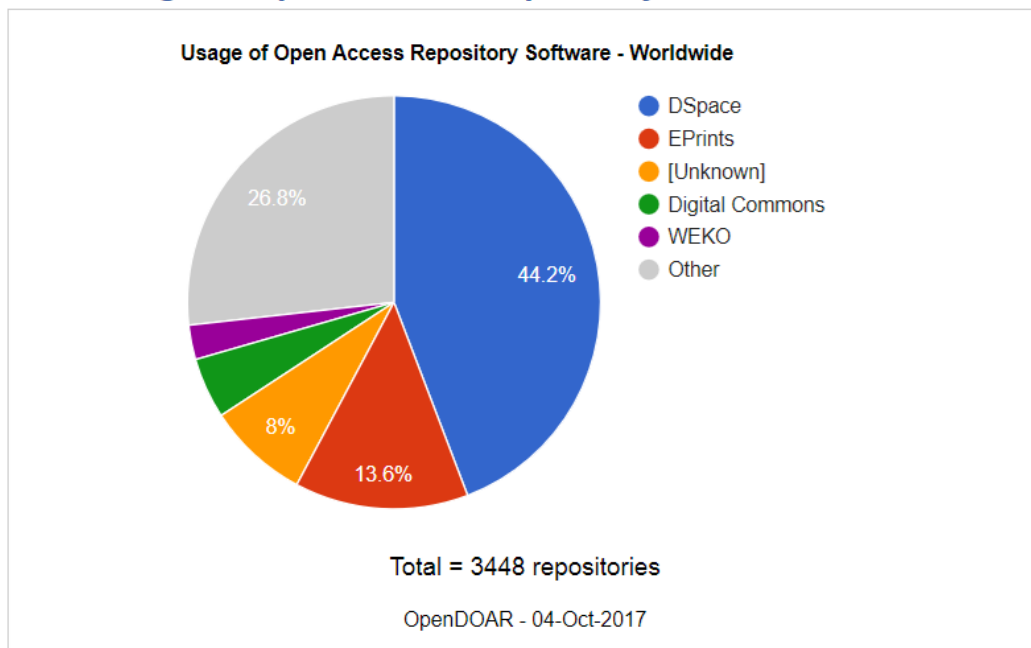


Figure 4: Types of IR software

Source: Available at: <http://www.opendoar.org> (Accessed on 04 October 2017)

Institutional repository: global scenario: Up to 04 October 2017 there are 3448 institutions that are providing access to their repositories worldwide as given the data by OpenDOAR. By continent, Europe is the top continent having 1558 institutions and Asia is the second with 701 institutions. Figures 5 clearly shows the growth and proportion of IRs in the global scenario.

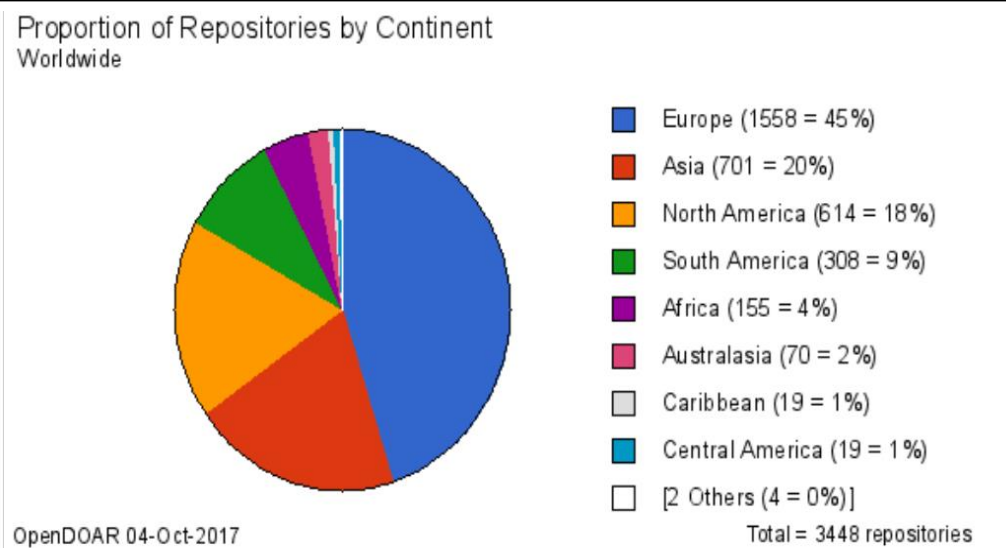


Figure 5: Proportion of repositories by continent

Source: Available at: <http://www.opendoar.org> (Accessed on 04 October 2017)

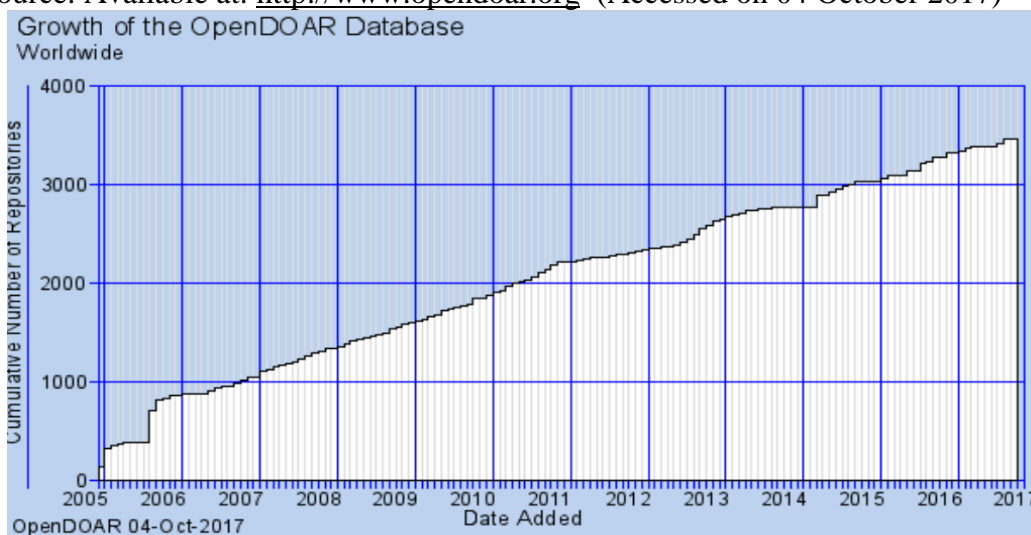


Figure 6: Growth of OpenDOAR databases worldwide

Source: Available at: <http://www.opendoar.org> (Accessed on 04 October 2017)

Like developed countries, the academic and research libraries of Bangladesh are trying to embrace the concept of developing institutional repositories. Nonprofit organizations, such as higher learning and research organizations might find IR

useful for circulating their intellectual works through Internet, for raising funds, and creating interest in the projects and activities of the respective organizations. icddr, library, Sher-e-Bangla Agricultural University Library, Islamic University of Technology Library, East West University Library, Eastern University Library, Daffodil International University Library and BRAC University Library, are now working on IR using DSpace and GreenStone software. East West University (EWU) Library and Eastern University Library have moved with GreenStone and DSpace digital library software for building digital library system/IR. Independent University, Bangladesh (IUB) library has developed its IR using DSpace software. Bangabandhu Sheikh Mujib Medical University (BSMMU) is also trying to set up an IR in their Library (M. H. H. Chowdhury, Uddin, Afroz, & Sameni, 2011). The below table clearly depicts the present IR status of Bangladesh as taken from OpenDOAR on 04 October, 2017.

Table 3: Development of IR by various libraries in Bangladesh

Repository name	No. of Records	Base URL	Software
BRAC University Institutional Repository	6398	http://dspace.bracu.ac.bd/xmlui/	DSpace
Daffodil International University Institutional Digital Repository	1362	http://dspace.daffodilvarsity.edu.bd:8080/	DSpace
Dhaka University Institutional Repository	730	http://repository.library.du.ac.bd/xmlui/	DSpace
E-Library on Disaster Management	1038	http://kmp.dmic.org.bd/	DSpace
Eastern University Digital Library	378	http://gsdl.easternuni.edu.bd/greenstone/cgi-bin/library.cgi?a=p&p=home&l=en&w=utf-8	Greenstone
Eastern University Institutional	337	http://dspace.easternuni.edu.b	DSpace

Repository name	No. of Records	Base URL	Software
Repository		d:8080/xmlui/	
EWU Digital Library	2269	http://gsdl.ewubd.edu/greenstone/cgi-bin/linux/library.cgi	Greenstone
EWU Institutional Repository	1905	http://dspace.ewubd.edu/	DSpace
Islamic University of Technology Digital Library	192	http://lib.iutoic-dhaka.edu/	Greenstone
IUB Library Digital Repository	195	http://dir.iub.edu.bd:8180/	DSpace
icddr,b Knowledge Repository	8381	http://dspace.icddrb.org/jspui/	DSpace
SAUL Archive	1588	http://archive.saulibrary.edu.bd	DSpace

Challenges facing the digital libraries: Bangladesh Scenario

The development of Digital Resource Management (DRM) as well as access to digital information can be seen as one of the major challenges for the library and information professions of any developing country especially for Bangladesh. Some of the major constraints hindering digital library development efforts in medical libraries of Bangladesh are outlined below:

- **Budget constraints:** Digital library development requires sufficient budget for procuring of physical infrastructure, subscribing e-resources, implementation, licensing, training, costs for digital equipment and support for the technical infrastructure. Due to a lack of sufficient funds, notable ICT-based development projects are absent in libraries where the source of funding comes from the government and concerned organization authorities.
- **Intellectual Property Rights:** A core challenge for developing digital library is complying with copyright and other Intellectual Property Rights (IPR) issues. Issues of copyright, intellectual property and fair use concerns are

creating unparalleled array of difficulties to the libraries and librarians who are struggling to cope with all these related Intellectual Property Rights (IPR) issues in the new technology-based environment.

- **Digitizing analog materials:** Books, journals, laboratory records, sound recordings, manuscripts, photographs of a traditional library must be converted into digital form. Today, the technology for digital conversion is emergent and there are few established standards on which they have to ensure reproduction quality. Unfortunately, most of the information professionals are not well versed about the equipment and their applications let alone the standard of digitization.
- **Absence of organizational policy:** Organizational policy for DRM system is highly essential for successful implementation of the same. Parent organizations' policy documents should mention clearly and elaborately about its library digitization policy. The libraries need to suggest the parent organization for the development of library digitization policy.
- **Bandwidth problem:** Digital libraries are multimedia products incorporating structured text, sound, graphics, pictures, photographs, video clips, and other material that requires intensive use of bandwidth. The developing countries have limitations of bandwidth available to them.
- **Absence or diversified standard:** Most of the libraries leading digitization initiatives in Bangladesh don't follow specific standard in digitization and preservation process.
- **Selecting appropriate software for digital library:** Selection of appropriate digital library software is another issue for libraries. It is essential to have full-fledged digital library management software.

Major Findings

The major findings of the study are furnished below:

- The study has made it clear that digital libraries are a new breed of library and information system / services, as digital libraries help in realizing the enormously powerful vision of anytime, anywhere and by anyone, access to the knowledge and thus enable wider and more varied access to the knowledge resources.
- Majority of the digital library programs have the primary mission of storage and dissemination of knowledge to the users as a commitment to the delivery of high-quality services, followed by a mission related to widest dissemination of research and raise visibility and prestige of their parent body.

- As the data had revealed, only a very small percentage of the libraries had done some digital library initiatives. Only 12 institutions in Bangladesh so far had some kinds of involvement with the Digital Library System/Institutional Repository.
- Most libraries of Bangladesh were headed by people with a wide range of educational background, from the professional, semiprofessional and non-professional groups, reflecting mixed grades and qualifications, ranging from Chief Librarian/Library Head/Librarian to Assistant Librarian.
- Digital libraries are highly resource intensive. They demand strong and powerful Information and Communication Technologies (ICT) infrastructure such as, high end and powerful servers; structured LAN with broadband Internet and Intranet facilities, high storage capabilities, digital devices, digital information resources, skilled IT staff, required number of workstations capable of delivering web-based and online information services, computing and multimedia applications, internet connectivity with sufficient bandwidth etc.
- The study reveals that most of the institutes prefer either DSpace or Greenstone software to develop an IR.
- Different library associations of Bangladesh, such as LAB, BALID have to come forward and should organize seminars, workshops, etc. to provide necessary trainings among librarians about current developments in Digital Library Systems.

Concluding Remarks

Digital libraries and Institutional Repositories have increasingly become a gateway to speedy access of electronic resources but digital library initiatives in Bangladesh are still at a nascent stage of development. A very limited number of libraries in Bangladesh have very limited electronic/digital resources. The success of a digital library is fully dependent on skilled and dedicated digital librarian who will ensure that the digital libraries are used effectively and with ease. Necessary professional education and training on technological knowledge and skills required for a digital librarian should be ensured for young library professionals of Bangladesh in order to keep pace themselves with modern technology-based library environment. The information revolution not only accelerates the technological horsepower that drives digital libraries, but fuels diversified demands for storing, organizing, and accessing online and digital information. Digital libraries will be the banks where it is invested where information is the currency of the knowledge economy.

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