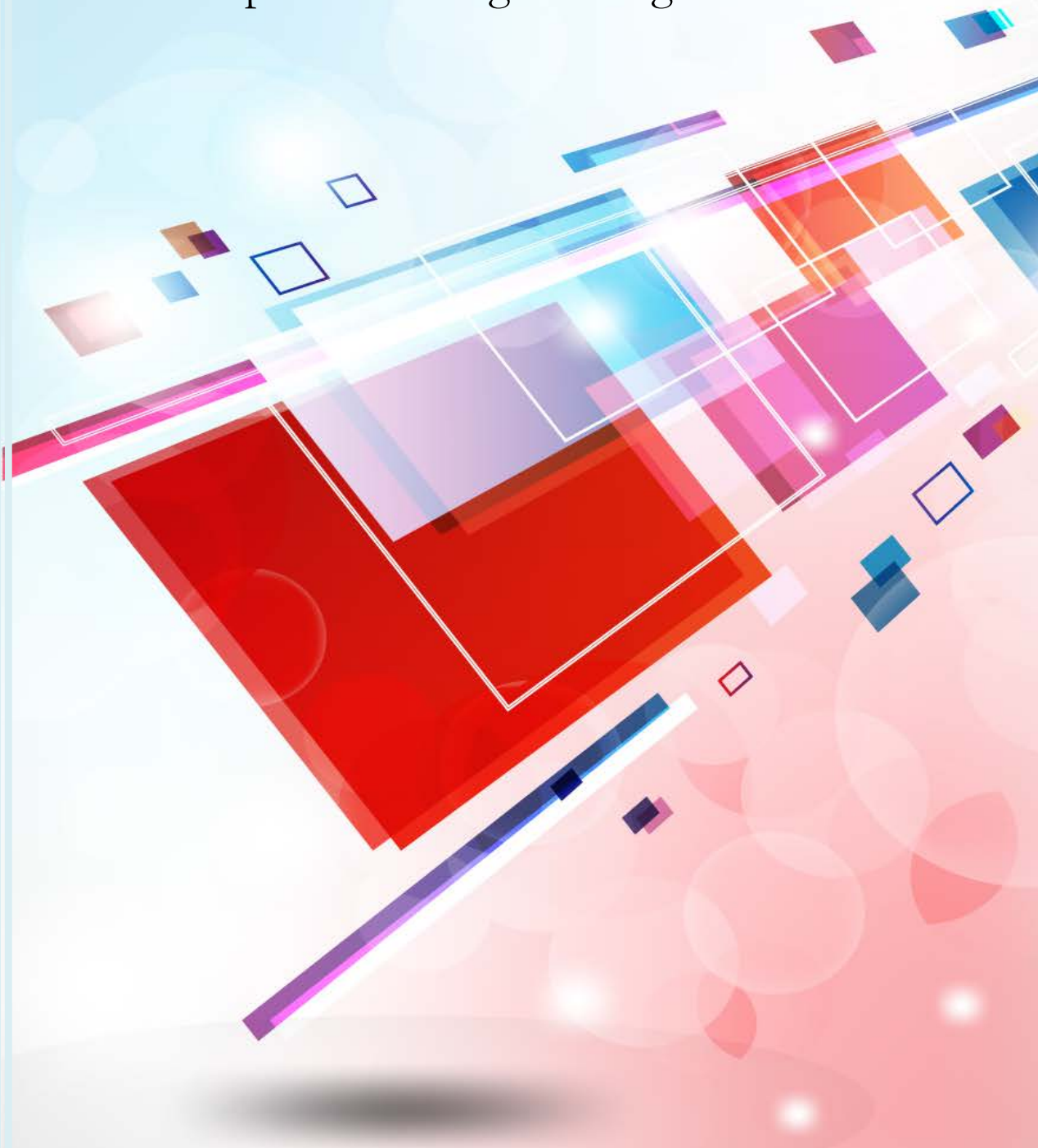
ISBN 978-984-33-9521-4

PROCEEDINGS

National Seminar
on
Cross-talk of Digital Resources Management
step towards Digital Bangladesh



22 August 2015

Organized by
Bangladesh Association of Librarians, Information Scientists and Documentalists (BALID)
www.balid.org

National Seminar
on
Cross-talk of Digital Resources Management
step towards Digital Bangladesh

22 August 2015

Venue
CIRDAP International Conference Centre (CICC)
Dhaka, Bangladesh

Organized by
Bangladesh Association of Librarians, Information Scientists and Documentalists (BALID)
House # 67/B (2nd floor), Road # 9/A, Dhanmondi, Dhaka-1209, Bangladesh.
www.balid.org

Published by
Bangladesh Association of Librarians, Information Scientists and Documentalists (BALID)
House # 67/B (2nd floor), Road # 9/A, Dhanmondi, Dhaka-1209, Bangladesh.
www.balid.org

Cover Design and E-book
A.K.M. Nurul Alam (Apu)

BALID Cataloging-in-Publication Data
Proceedings of National Seminar on Cross-talk of Digital Resources Management: Step towards Digital Bangladesh, Dhaka, Bangladesh, 22 August 2015

117p.; 29 cm.
ISBN 978-984-33-9521-4
ISSN
1. Digital Library 2. Information Science – Congress 3. Communication in Science – Congresses
4. Scientific literature – Congresses
025.042—dc23
ZA408.D85 2015—LC

Printed by BALID
House # 67/B (2nd floor), Road # 9/A
Dhanmondi, Dhaka-1209, Bangladesh.

SESSION CHAIRS

Professor Dr. M. Kaykobad
Dept. of Computer Science and Engineering, BUET

Mr. Ashish Kumar Sarker
Director General (Additional Secretary), Departent of Public Library

Professor Dr. Md. Nasiruddin
Chairman, Dept. of Information Science and Library Management, National University

Mr. Minhaj Uddin Ahmed
Director, Centre for Information Studies, Bangladesh (CIS,B)

Dr. Mirza Mohd Rezaul Islam
Chairman, BALID and BIIM

ORGANISATION AND COMMITTEES

A. K. M. Mofizur Rahman

A. K. M. Nurul Alam

ABM Mahfuzul Haque

Dr. Md. Mostafizur Rahman

Dr. Md. Nazim Uddin

Dr. Mirza Mohd Rezaul Islam

Dr. Usha Rani Boruah

Kazi Farhad Noman

Md. Ahasan Habib

Md. Alom Hossain

Md. Humayun Kabir

Md. Moniruzzaman

Md. Mukhlesur Rahman

Md. Shafiur Rahman

Momena Khatun

Muhammad Hossam Haider Chowdhury

Nomita Khan Mukti

Safinoor Shagorika

Sasanka Kumar Singha

Shamsuddin Ahmed

Syed Ali Akber

Zohurul Amin Kaium

BALID Executive Council 2014-15

Chairman	**Dr. Mirza Mohd Rezaul Islam** Librarian, Islamic University of Technology
Vice Chairman	**Mr. Syed Ali Akbar** Deputy Librarian, Dhaka University Library
	Ms. Shamsun Naher Khan Shapna Librarian, Ministry of Public Administration
	Ms. Nomita Khan Mukti Librarian, Press Institute of Bangladesh (PIB)
Secretary-General	**Mr. Sasanka Kumar Singha** Deputy Director, Bangladesh Bank Library
Joint Secretary General	**Mr. Md. Alom Hossain** Senior Librarian, Scholastica Limited
Finance Secretary	**Mr. Md. Humayun Kabir** Deputy Librarian, Independent University Library
Establishment Secretary	**Md. Ahasan Habib** Library Officer, Islamic University of Technology
Research and Development Secretary	**Mr. Mukhlesur Rahman** Assistant Librarian, Independent University Library
Publications and Public Relations Secretary	**Mr. A.K.M. Nurul Alam** Assistant Director, Bangladesh Bank Library
Member	**Mr. Faradul Islam Farid** Deputy News Editor, Independent Television
	Mr. Muhammad Hossam Haider Chowdhury Librarian, Independent University Library
	Mr. Md. Moniruzzaman Officer-in-Charge, United Nations Information Centre (UNIC) Dhaka
	Mr. Md. Abdul Hayee Sameni Head of the Library, Shahjalal University of Science and Technology
	Mr. Kazi Farhad Noman Assistant Librarian, Southeast University
	Mr. ABM Mahfuzul Haque Deputy Librarian, Prime University
	Mr. Atiar Rahman Business Editor, Ekushey Television

National Seminar
on
Cross-Talk of Digital Resources Management: step towards digital Bangladesh

Saturday, 22 August 2015

Organized by
Bangladesh Association of Librarians, Information Scientists and Documentalists (BALID) in collaboration with Center on Integrated Rural Development for Asia and the Pacific (CIRDAP).

Venue
CIRDAP International Conference Centre (CICC), 17 Topkhana Road, Dhaka 1000.

Program Schedule

08.00 - 09.00 **Registration**

09.01- 10.30 **Opening Ceremony and Keynote Session**

Welcome Address
Sasanka Kumar Singha, Secretary General, BALID

Keynote Paper
Digital resources management in libraries: Step towards digital Bangladesh
A. I. M. Jakaria Rahman, Md. Mostafizur Rahman, Muhammad Hossam Haider Chowdhury

Keynote Paper
Model community library O milon kendro (Summary)
Hazera Rahman

Address by Special Guests
Begum Akhtar Jahan
Member of Parliament & Member of Standing Committee on Ministry of Finance, Bangladesh National Parliament

Advocate Hosna Ara Lutfa Dalia
Member of Parliament & Member of Standing Committee on Post, Telecommunication and Information Technology, Bangladesh National Parliament

Address by Chief Guest
Mr. Imran Ahmad
Member of Parliament & Chairman of Standing Committee on Post, Telecommunication and Information Technology, Bangladesh National Parliament

Address by the Chairperson
Dr. Mirza Mohd. Rezaul Islam
Chairman, BALID and BIIM

Vote of thanks
Dr. Md. Nazim Uddin
Convener, BALID Seminar 2015

10.30 – 11:00 **Refreshments**

11:01 - 12:15 **1st Technical Session: Open Source Software in Libraries**

Session Chair: Prof. Dr. M. Kaykobad
Dept. of Computer Science and Engineering, BUET

Koha: An open source integrated library system
Dr. Md. Zahid Hossain Shoeb

DSpace: An open source repository software
Kazi Farhad Noman

GreenStone: An open source digital library software
Md. Ahasan Habib

Senayan Library Management System (SLiMS): An open source library management system
A.K.M. Nurul Alam

Presentation of **Elsevier**, a world-leading publisher of scientific, technical and medical information products and services.

12:16 – 13:15 **2nd Technical Session: Digitization in Libraries**

Session Chair: Mr. Ashish Kumar Sarker
Director General (Additional Secretary), Departent of Public Library

North South University Library Management System: Experiences of customization in library automation and digitization
Md. Mostafizur Rahman , Molla M. Shoeb, Rajiv Mahmud , Ishrat Jaha Chaudhury

Steps towards digital Bangladesh: Bangladesh Bank library perspectives
Md. Samsur Rahman, Sawad Bin Shahid, Tasnim Fatema

Model community library O milon kendro
Hazera Rahman

13:16 – 14:30 **Lunch and prayer break**

14:31 – 15:15 **3nd Technical Session: Use of ICTs in Libraries**

Session Chair: Prof. Dr. Md. Nasiruddin
Chairman, Dept. of Information Science and Library Management
National University

ICT use in the Library of Independent University, Bangladesh: Past, present and future plan
Muhammad Hossam Haider Chowdhury; Md. Zahid Hossain Shoeb
Md. Mukhlesur Rahman; Nur Ahammad

Automation of resource management in BUET central library: Procedure of implementation of integrated library management system
Shah Abdul Kabej and Md. Ahsan Habib

15:16 – 16:20 **4th Technical Session: Web-based services and Digitization**

Session Chair: Mr. Minhaj Uddin Ahmed
Director, Centre for Information Studies, Bangladesh (CIS,B)

Discovery to Delivery: Web-based library services of ICDDR,B
Dr. Md. Nazim Uddin, Md. Shafiur Rahman, M. Al Mamun, Md. Harun-Or-Rashid Khandaker

Libraries of Northern University Bangladesh: Progress in digitizing
Dr. Dilruba Mahbuba

Developing CIRDAP institutional repository for member countries
Dr. Usha Rani Boruah

16:21 – 17:20 **Plenary Session**

Session Chair: Dr. Mirza Mohd Rezaul Islam
Chairman, BALID and BIIM

Discussants

Mr. Shyama Prasad Bepari
Joint Secretary, Ministry of Education, Govt. of Bangladesh

Mr. David Hilton
OIC, CIRDAP

Prof. Dr. Abdus Sattar
Controller of Examinations, University of Information Technology & Sciences (UITS)

17:21 – 18:00 **Closing Ceremony and Refreshment**

Contents

Keynote paper

Digital Resources Management in Libraries: Step towards digital Bangladesh

A. I. M. Jakaria Rahman[1], Md. Mostafizur Rahman[2], Muhammad Hossam Haider Chowdhury[3]

[1]*jakaria.rahman@uantwerpen.be; jakaria@gmail.com*
Center for R&D Monitoring (ECOOM), Faculty of Social Sciences
University of Antwerp (Belgium)

[2]*mostafizur.rahman@northsouth.edu*
University Librarian, and Head, AIF Management Unit
North South University (Bangladesh)

[3]*mhhc@iub.edu.bd*
Librarian
Independent University, Bangladesh (Bangladesh)

Abstract: The purpose of this paper is to investigate the existing digital resource management systems and practices in Bangladeshi libraries. This paper followed a mixed research approach and collected primary data by questionnaire method. It explored the library professionals' conception about digital library and institutional repository that best fit in Bangladesh context and their practices. The findings indicate that there is an enormous development in library digitization initiatives in the last decade. The libraries are facing challenges like capacity building, declining budgets, insufficient facilities, and traditional functions knocked by modern technologies. Despite many obstacles, the library professionals are leading from the front in digitization projects and implementing digital resource management systems. This paper also discusses some issues, for instance, digital library, institutional repository, open source software, metadata, vocabulary, open access vs close access, copyright issues, user's needs, user interface, virtual reference, organizational policy, barriers, etc., and suggested a set of practical guidelines and proposed collaborative digitization initiatives.

Keyword: Digital resource management system, Digital library, Institutional Repository, Metadata, Open Access, Federated search, Virtual reference, Vocabulary, Bangladesh.

1. Introduction

Libraries in Bangladesh are at the crossroads of digitization system. Some libraries have already stepped into the new era of library, the digital resource management (DRM), while the majority of the libraries continue to practice traditional librarianship. There is increased demand for access to digital materials, preservation, and conversion of print materials into electronic format for longer life, and ensuring multiple users access to limited resources. Researchers recognize that library education in Bangladesh emphasize on the traditional librarianship (Rahman, Khatun, & Mezbah-ul-Islam, 2008; Ameen, 2014) as the majority of the libraries require this. This is mostly due to resource constraints. Most libraries cannot even afford computers to begin their transition towards DRM systems. Only a handful organizations can afford dedicated IT experts as a library team member (Rahman, 2010). Despite these limitations, the few professionals who are working on the development of the DRM systems are either self-motivated and self-trained, or received on-job training, or attended the trainings organized by Bangladesh Association of Librarians, Information Scientists and Documentalists (BALID) including other organizations. While some libraries are in the race to embrace the challenge of digitization and have gained experience, the majority are yet to catch up with the knowledge. The latter is uncertain about how to roll the stone, such as which systems and tools to use for managing digital resources effectively, what are the standards and best practices, what kind of challenges are waiting for them, and how and where to find solutions to win those challenges. Moreover, there is some misapprehension about the terminologies and practical application of preservation and access to materials with respect to copyright and intellectual property right. In this paper, we have focused on some of these issues useful for the libraries practicing DRM system as well as those who are about to step in the world of digitization.

2. Methodology

We followed a mixed method approach (Matthews & Ross, 2010; Creswell, 2013) that required both qualitative and quantitative data. For this paper, we designed two online questionnaires (see Annexure): the first one gathered data on the libraries that initiated or implemented DRM systems, as well as the libraries, which are in planning stage. It included both *close-ended* and open-ended questions. We email this questionnaire to the library heads. The second questionnaire gathered library professionals' views on DRM system and future directions through open-ended questions. We emailed this questionnaire to two e-mail groups of library professionals, namely 'BALID-BD' and 'LISBD'. We also made this available in the Facebook group of 'Library professionals of Bangladesh' (around 670 members). In addition, we explored different library websites to check the content of the DRM system and directory of open access repositories. We interpreted the findings from the comparison of the discoveries as those emerged from the collected data as well as literature reviews.

3. Status of Digital Resources Management

3.1 Early initiatives

In Bangladesh, the first bibliographic database was initiated by the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) library, and the Agricultural Information Centre (AIC) of Bangladesh Agriculture Research Council (BARC) with microcomputer in 1987 (Khan, 1989; Foote, 1993). The ICDDR,B library started with 'In Magic' software and later shifted to CDS/ISIS (Computerized Documentation System/Integrated Set of Information Systems) database software in 1989 (Chowdhury and Khan, 2012). AIC used to provide services through the Food and Agricultural Organization's (FAO) CD-ROM databases – AGRIS (Agriculture Research Information Service) and CARIS (Current Agriculture Research Information Service) - a global database providing agriculture related bibliographic information (Foote, 1993). 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 (Chowdhury and Khan, 2012; Eeckels, 1997). Bangladesh National Scientific and Technical Documentation Centre (BANSDOC) library started to provide CD-ROM database abstract service on Biological Abstract, Physics Abstracts and Current Contents on life sciences in 1997 (BANSDOC, 1998). Similarly, North South University (NSU) library also offered CD-ROM database services on Economic Literature (EconLit), AHEAD, and Global Development Finance databases in 1998 (NSU, 2015).

In 1998, BANSDOC launched the Bangladesh National Scientific and Library Information Network (BANSLINK), the first online library network to connect 15 libraries (6 out of Dhaka and 9 in Dhaka) via dial-up connections under the project entitled automation and networking of science and technology libraries in Bangladesh (BANSDOC, 1998; Chandel & Begum, 1998). This initiative, however, failed to survive due to non-cooperation from the parent organization of the member libraries of the network (Uddin & Chowdhury, 2006). In the same year, University of Dhaka launched automated library system with GLAS (Graphical Library Automation System) software (Munshi, 2003), but the software lost its functionality in 2000 (Chowdhury & Khan, 2012). Since 1993, Internet has been available in the government sectors followed by the private sectors in three years (Azam, 2007). ICDDR,B library, NSU library and Independent University Bangladesh (IUB) library pioneered in providing internet connection in the libraries in Bangladesh. BANSDOC library was the first public sector institution to provide internet services to its users since 1999 (BANSDOC, 2000), followed by Press Institute of Bangladesh (PIB) Cyber Centre in 2000.

In 2002, the National Archives of Bangladesh initiated to digitize district records covering the years 1760-1900, but the project was dropped in the midway (Shuva, 2012). In the same year, NSU library and BRAC University (BRACU) library subscribed to online journal databases followed by IUB library in 2003. In early 2003, NSU library launched a full-text digital repository with customized software named NSU-Library Management System (Rahman, 2015). In Bangladesh, the use of Free and Open Source software (FOSS) started in 2005 as ICDDR,B library launched institutional repository with DSpace software. In 2006, the Bangladesh INASP-PERi (International Network for the Availability of Scientific Publications - Programme for the Enhancement of Research Information) Consortium (BIPC) was formed to access electronic journal databases (Uddin, 2009; Tariq, 2010; Islam, 2013). This consortium officially launched in January 2007 with 13 organizations and subscribed 12 databases. Later in 2008, BRAC university library started to manage their digital resources with DSpace software and launched Integrated Library System (ILS) using Koha (Open Source) software in 2010 (Afroz, 2014).

3.2 Current initiatives

Since 2011 until mid-2015, a good number of libraries in Bangladesh have implemented DRM system. These include Asian University for Women, Bangladesh Agricultural Research Institute (BARI), Bangladesh Agricultural University (BAU), Bangabandhu Sheikh Mujib Medical University (BSMMU), Bangladesh Bank, Bangladesh Bureau of Educational Information & Statistics (BANBEIS), Bangladesh National Museum, Bank and Financial Institution Division (BFID) of Ministry of Finance, Chittagong Veterinary and Animal Sciences University (CVASU), Daffodil International University (DIU), East West University (EWU), Eastern University (EU), Independent University Bangladesh (IUB), Islamic University of Technology (IUT), National Institute of Nuclear Medicine and Allied Sciences (NINMAS), National library of Bangladesh, Shahjalal University of Science & Technology (SUST), Sufia Kamal National Public library, and University of Dhaka (DU).

Further, Bangladesh Secretariat Central Library, Bangladesh University of Engineering and Technology (BUET), Center on Integrated Rural Development for Asia and the Pacific (CIRDAP), Khulna University of Engineering & Technology (KUET), Sher-e-Bangla Agricultural University (SBAU), Society for Environment and Human Development (SHED), South East University (SEU), Stamford University Bangladesh (SUB), University of Rajshahi (RU) library have already taken initiatives to introduce DRM system.

The two-third of the above mentioned libraries preferred DSpace and the rest used GreenStone followed by SLiMs, customized software and commercial software. However, some of the libraries that have implemented DRM system were found inactive. Surprisingly, some libraries initiated a DRM system without having an ILS, while some libraries are planning for implementation of ILS and DRM system together. University Grants Commission (UGC) of Bangladesh has set up an e-resources consortium called the UGC Digital Library (UDL) as a sub-component of Higher Education Quality Enhancement Project (HEQEP) in 2012 (Ahmed, 2014). Currently, 41 universities have joined the consortium (UGC, 2015). The UDL provides access to subscribed e-journal databases only. The UDL is practically a gateway, not a Digital library.

It is mentionable that BANSLINK launched just after two years of availability of the internet for general people in Bangladesh. It signaled that libraries could make better uses of computers rather than as office equipment only. Three decades have passed since the initiation of computerization in Bangladeshi libraries. The computer technology has been changing rapidly and it took time to train library professionals as tech-expert. In addition, costs of commercial software were another noticeable obstacle to the progress of digitization in Bangladesh. Yet, considering the first digitization initiative in 2003, and introduction of open source software in 2005, engagement of 31 libraries in the digitization process demonstrates much potential. In Bangladesh, e-journal databases first appeared in 2002. Currently, 47 libraries are subscribing 37 databases (including 13 free of cost databases) through BIPC and providing access to the users. It is evident that libraries welcome e-journal databases immediately after its availability in Bangladesh. Moreover, libraries took the advantages of open source software for digitization within two years of its appearance (public version of DSpace released in November 2002). The library professionals played the key role for these accomplishments. It is an enormous achievement in the last decade, while computerization and digitization got momentum in Bangladeshi libraries. A report from the British Council (2015a) indicates that public library usage is increasing rapidly in Bangladesh despite insufficient reading resources. These surely register advancement of the library sector in Bangladesh.

4. Concept of Digital Library and Institutional Repository

4.1 Digital library

What is a library? The answer is likely to vary based on whom we ask the question and the type of the library where the respondents work. To get a comprehensive perspective of the library professionals on the conception of the library, we should begin with more specific questions about the type of library (national, public, academic, special or private), so that we might avoid the misperceptions. Similarly, the concept of digital library (DL) has many interpretations and diverse definitions that need to be treated with proper care. It is often argued that the internet is a huge DL, which is wrong. The Internet is a collection of crowds of documents and has nothing about selection of materials (Cleveland, 1998). Even the Library of Congress admits that it does not collect everything and nor it would want - selection of materials. Similarly, it is tempting to use the term DL for any collection of digital object that have some means of navigation and retrieval (MacColl, Jones, & Andrew, 2006).

In 1990, the term 'Digital library' appeared for the first time in literature (Bawden & Rowlands, 1999). However, before and after the first appearance, phrases like 'virtual library', 'electronic library' (Battin, 1984; Buckland, 1992), 'library without walls' (Fayen, 1986; Chartier, 1993), 'hybrid libraries (Rusbridge, 1998; Oppenheim & Smithson, 1999; Pinfield et al., 1998) have been used interchangeably to define the concept of digital library (Rahman, Francese, Yilmaz, & Beyene, 2011). In literature, DL provides access to selected digital objects that contain organized information and knowledge, and information sources are seamlessly integrated (Yerkey & Jorgensen, 1996), including data and metadata, provide access and retrieval to a community of users with coherent access from anywhere of the world (Borgman, 1999, Arms, 2000; Shiri, 2003; Rahman, 2007; Witten, Bainbridge, & Nichols, 2009; Chowdhury, 2010). It also offer integrated environments with collections, information services, and preserving knowledge and effectively support learning (Chen & Lin, 2014), including full-text indexing, ranking, searching for information retrieval that is quite different from traditional libraries (de Smet, 2014).

There are around 64 formal and informal definitions of DL (Schwartz, 2000). A large amount of literature contains discussion on how to define DLs (Calhoun, 2014). These literatures produce many wordy definitions of the phrases DL or DLs. Some definitions focus more on technical issues than the wider social context of DLs (Lagoze, 2010). Some definitions describe the DL as a collection of documents in organized electronic form and available on CD-ROM. If we considered these pointless definitions, a CD/DVD-ROM with a couple of movies has to be considered as a DL. However, a DL is not equivalent to a digitized collection with information management tools (Sun & Yuan, 2012). The definition of DL has changed over the time due to the change of technological development. The computer professionals viewed it as a distributed space of the interlinked information system; library professionals indicated it as a system with new kinds of information resources for operating the library functions; users identified it as a computerization of traditional libraries, while the IFLA/UNESCO manifesto (IFLA, 2010) on DLs stressed on bridging the 'digital divide' (Calhoun, 2014). It seems different professionals have tried to define DL from their own perspectives.

We have received a considerable number of feedbacks on the perception of DL from the library professionals. Some of these are as follows: "DL is a library collection that is digitally available…", "…is a collection of documents in organized electronic form, available on the Internet …", "… means all collections are digitalized and accessible from anywhere in the world.", "… is a collection of electronic documents which is accessible through Internet …", "A system with comprehensive collection, manage and preserve digital contents and offer access". Some professionals mentioned the definitions stated in the IFLA/UNESCO manifesto for digital libraries. Based on our findings, we recognize that while the library professionals define DL from their own perspective, some echo the same as the literature indicated, whearas, a few of them widening the scope of the DL beyond its purpose.

In Bangladesh, we cannot simply adopt a definition articulated in another context, as the user needs and library cultures in Bangladesh are different from those in other countries. In our study, the library professionals mentioned about preservation and access to the library materials. We recognize that they considered preservation as a rule of thumb for every library, especially for archival materials, whereas access is dependent on the user community. For example, the objective of a National Archive digitization follows a more restrictive users' access while public library allows the entire nations, and university/research organization permits only the well-defined user community. Further, DL should allow digitized contents (Born digital and converted from physical medium) and provide access to external resources (subscribed, under agreement, exchange). In general, our respondents mention that DLs should have the same purposes, functions, and goals as traditional libraries with selected and organized library object in electronic format and the contents accessible to a define community or set of communities. They also emphasized on some vital issues including subject analysis, index creation, reference work, preservation, and full-text. We should be aware that DL is too young to define in any permanent ways (Seadle &Greifeneder, 2013). Therefore, it will be better to define respective DRM system according to the functionality and services, and this should not involve fabricated information.

4.2 Institutional repository

In the term Institutional Repository (IR), 'institution' refers to the library's parent organization. The rise of the IR is an innovative form of scholarly communication within the digital environment (Crow, 2002). For scholarly communication, there are two roads to Open Access (OA): golden and green; the former allows publishing in OA journals while the latter permits self-archiving in addition to publishing in a non-OA journal (Harnad et al., 2008). Further, the self-archiving focus of the library and academic community are concerned about the library budget management due to skyrocketing prices of journal databases. In addition, researches that have been funded by public money should have free access to the public (Uddin, Koehlmoos, & Hossain, 2014). Hence,

the term IR becomes popular mostly among the academic and research libraries in the management and dissemination of scholarly materials created by the institution and its community members (Lynch, 2003; McDowell, 2007). IR ensures organizational benefits of the research works they support and fund; and make the research outputs available to the wider community. Moreover, it helps to get rid of the publisher's policy - 'produce, publish, and buy it back'. The use of IR is spreading into other types of organizations too, even discipline based, for example, 'E-LIS' for Library and information science, 'ArXiv' for Physics, 'CiteSeer' for Computer and information science, etc.

The respondents in this study expressed definition of IR as: "IR preserves institutional own publications that can easily accessible through a software", "… for preserving all intellectual publications by particular organizations as open access for sharing knowledge in the community..", "…online archive for collecting, preserving, and disseminating digital copies of the intellectual output of an institution and offers to user communities according to institutional policies…". Some definitions are too narrow based on specific type of organizations, e.g. ministry library, health library, university and research organization's libraries etc., while some others suggested to include journal articles as an IR contents. Some of the professionals mostly echo the definition stated by Johnson (2002) "IRs are a practical, cost-effective, and strategic means for institutions to build partnerships with their faculty to advance scholarly communication". We argue that depends on collection policy and technical ability (Shoeb, 2010; Chen & Zhang, 2014), an IR usually preserves peer review materials, journal articles - preprint and postprint, working papers, books, book chapters and sections, conference and workshop papers, datasets, learning objects, audio-visual materials, software, patents (Rahman & Mezbah-ul-Islam, 2014) including non-peer reviewed materials (Rahman & Bayramova, 2011) of the host organization. Further, open access IRs increase the visibility of the institution's scientific productions (Ezema, 2011).

We observed that none of the IR in Bangladesh is using Altmetics (alternative metrics based on online activity). Altmetrics helps the organizations to show the impact of their research, contextualize the readership of an author's research output to both internal and external stakeholders, and provide a measure for scholarly works available in the Open access IR (Konkiel & Scherer, 2013; Rehemtula, Rosa, Leitão, & Avilés, 2014). The 2014 edition of the ranking web of repositories included Altmertics as an indicator. We suggest that Bangladeshi library professionals have to be familiarized with the tools of Altmetrics as it is here to stay.

There is an open question, Can an IR be considered as a DL? Apparently, an IR and DL are two different entities. We argue that the digitization process and technical requirements to create an IR is same as a DL, and both contain full-text, not just metadata (Schöpfel, 2013). However, the resource selection, collection, preservation, and accessibility policy differ in both the cases. For example, an IR makes the intellectual output of an organization or multiple organizations or just one department or discipline freely available to the world, but in the DL, the copyright and license protected materials cannot have public access. Therefore, IR and DL differ based on the policy- which materials belong to the organizations and which are for a set of the user community. Nevertheless, the technical requirements for both are same, and DL can be regarded as an extended IR system (Fox & Sornil, 1999).

5. Technical Aspects

5.1 Software selection

The survey result indicates that in Bangladesh, the libraries are developing DRM systems with open source software and a few of them are using customized (developed by them) or commercial software, while the rest is uncertain choosing the software. The majority of the libraries has conducted a library users' needs assessment, and organizational needs assessment before starting DRM system. A few of the libraries provided training to the library personnel, recruit expert library personnel or hire external expertise, for the same purpose. We found that during DRM system software selection, the libraries have given priority to library personnel's expertise, external professional expertise, and compatibility with existing software, while ignoring feasibility study and SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis.

Which software is the best for a DRM system? - We have received this question during the survey. Our simple answer is 'none'. For example, when we like to have food, we have four options: visit a restaurant and choose from the menu based on our taste (compare and choose from the available software), or look around and see what others are eating and order the same (follow what other libraries are doing and chose the suitable one), Or visit a restaurant that served the food that we like most (select the software that covers the purpose of the library), or cook at home (build your own software). Nevertheless, in all the cases, we need to consider the

purchasing power of our wallet (library budget). We argue that none of the approach is better than others. We suggest that whatever approach the libraries choose for software selection, it should begin with a feasibility study including SWOT analysis followed by detail technical and operational plan.

In the last decade, libraries introduced open source software in Bangladesh. In the beginning, it was assumed that DRM system would flourish with open source software, as the commercial software cost almost one year library budget, and even a couple of year's budget for some libraries. Moreover, there are some commercial initiatives for building DRM systems with open source software. The profit-making mentality of these organizations keeps the open source software installation cost equivalent to the commercial software. The receiver library is bound to choose the software in which the commercial organizations have expertise. There is no scope to think about the usability and adaptability with the software as the receiver libraries have very little or no expertise in the provided software. Further, these commercial organizations deliberately overlooked the comparative study of software and need analysis of the organization. They intentionally show the features and technical aspects of software about which the receiver library professionals have big doubt. These commercial organizations avoid feasibility study and SWOT analysis purposefully, too. It is like serving fish to eat rather than teaching how to catch fish. These commercially minded entities are an obstacle in choosing required software that best suit to the receiver library needs and development of tech-expert library professionals also.

One library reported that the “software itself is a problem” and another expressed, “it becomes slow day by day”, and both the libraries are using GreenStone. DSpace uses a relational database system, while GreenStone uses the file-system. The latter one stores the original document in the import folder, archive folder and index folder. Therefore, a single object occupies three times storage area than the other software, and provides proportionally slower services while the amount of digital object increase (de Smet, 2014). In addition, GreenStone does not support any persistent identification scheme, while handle.net for DSpace, URI (Uniform Resource Identifier) for EPrints and Fedora are there (Madalli, Barve, & Amin, 2012). Further, applying ‘Embedded Metadata Plugin’ into all the objects slow down largely the time needed for adding single document, even in the minimal rebuild option in GreenStone. The developers themselves know that attention has to be given to performance in larger collections (de Smet, 2014). Libraries need huge time, workforce, and monetary investment to build a DRM system. Thus, libraries should be aware that once a DRM system is set up, changing its structure takes almost the same effort to establish a new one. If the selection of the software is not done with caution, the system will be just an ‘elephant graveyard’ in the long run. Therefore, a trustworthy evaluation should be done before software selection instead of blindly following what others are doing.

5.2 Metadata requirements for DRM system

What is metadata? The 150-year old term ‘cataloguing’ or bibliographic information gets a new identity as ‘metadata creation’ in the digital age. In a sense, metadata is the life of the documents, and obligatory part of any DRM system (Rahman et al., 2011). The survey result indicates that some of the libraries are using two different metadata schemas, one for ILS and another for DRM. We found that most libraries selected metadata for ILS either based on the default setup of the software, or developed without following any International schema. On the other hand, for DRM system some libraries chose metadata schema based on the default setup of the software, while some others considered the expertise of existing and/or recruited library personnel, and a few of them focused on external expertise. There is no sign of a feasibility study or SWOT analysis for metadata schema selection. We also found that all the available DRM systems create descriptive metadata (for example, title, subject, etc.), followed by administrative metadata (access privileges, rights, ownership of material). Only a few of them considered technical metadata (information describing the production process or digital attributes of the work) too, while structural metadata (for purposes of linking different parts or units of data) is largely ignored. Adequate metadata guarantees future access to a digital object. Otherwise, the object will be non-retrievable. This will cause information loss and expensive consequence for the society (Rahman et al., 2011).

There is no ‘one-size-fits-all’ metadata schema that can satisfy different library materials and users communities (Baca, 2003). No international metadata schema can guarantee the need of the local materials (for example, manuscripts, history, culture, etc.) or meet the specific objective of the digitization project. Therefore, it is often necessary to modify the schema to best fit the library needs (Rahman et al., 2011). The libraries should first determine functions that metadata needs to serve, as there are two main criteria for metadata selection: i) the types of materials to be digitized; and ii) the purpose of the project (Beall, 2007; Lopatin, 2010).

Qualified Dublin Core is widely used in DRM system, as it is specified by the OAI-PMH (Open Archives Initiative - Protocol for Metadata Harvesting) as a ‘lowest common denominator’ format well suited to support harvesting into a commonly structured repository, and therefore, supports discovery interoperability (Jones,

2006). Some misunderstanding has been observed as some libraries indicate about using simple Dublin Core, while they are actually using qualified Dublin Core. For example, 'Date' is one of the 15 basic Dublin Core metadata elements. The 'Date' is then further specified to identify it as a particular kind of date, for example, 'dc.date.created', 'dc.date.valid', 'dc.date.available', 'dc.date.issued', 'dc.date.modified' etc. The libraries have to know what metadata schema they are actually following to maintain the standard metadata practice.

The survey indicates that a good number of libraries in Bangladesh are using MARC 21 for DRM system. However, MARC originally designed to read linearly from tape and support flat file format and thus is limited in its granularity. It also unnecessarily stretches too wide to accommodate certain other genres of information objects (Alemu, 2014). In the digital era, MARC 21 fails to represent relationship and hierarchies (Niu, 2013). Relationships help users to find and identify what they are looking for, and make them aware of other available resources that may be useful, which is the one of the main objectives of DRM systems. Because of these limitations, the libraries in the developed world are already practicing alternative of MARC 21. For example, the Dublin Core metadata standard is mostly used for describing digital materials, which is not limited by size as MARC 21, and allows repetition of the fields for certain elements, whereas, MARC 21 subfields obstruct the need for repetition (Reese & Banerjee, 2008). Library of Congress provides necessary instructions for crosswalk between core MARC 21 bibliographic data elements and elements in the Dublin Core element set in their website. Crosswalks is the most common method used to enable interoperability among metadata schema (Chan & Zeng, 2006a, 2006b; Neiswender & Montgomery, 2009). We argue that the libraries stuck with MARC 21 and/or other non-standard metadata schema should find their way towards metadata schema supporting digital materials, as well as the libraries that are in the early stage of DRM system building.

5.3 Resource description and Vocabulary

We found the libraries using AACR2 (Anglo-American Cataloguing Rules, 2nd edition) even in the digital environment irrespective of metadata schema. In general, MARC goes with AACR2 for traditional library catalogue. However, RDA (Resource Descriptor and Access) has been developed as a replacement for AACR2 to use in the digital environment and remove the Anglo-American prejudice (McCutcheon, 2012). RDA is a content standard, not a display standard, and has clear line of distinction between recording of data and presentation of data that better suited to a digital environment (Chapman, 2010). Moreover, RDA is based on the IFLA metadata models Functional Requirements for Bibliographic Records (FRBR) and Functional Requirements for Authority Data (FRAD), and uses the language and terminology of FRBR and FRAD (IFLA, 1998; Patton, 2009; Dunsire & Willer, 2011). The FRBR model consists of entities, relationships, and attributes used to describe resources for how to display bibliographic data for access and retrieval by the user, while FRAD defines entities such as name, identifier, rules, agency, controlled access point, attributes (descriptions) and relationships (Tillett, 2007). Relationships help users to find and identify what they are looking for, and make them aware of other available resources that may be useful. For example, author, illustrator, producer, composer, conductor, translator, and others may be used with names to show the relationship of the person to the resource, whereas adaptation of, translation of, paraphrases of, based on, remake of, etc. may be used to show the relationship of one resource to another resource.

We should be aware that currently, Metadata standards for DRM system have been expressed using XML (Extensible Markup Language), which is easy to store, read, update, and share. New technologies are expanding the way of data storage with and about digital object, using the Resource Description Framework (RDF) to construct relationships, descriptions, and digital objects that are more semantically connected to the web (Pan, 2009). RDF has become a W3C (World Wide Web Consortium) standard for encoding knowledge in the semantic web (Soundararajan, Meenachi, & Baba, 2010). When selecting vocabularies, the aspect of semantic information should be given emphasis (Neiswender & Montgomery, 2009). The standard and internationally accepted vocabularies should be considered as a point of reference for indexing subject information. Moreover, Linked Data (expressed in SKOS, Simple Knowledge Organization System) provides benefits for libraries. The library resources index are automatically linked if the thesauri are linked (Caracciolo et al., 2011). New standards are replacing the olds, and keeping pace for digital collection building. Therefore, the libraries at their early stage of DRM system should follow the new resource description framework rather than old one, and the libraries that have already implemented DRM system should find their own way to adapt the new standards.

5.4 Digital objects building

We found that libraries are preserving both born digital and digitized materials including, book, book chapters, thesis, journal published by the organizations, organizational newsletters, manuscripts, images, newspaper articles, preprint and postprint of articles, annual report, organizational magazine, old question papers, protocols,

scientific reports, bibliographies, abstracts, letters, conference proceedings, monographs, audio-visual materials, reports and some other materials without research value. The libraries give priority to born digital materials than digitally converted objects, and their main concern is to journals, e-books, and thesis databases. The university libraries emphasize on digitizing thesis, reports, and newspaper articles. In all these cases, there is an attitude to provide access to the resources freely (no direct cost) available in the internet and linked those to the either ILS, or library website or in the DRM system. The majority of the libraries has less materials to digitize, whereas, Old public universities, National library, National Archives, National Museum, and Public library preserve a huge collection of archival materials, historical documents, cultural documents, 100 or more years old books, pamphlets, manuscripts that are in the urgent need of digitization.

Currently, a few libraries subscribe e-books databases. However, some of these libraries often miss to distinguish between an e-book and a book as a single PDF file. A book can be digitized in PDF, but an e-book includes some functional utilities such as search and cross reference functions, hypertext links, bookmarks, annotations, highlights, multimedia objects, interactive tools (Vassiliou & Rowley, 2008; Velagić, 2014; Maceviciute, Borg, Kuzminiene, & Konrad, 2014). E-books are made accessible with the help of appropriate devices (D'Ambra, Wilson, & Akter, 2013) including PCs, PDAs, blackberry, pocket PCs, tablets, mobile phones, iPods, etc. Each format has its own features and specific reader software is needed to enable the e-book to be read or viewed on a device. A major advantage of DRM is that multiple users can access the same e-book simultaneously round the clock. Sometime, copyrighted materials (e.g., e-books) have a license for 'lending out' only one copy at a time. Digital right management system ensures the access of a resource for a specific period (equivalent to returning the resource in a traditional library) to a user (Zhang, Zhang, & Zhao, 2014). The Digital right management system is not implemented by any DRM system in Bangladesh until now.

5.5 Collection builds up, Access right, and copyright issues

The survey indicates that half of the libraries digitize objects by themselves (in-house), while one-fourth of the libraries using both the in-house and outsourced to vendors approach, and only a few of them fully depend on vendors. However, it is surprising that the majority of them has not sought permission from the creator/s of the material before digitization, while only a few have mentioned that they follow the proper procedure to obtain creator/s permission. Furthermore, some IRs are not conscious about the preservation and access to preprint and postprint version of journal articles. Some journals have an embargo on hosting preprint and postprint, but the libraries are not aware about those, and thus run the risk of violating copyright act. In addition, libraries sometimes download open access materials from the Internet and add to own collections, which is a total violation of intellectual property act and the copyright act, too. The libraries are acquiring Simple text/Microsoft Office formats/Open Office formats, Encoded text (blogs, websites, PDF documents), Photography or other still images (JPEG, TIF, PNG, GIF, etc.), and acquiring Licensed e-books (XML format), Non-licensed e-books (XML format), Digital video (mpeg, 3gp, mp4, flv, etc.). None of the libraries focused on preservation of 'Research data' and 'Geospatial data', while Borgman et al., (2015) argued that DLs was planned with documents as a content, but it has expanded its area for multi-media contents and research data.

There are some misconception between access right and collections building. Libraries pursue to collect, preserve, and provide access to materials in print and other physical and electronic formats to support the users' community. Libraries have to acquire library materials and add them to a permanent collection to build a collection. While for access right, libraries need to subscribe or make an agreement with the host organization for exchange and share, and obviously should not claim as a collection rather than subscribed materials. We found some libraries not being aware about the visible difference between access right and collection build up. For example, one university claimed 44,000 E-book as their library resource (British Council, 2015b), which is a fabricated information. In Bangladesh, no library has the capacity to hold such amount of e-books until now. The libraries must not claim an object as a library resource while they either subscribe or have only free access (no direct costs to acquire, access, read, copy, or use). Moreover, a library must not count free access to any database (e.g., e-books by Gutenberg project) as its own resource.

5.6 Federated search and user interface

The survey indicates that half of the libraries prefer to provide open access, but some of the materials are only for registered users, while some libraries are strict to make the resources available only through the Intranet. Some of the libraries maintained separate web page for subscribed online databases, and provide access through the IP login or remote access management system, e.g. MyAthens, EZproxy while some libraries provide access to subscribed journal and e-book databases through the DRM system. The survey also indicates that the libraries have OPAC, dedicated webpage with a list of subscribed e-resources, Institutional repository, and even full text

collections. Some of the libraries have an access interface based on collection, for example, thesis paper, internship report, e-book collection, etc. From the library point of view, we cannot expect that users have to know the location of required information in a specific subset (physical library catalogue, IR, Journal Database) of collection, and search there. Some libraries have apparently combined, but use separate tabs for each subset of the collection, while some keep the search interface in a scattered way. Each of the access point has its own approach, and a user loses the point of start to find the right information and is likely to give up before knowing the right resources, though the library have more relevant resources for the user.

A user cannot read what a user cannot find (Rahman, 2012). If users cannot locate desired items by search, they have to spend an enormous amount of time to search for related items, and certainly miss many items because of the ineffective and inefficient search facility. We argue that users do not judge the library service with its huge amount of collection or access policy rather how the library can satisfy their specific information need. Users usually search for information not for collections, and rarely know in which collection s/he might get the desired information. Sometimes, libraries put much attention to information-centered approach rather than a user-centered approach, and overlook the characteristics, needs, and approaches of the users. A user centric system should not be designed by ignoring the users' perceptions (Rahman, 2012). It is a total failure of the entire system if federated search (federated information retrieval or distributed information retrieval) is absent. Any library with multiple searchable databases can apply federated search techniques, where queries likely to return relevant answers by searching a subset of collections and merged into a single file (Shokouhi & Si, 2011). It is important for the libraries to learn more about non-users in order to make a DRM system attractive to all potential users (Monopoli, Nicholas, Georgiou, & Korfiati, 2002). Otherwise, a huge number of potential users may not use them.

5.7 Virtual reference service

Librarians have been providing reference services since the early 1900 (Stabler, 1993). A DRM system allows users for remote access to the library collections, but it does not minimize the consultation of library professionals, reference services, consultation with subject librarian, and a place to meet with peers and the research community, too. A DRM system is not only a collection of documents in well-organized electronic form (Borgman, 1999; Chowdhury & Chowdhury, 2002), but also a platform for users' communication, e-learning and e-research (Lankes, 2011). Today's libraries are developed to meet the user needs to remain effective, and initiate the reference services via email, chat, web-based inquiry services, social networking tools, etc. These efforts expanded the traditional core reference function of the library from the reference desk to the desktop. Users prefer virtual reference services as it is quick, convenient, reliable, require less time for interactions and efficient (Connaway & Radford, 2011), and feel more comfortable since it is an anonymous environment (Mu, Dimitroff, Jordan, & Burclaff, 2011; Yilmaz, 2012). If a DRM system is a simple place to get publications and stuff of others, and not a place to create and to gain access to the rest of the community, the value of the DRM system is nothing but a virtual entity (Lankes, 2012).

We found a big gap in virtual reference service. The majority of the libraries while expecting the user to have remote access to the materials, ignoring the users' need such as virtual reference service, consultation with subject librarian, or ask a library professional for clarification about a topic. Some of the libraries consider their email, Facebook, Twitter as a virtual reference tool. We argue that these tools can be considered as a means of communication with users as long as it is clearly mentioned in their web appearance. Two universities have claimed of implementation of virtual reference services, and stated a specific hour during the day for the service, but they are actually not providing any service. We have observed the services continuously for four weeks and found both of them inactive. Libraries should provide virtual reference service having library professionals online for the entire opening hours.

5.8. Digitization Policy and Procedure

The survey indicates that none of the libraries have well documented in the DRM system. A DRM system should have a well-written policy and procedure for the respective organizations. It helps the system to run smoothly and to avoid any unforeseen situation well in advance. The most common phenomenon of the expert library professionals is to switch organizations for the advancement of career. When a professional leaves the organization, s/he carries out tacit knowledge and only can leave behind the explicit knowledge through documentation. Without documentation, the successors need to make a fresh start that is a direct hindrance towards the library's growth. In addition, there is a significant need of knowledge management system among the library staff to protect and share the intellectual outcome within the library.

A well-written policy and procedure addressing the DRM system is essential. A written policy provides a set rules and guidelines for decision-making in routine situations and speed up the work process to achieve the goal. It is logical that many unwritten rules made up by the staff to avoid a crisis, but typically, these are incomplete, inconsistent, or unnecessary because there is no predominant policy to provide guidance. As a result, the daily operations go in unexpected ways and give the foundation of failure. The survey found an incredible number of libraries without written policy. However, some of the libraries that established DRM system have emphasized on written policy about 'mission and goals', 'collection development', 'preservation', and only a few of the libraries focused on 'rights and licensing' and 'emergency preparedness'.

6. Obstacles in Building DRM System

The obstacles faces by the libraries for implementing the DRM system are reasonably similar. We have clustered the survey feedback as follows:

6.1 Administrative non-cooperation

The parent organization's highest authority fails to understand the importance of the library and its digitization. Sometimes non-cooperation from the management and administration level is also there. The first problem is explicit while exploring the organizational websites with an absence of a dedicated library website and the name and contact addresses of the library personnel. It indicates how much negligent the authority is towards the library.

An equal web visibility of the library personnel has to ensure by the library in comparing to the other department/section of the organization. Library professionals need to take the challenge to raise the reputation of the library to the respective highest authority by themselves, as no other internal or external sources will do the same. Library professionals need to make strategic planning and put light on the ignorance of the higher authority where applicable. In addition, libraries have to arrange a regular user-training program to make the users aware about the DRM system. Users' demand for library development will play a key role to convince the concerned authority.

6.2 Absence of organizational policy

Organizational policy for DRM system is highly essential for successful implementation of the same. There is an absence of parent organization's policy for library digitization. Therefore, the primary goal of digitizing, selection of object, authentic and trustworthy digital replacements of original source material, access right, sustainable digitization, life cycle of digital objects, maximum use and reuse of digital object, third parties use, planning and management, etc. are not available in a written form. Moreover, digital preservation policy, metadata policy, collection development policy are not available.

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. Libraries should develop their digitization policy for their own sake, if the parent organization does not take any initiatives for the same. Nonetheless, a well-planned project and feasibility study and SWOT analysis are obligatory in advance. The library should understand what kind of library materials it has and what will be added to its collection, who are the user, and develop policy documents and guidelines accordingly. Having a well-planned and well-equipped DRM system may be time consuming, but will lead to the right way to reach the goal.

6.3 Human resources and training

Shortage of technically sound library professionals is widely reported. Sometime the existing manpower has inadequate knowledge about DRM system, while some professionals do not apply the knowledge acquired from the training programs and stay beyond professionalism. A good number of training programs have been arranged for the library professional in the last eight years, but the numbers of existing DRM systems are proportionally very small considering the number of trainees. The practical reasons are either the trainings were not appropriate enough to train the professionals or the trainee's organizations were not in a position to initiate a DRM system. In some cases, advance level training is not fruitful when the required access and technologies are not available in the libraries. In addition, the number of experts did not increase as expected due to less focus on the digital library education. Although, the NSU library offers 14-week long training program on Digital and Online Librarianship since 2004 (Rahman, 2015). The department of Information Science and Library

Management of University of Dhaka introduced a 100-marks course on digital library at post-graduate level (course no. 501) from the academic session 2010-2011 (University of Dhaka, 2011). University of Rajshahi offered a 50-marks course at both post-graduate (course no. 507) and graduate level (course no. 105) from the academic session 2012-2013 and 2013-2014 respectively (University of Rajshahi, 2012, 2013). All these courses concentrate on introductory level of digital library only, while the professionals already involved in the digitization process long before.

There is no immediate solution other than nominating staffs for training who have dedication to establish a DRM system and recruit expert professionals to succeed in the DRM system implementation program. There is an immense need to focus on digital library education. Educational organizations that involve in library education should conduct a survey to determine the required type of personnel to administer digital libraries in Bangladesh (Rahman, Khatun, & Mezbah-ul-Islam, 2011) and should offer in-depth courses on digital library management (Myburgh & Tammaro, 2013). Moreover, these educational organizations should introduce well-designed full-fledged master degree program on digital library taking into account the technological advancement. At the same time, motivating the library staffs is highly essential. Obviously, neither a library nor a DRM system is a one-man show. It requires a dedicated expert team for the DRM system and sophisticated technologies to start the program.

6.4 Infrastructure and technical support

We found that library teams operate none of the DRM system entirely. The IT department of the parent organization administers network support, file management and storage, backup and disaster recovery, centralized hardware and software acquisition and maintenance, security and protocols (authentication, authorization, etc.). Some of the self-motivated library professionals acquired knowledge in IT, too. However, there is always conflict between the library oriented IT professional, and the IT professional who are responsible for the entire organization's IT support. In addition, some libraries reported about the poor internet speed, ineffective IT structure of the entire organization, and obsolete software and devices as an obstacle for the development of DRM systems.

The solution involves recruiting dedicated IT professional in the library team and/or ensuring some dedicated support-hand from the IT infrastructure of the parent organization. The technology changes rapidly. Today's technology will become obsolete tomorrow (Calvert, 2014). The old-fashioned software and hardware should be replaced and compatible equipment should be managed. Computerized systems are more dynamic rather than static. Therefore, proper selection of devices and software that are adequately flexible to meet both the present and future needs is required.

6.5 Budget constraints

Insufficient library budget is another obstacle. The majority of the libraries' DRM system development is supported by the organizational operating budget, while only a few have managed grants from donor agencies or government. It is very difficult to manage sufficient allocation of budget for the development of DRM system from operational budget. Sometimes, the parent organization cuts its library budgets in the middle of a financial year to support other departments, and does not do otherwise.

Libraries need to plan and pursue for sufficient budget allocation from the parent organization. There is no easy solution to recover budget limitation. The libraries need to create awareness among the respective highest authority and make them understand about the intangible value of library and recognize its contributions to value creation (Kostagiolas & Asonitis, 2008, 2009). Dynamic leadership is required to influence the top management to stop budget cuts. Concurrently, libraries should seek opportunities for external funding to build DRM system.

7. Considering Factors for DRM System Development

Before jumping into any DRM system development, it is essential to think about required information architecture, software, metadata schema, preservation, design, evaluation, funding, compatibility and integration in the existing library structure (Arms, 2000; Schwartz, 2000; Tedd & Large, 2004). To preserve a digital scholarly record, libraries need to follow best practices for preservation. Libraries should be aware that illuminated manuscripts lasted for over 1000 years, but CDs degrade in 15 years (Li & Banach, 2011). Moreover, technological obsolescence is a bigger threat than deterioration of storage media **(**Jackson, 2012**).** Therefore, libraries need to consider a number of factors before starting any DRM system. Technical knowledge

and expertise are required to evaluate these factors. To provide a preliminary idea, we have listed some of the major factors below:

Plan and Policy
Feasibility study with SWOT analysis
Organization's needs assessment
Users need assessment
Clear mission, goal and purpose
Planning – short term, long-term
Preservation policy
Organizational and library policy
Road-map for completion of phases

Technical issues
Software selection
Metadata management
Vocabulary, Resource descriptor selection
Types and format of materials
Storage media, Back-up and security
Share and reuse techniques
Collaboration techniques
Disaster management system
Security against hacking & sabotage

Budget
Cost modelling
Cost benefit analysis
Budget distribution

Collection
Estimation of own collection
Selective collection development
Access to subscribed databases
Copyright rights and licensing issues

Manpower
Strategic human resource management
Proper training for library staffs
Recruit expert professionals

Users
User education and training
Information marketing
E-learning module for users

In addition, the libraries that plan to digitize their own collections may attend the following questions (not limited to) as a starter for digitization program:

- Do we have resources set aside for ongoing long-term storage of digital objects?
- Are our objects unique?
- Do the objects have representative value?
- Is there a sufficient context surrounding our digital objects to make the collection usable?
- What are the main issue underlying the transformation from print to digital format?
- Do the users have demand for the digital version rather than the print version of the material?
- Do our objects have appeal to specific scholarly communities?
- Do we have evidence that the user community would use digital objects?
- Will digital objects reach new audiences?
- Will digitization help previously known audiences access our items, when they could not access them in the physical versions?
- How the digital objects will be discovered?
- Will we use the equipment compatible with the upcoming technologies?
- Do the materials have special characteristics that require special processing during digitization that would increase the cost?
- Do we have sufficient resources, both in money and in personnel to devote to digitization?
- Will we be able to digitize objects with sufficient quality?
- Will the digital objects add value, e.g., keyword search ability for textual materials?
- Will we give priorities according to the users need or do it randomly?
- Do we have a collection policy that will inform digitization selection decisions?

We suggest that libraries should ensure proper planning and resource gathering (expert manpower, budget, technology) before the start of the digitization program. It is better to make a plan ahead and build the DRM system to the end, and collaborate with others. Since nobody wants a vanishing DRM system.

8. Suggestions for Collaboration Plan

The initiatives of DRM systems are going on in the scattered way in different corner of Bangladesh. The libraries are doing their best according to their level of understanding in the absence of national standards and guidelines. There are no two libraries those follow the same policy for DRM system. In one hand, the libraries are enjoying their freedom for the same aim, but in diverse ways. On the other hand, the absence of national level initiatives and guidelines are hindrance to encourage other potential organizations to join in the

momentum. In the long run, these libraries will stand as an island without a boat. Currently, the libraries are serving community based. Therefore, users of that particular community are getting support from the particular library and significantly not from all the libraries. Obviously, some libraries are digitizing same materials simultaneously, and that is a clear waste of national resources. These problems can be solved with a collaborative DRM system.

The respondent libraries reported that they are willing to join in a collaborative digital preservation with similar kind of libraries, while a few of them have a plan for National level collaboration of digital resource management. Since libraries do not perform in harmony, a big project that includes a large number of different types of libraries may return the unfortunate history of BANSLINK. The libraries need to take the first step immediately to reach a hundred mile away goal. We suggest that there should be two short-term and two long-term plans as depicted below:

Firstly, any advance level research library can take a 'one to one' collaborative initiative; create policy paper, short term and long-term planning, and management. They should also gather experience from their trial and error, and make a common platform for the different organizational culture. This will allow similar types of libraries to join in the collaborative DRM system progressively. Together they can set national standard and develop guidelines for other libraries to fulfill to be a member of the collaborative system, and extend their hands to increase the number of members.

Secondly, as a good number of university libraries are implementing DRM systems, UGC of Bangladesh can take an initiative for collaboration among them. Similar steps can be followed as proposed for the research libraries. UGC may consider a couple of progressive university libraries in the initial stage, set guidelines for themselves, and encourage other university libraries to fulfill the requirements to join as a member. This approach will bring long-term success and create a national standard for university DRM system steadily.

The above-mentioned approaches will bring research and university libraries under respective platform. It will minimize the duplication of digitization work, create a national standard, and allow library users to access to all the member organizations DRM systems from a single federated search interface. Nonetheless, other organizations (public, national, international, etc.) with DRM system will remain out of the scope of the above mentioned research, and university library collaboration.

Therefore, as a third step, there should be a national level collaboration to bring all the libraries with DRM systems under an umbrella. It may be named as a Bangladesh Digital Library. It should have a provision to include new libraries' DRM systems when they are ready. The National Library of Bangladesh may take the lead role and work closely with the library professional bodies like BALID and LAB (Library Association of Bangladesh) to materialize such initiatives. In addition, necessary steps should be taken to make these digital resources available on the doorstep of the people by establishing Community Library and Assembly Centre in rural areas in the country.

Fourthly, when the libraries will accomplish national level collaboration with DRM system, the National library may play the key role to establish an international collaboration. An initiative can be taken to establish 'Asian Digital Library' following the model of the European library (an aggregator), which provides access to the resources of 48 National Libraries of Europe and leading European research libraries (European Library, 2015).

All the above proposals include decentralized development approach. The parent organizations have more authority and responsibility for the development of the DRM system and share the same at the national level, and the central management authority will ensure the access right, responsible for policy and guidelines development, and quality control. To materialize the above proposals, proper planning, policy and guidelines development, and adequate fund will be required. If the above proposals are materialized, it will be the best contribution from the library professionals to achieve the 2021 vision of Digital Bangladesh for which we have five more years in hand.

9. Conclusion

The library sector and the library professionals of Bangladesh have made a remarkable progress in the last decade despite of many visible obstacles. The google is used for a variety of purposes nowadays. However, accessing information from a legitimate source or publisher comes at a cost for the user. The DRM system brings this access to the users and ensures the authenticity of information. The libraries are developing DRM systems to facilitate their users. The purpose of DRM system in libraries should be to establish new services and

ways of discovering and accessing knowledge rather than a static access interface to digital resources. Digitization of material is just a small percentage of digitization project activities, while the libraries are ignoring the licensing and negotiation of e-resources, monitoring and evaluation of digital library, disaster management, in house and remote access, staff training, user training, etc. The libraries need to follow a standard metadata schema to describe their digital resources. The libraries should ensure maximum use of their resources through the federated search interface, and provide virtual reference service. The libraries that are in the early stage of developing a DRM system have to develop proper plan and road maps to reach their goals. The libraries that have already implemented DRM system should follow the international standard in all aspects. In both the cases, there is a high need to develop organizational and library policy for digitization. Nonetheless, the libraries have to take initiatives to create awareness among the users and encourage using the DRM system. Without proper awareness, users will not able to prompt on their need, and all the efforts will be fruitless.

The collaborative effort will bring all the DRM systems under a single interface. This will provide direct benefit to the users' community who are the main target of any digitization program. Moreover, this effort will create a national standard of digitization and bring harmony among the libraries. The libraries who are in the initial stage will be encouraged to develop their DRM system following national standard and their path will be much easier than current individual practices. BALID should focus on training about the new standards, for example, Dublin core and other metadata schema that sufficiently describes digital objects, RDA standard, RDF data model, FRBR and FRAD model for the library professionals. The earlier the library professionals embrace these internationally recognized standards, the quicker they can implement these in building DRM systems. We observed scarcity of research on DRM systems in Bangladesh. The majority of the available researches is mostly descriptive and quantitative in nature and largely focuses on theoretical aspects. The professionals should focus on the qualitative and analytical research that can show the way to the library development in Bangladesh. Moreover, researches are needed to identify the impact on the library users and how scholarly community is influenced before and after DRM systems. We expect the future generation librarians to conceptualize their mission in the digital world.

Acknowledgments

We thank all the Bangladeshi library professionals, and the heads of the libraries who have participated in the survey. We also thank Hasan Mahmud, Ahasan Habib, Momena Khatun, and A.K.M. Nurul Alam for their support.

References

Afroz, H. (2014). Digital Library initiatives at BRAC University: Successes and challenges. Oxford: International Network for the Availability of Scientific Publications (INASP). Retrieved from http://www.inasp.info/uploads/filer_public/2014/07/11/digital_library_initiatives_at_brac_university_1.pdf

Ahmed, S. M. Z. (2014). The use of IT-based information services. *Program: Electronic Library and Information Systems*, *48*(2), 167 – 184.

Alemu, G. (2014). *A theory of digital library metadata: the emergence of enriching and filtering* (PhD Thesis). University of Portsmouth, UK.

Ameen, K. (2014). Challenges of LIS Education in South Asia: Pakistan, India, Sri Lanka, and Bangladesh. In I. Abdullahi, C. R. Karisddappa, & A. Y. Asundi (Eds.), *LIS education in developing countries: The road ahead* (pp. 86 – 100). Munich: De Gruyter Saur.

Arms, W. Y. (2000). *Digital libraries*. Cambridge, MA: MIT press.

Azam, M. S. (2007). Internet adoption and usage in Bangladesh. *Japanese Journal of Administrative Scienc*, *20*(1), 43–54.

Baca, M. (2003). Practical issues in applying metadata schemas and controlled vocabularies to cultural heritage information. *Cataloging & Classification Quarterly*, *36*(3-4), 47–55.

BANSDOC. (1998). *Annual report 1997-1998*. Dhaka: Bangladesh National Scientific and Technical Documentation Centre.

BANSDOC. (2000). *Annual report 1999-2000*. Dhaka: Bangladesh National Scientific and Technical Documentation Centre.

Battin, P. (1984). The Electronic library: a vision for the future. In H. Liebaers, W. J. Haas, & W. E. Biervliet (Eds.), *New information technologies and libraries, Proceeding of the Advance research workshop on the impact of new information technologies on library management, resources, and cooperation in Europe and North America*, November 1984, Luxembourg (pp. 201–2018). Dordrecht: D. Reidel publishing.

Bawden, D., & Rowlands, I. (1999). Digital libraries: assumptions and concepts. *Libri*, *49*(4), 181–191.

Beall, J. (2007). Discrete Criteria for Selecting and Comparing Metadata Schemes. *Against the Grain*, *19*(1), 28.

Borgman, C. L. (1999). What are digital libraries? Competing visions. *Information Processing & Management*, *35*(3), 227–243.

Borgman, C. L., Darch, P. T., Sands, A. E., Pasquetto, I. V., Golshan, M. S., Wallis, J. C., & Traweek, S. (2015). Knowledge infrastructures in science: data, diversity, and digital libraries. *International Journal on Digital Libraries*, (published online) http://doi.org/10.1007/s00799-015-0157-z

British Council. (2015a). *Library landscape assessment of Bangladesh: Brief report 1 may 2015*. Dhaka: British Council Bangladesh. Retrieved from http://www.britishcouncil.org.bd/sites/britishcouncil.bd/files/iid-brief-report-lis_0.pdf

British Council. (2015b). *A new vision for libraries in Bangladesh: Transforming access to digital information*. Symposium Report, 12-13 May 2015 (p. 26). Dhaka: British Council Bangladesh.

Buckland, M. (1992). *Redesigning Library Services: A Manifesto*. Chicago, IL: American Library Association. Retrieved from http://eric.ed.gov/?id=ED367317

Calhoun, K. (2014). *Exploring digital libraries: foundations, practice, prospects*. UK: Facet publishing.

Calvert, S. (2014). Second life librarianship and the gendered work of care in technology. *PhaenEx: Journal of Existential and Phenomenological Theory and Culture*, *9*(2), 24–42.

Caracciolo, C., Morshed, A., Stellato, A., Johannsen, G., Jaques, Y., & Keizer, J. (2011). Thesaurus maintenance, alignment and publication as Linked Data: The AGROOVOC use case. In Elena García-Barriocanal, Zeynel Cebeci, Mehmet C. Okur, & Aydın Öztürk (Eds.), *Metadata and Semantic Research* (pp. 489–499). Izmir, Turkey: Springer Berlin Heidelberg.

Chandel, A. S., & Begum, S. (1998). Strategic planning for information technology application with special reference to Bangladesh. *Bangladesh Journal of Library and Information Science*, *1*(1), 15–24.

Chan, L. M., & Zeng, M. L. (2006a). Metadata interoperability and standardization: A study of methodology, Part I. *D-Lib Magazine*, *12*(6), 3.

Chan, L. M., & Zeng, M. L. (2006b). Metadata interoperability and standardization: A study of methodology, Part II. *D-Lib Magazine*, *12*(6), 4.

Chapman, A. (2010). The Case of AACR2 Versus RDA. *Legal Information Management*, *10*(3), 210–213. http://doi.org/http://dx.doi.org/10.1017/S1472669610000721

Chartier, R. (1993). Libraries without Walls. *Representations*, (42), 38–52. http://doi.org/10.2307/2928617

Chen, C.-M., & Lin, S.-T. (2014). Assessing effects of information architecture of digital libraries on supporting E-learning: A case study on the digital library of nature & culture. *Computers & Education*, *75*, 92–102. http://doi.org/10.1016/j.compedu.2014.02.006

Chen, H., & Zhang, Y. (2014). Functionality analysis of an open source repository system: Current practices and implications. *The Journal of Academic Librarianship*, *40*(6), 558–564. http://doi.org/10.1016/j.acalib.2014.09.012
Chowdhury, G. (2010). From digital libraries to digital preservation research: the importance of users and context. *Journal of Documentation*, *66*(2), 207–223. http://doi.org/10.1108/00220411011023625

Chowdhury, G. G., & Chowdhury, S. (2002). *Introduction to digital libraries*. UK: Facet publishing.

Chowdhury, M. H. H., & Khan, M. S. I. (2012). Libraries and Librarianship in Bangladesh. In R. N. Sharma (Ed.), *Libraries in the early 21st century: An international perspective* (Vol. 2, pp. 101–128). Munich: De Gruyter Saur.

Cleveland, G. (1998). *Digital libraries: Definitions, issues and challenges*. IFLA Universal Dataflow and Telecommunications Core Programme, Occasional Paper 8. Retrieved from www.ifla.org/VI/5/op/udtop8/udtop8.htm

Connaway, L. S., & Radford, M. L. (2011). *Seeking synchronicity: Revelations and recommendations for Virtual Reference*. Dublin, Ohio: OCLC Online Computer Library Center, Inc. Retrieved from http://www.oclc.org/content/dam/oclc/reports/synchronicity/full.pdf

Creswell, J. W. (2013). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (4th edition). Thousand Oaks: SAGE Publications, Inc.

Crow, R. (2002). *The case for institutional repositories: A SPARC position paper* (ARL Bimonthly Report No. 223) (pp. 1–37). Washington, DC: SPARC: the Scholarly Publishing & Academic Resources Coalition.

D'Ambra, J., Wilson, C. S., & Akter, S. (2013). Application of the task-technology fit model to structure and evaluate the adoption of E-books by Academics. *Journal of the American Society for Information Science and Technology*, *64*(1), 48–64. http://doi.org/10.1002/asi.22757

de Smet, E. (2014). Digital library technology in J-ISIS: Concept, implementation and comparison with GSDL. *Program-Electronic Library and Information Systems*, *48*(1), 76–89. http://doi.org/10.1108/PROG-07-2012-0038

Dunsire, G., & Willer, M. (2011). Standard library metadata models and structures for the Semantic Web. *Library Hi Tech News*, *28*(3), 1–12. http://doi.org/10.1108/07419051111145118

Eeckels, R. (1997). Editorial: Reporting to our contributors and looking at the future. Journal of Diarrhoeal Diseases Research, 15(1), 1–2.

Ezema, I. J. (2011). Building open access institutional repositories for global visibility of Nigerian scholarly publication. *Library Review*, *60*(6), 473–485. http://doi.org/10.1108/00242531111147198

European Library. (2015). The European Library: Open to National and Research libraries across Europe. Retrieved on 29 July 2015, from http://www.theeuropeanlibrary.org

Fayen, E. G. (1986). Beyond technology: Rethinking "librarian." *American Libraries*, *17*(4), 240–242.

Foote, J. B. (1993). Bangladesh. In Robert Wedgeworth (Ed.), World encyclopedia of library and information services (3rd ed., pp. 101–103). Chicago: American Library Association.

Fox, E. A., & Sornil, O. (1999). Digital libraries. In R. Baeza-Yates & B. Ribeiro-Neto (Eds.), *Modern information retrieval* (4th ed., pp. 415–432). Essex: ACM press.

Harnad, S., Brody, T., Vallières, F., Carr, L., Hitchcock, S., Gingras, Y., … Hilf, E. R. (2008). The Access/Impact problem and the green and gold roads to Open Access: an update. *Serials Review*, *34*(1), 36–40. http://doi.org/10.1016/j.serrev.2007.12.005

IFLA. (1998). *Functional Requirements for Bibliographic Records*. München: K.G. Saur Verlag.

IFLA. (2010). IFLA/UNESCO manifesto for digital libraries: Bridging the digital divide, making the world's cultural and scientific heritage accessible to all (pp. 1–4). Hague: International Federation of Library Associations. Retrieved from http://www.ifla.org/files/assets/digital-libraries/documents/ifla-unesco-digital-libraries-manifesto.pdf

Islam, M. M. R. (2013). Present status of library cooperation, networking, and resource sharing in Bangladesh: Web-based library cooperation for access to World-wide information. *Library Philosophy and Practice*. Retrieved from http://digitalcommons.unl.edu/libphilprac/881

Jackson, J. (2012). *Digital Longevity: The lifespan of digital files (compiled for R&D in Digital Asset Preservation)*. York: Digital Preservation Coalition. Retrieved from http://www.dpconline.org/events/previous-events/306-digital-longevity.

Johnson, R. K. (2002). Institutional repositories: Partnering with faculty to enhance scholarly communication. *D-Lib Magazine*, *8*(1). http://doi.org/10.1045/november2002-johnson
Khan, M. S. I. (1989). Developments in new information technologies and their applications and prospects in Bangladesh. *Media Asia*, *16*(1), 32–40.

Konkiel, S., & Scherer, D. (2013). New opportunities for repositories in the age of Altmetrics. *Bulletin of the American Society for Information Science and Technology*, *39*(4), 22–26. http://doi.org/10.1002/bult.2013.1720390408

Kostagiolas, P. A., & Asonitis, S. (2008). Utilizing intangible assets in the worlds of production. *The International Journal of Knowledge, Culture and Change Management*, *8*(2), 1–8. http://doi.org/10.1108/01435120910982113

Kostagiolas, P. A., & Asonitis, S. (2009). Intangible assets for academic libraries: Definitions, categorization and an exploration of management issues. *Library Management*, *30*(6/7), 419–429. http://doi.org/10.1108/01435120910982113

Lagoze, C. J. (2010). *Lost identity: The assimilation of digital libraries into the Web* (PhD Thesis). Cornell University, New York. Retrieved from http://eric.ed.gov/?id=ED514539

Lankes, R. D. (2011). *The Atlas of new librarianship*. Cambridge, Mass: MIT Press.

Lankes, R. D. (2012). *Expect More: Demanding better libraries for today's complex world*. CreateSpace Independent Publishing Platform.

Li, Y., & Banach, M. (2011). Institutional repositories and digital preservation: Assessing current practices at research libraries. *D-Lib Magazine*, *17*(5/6). http://doi.org/doi:10.1045/may2011-yuanli

Lopatin, L. (2010). Metadata practices in academic and non-academic libraries for digital projects: A survey. *Cataloging & Classification Quarterly*, *48*(8), 716–742.

Lynch, C. A. (2003). Institutional repositories: Essential infrastructure for scholarship in the digital age. *Portal: Libraries and the Academy*, *3*(2), 327–336. http://doi.org/10.1353/pla.2003.0039

MacColl, J., Jones, R. D., & Andrew, T. (2006). The institutional repository in the digital library. Chandos (Oxford) Publishing Ltd.

Maceviciute, E., Borg, M., Kuzminiene, R., & Konrad, K. (2014). The acquisition of e-books in the libraries of the Swedish higher education institutions. *Information Research*, *19*(2). Retrieved from http://www.informationr.net/ir/19-2/paper620.html#.Va1QJ_mgt-9

Madalli, D. P., Barve, S., & Amin, S. (2012). Digital preservation in Open-Source digital library software. *The Journal of Academic Librarianship*, *38*(3), 161–164. http://doi.org/10.1016/j.acalib.2012.02.004

Matthews, B., & Ross, L. (2010). *Research methods: A practical guide for the Social Sciences*. New York: Pearson Education Canada.

McCutcheon, S. (2012). RDA and the reference Librarian: what to expect from the new cataloging standard. *The Reference Librarian*, *53*(2), 123–137. http://doi.org/10.1080/02763877.2011.607409

McDowell, C. S. (2007). Institutional repository deployment in the United States as of early 2005: Repositories by the numbers, part 2. *D-Lib Magazine*, *13*(9/10). http://doi.org/10.1045/september2005-lynch

Monopoli, M., Nicholas, D., Georgiou, P., & Korfiati, M. (2002). A user-oriented evaluation of digital libraries: Case study the "electronic journals" service of the library and information service of the University of Patras, Greece. *Aslib Proceedings*, *54*(2), 103–117. http://doi.org/10.1108/00012530210435239

Munshi, M. N. U. (2003). Library automation in Bangladesh: The Dhaka University library experiences. In *International CALIBER-2003: Mapping Technology on Libraries and People* (pp. 153–165). Ahmedabad, India.

Mu, X., Dimitroff, A., Jordan, J., & Burclaff, N. (2011). A survey and empirical study of virtual reference service in academic libraries. *The Journal of Academic Librarianship*, *37*(2), 120–129. http://doi.org/10.1016/j.acalib.2011.02.003
Myburgh, S., & Tammaro, A. M. (2013). Exploring education for digital librarians: Meaning, modes and models. Oxford: Chandos Publishing.

Neiswender, C., & Montgomery, E. (2009). Metadata Interoperability—What Is It, and Why Is It Important? Retrieved July 9, 2015, from https://marinemetadata.org/guides/mdataintro/mdatainteroperability

Niu, J. (2013). Hierarchical relationships in the bibliographic universe. *Cataloging & Classification Quarterly*, *51*(5), 473–490. http://doi.org/10.1080/01639374.2012.749969Oppenheim, C., & Smithson, D. (1999). What is the hybrid library? *Journal of Information Science*, *25*(2), 97–112.

NSU. (2015). North South University Library web page: About the Library. Retrieved 1 July, 2015, from http://library.northsouth.edu/ataglance.php

Pan, J. Z. (2009). Resource Description Framework. In S. Staab & R. Studer (Eds.), *Handbook on Ontologies*, *International Handbooks on Information Systems* (pp. 71–90). Berlin: Springer Berlin Heidelberg.

Patton, G. E. (2009). *Functional requirements for authority data: A conceptual model*. München: K.G. Saur.

Pinfield, S., Eaton, J., Edwards, C., Russell, R., Wissenburg, A., & Wynne, P. (1998). Realising the Hybrid library. *New Review of Information Networking*, *4*(1), 3–21. http://doi.org/10.1080/13614579809516914

Rahman, A. I. M. J. (2010). *Attitude of library professionals towards information technology of university libraries in Bangladesh* (MPhil thesis). University of Dhaka, Dhaka. Retrieved from http://hdl.handle.net/10760/25144

Rahman, A. I. M. J. (2012). *Social tagging versus Expert created subject headings* (Master thesis). Oslo and Akershus University College of Applied Sciences, Oslo, Norway. Retrieved from http://hdl.handle.net/10760/25587

Rahman, A. I. M. J., & Bayramova, E. (2011). *Fagarkivet: A proposed Institutional Repository for non-peer reviewed materials in HIOA* (p. 22). Oslo: Oslo and Akershus University College of Applied Sciences. Retrieved from http://hdl.handle.net/10760/25495

Rahman, A. I. M. J., Francese, E., Yilmaz, M., & Yilmaz, W. (2011). Metadata practices in digital libraries (pp. 66–82). International Seminar 'Vision 2021: the role of libraries for building digital Bangladesh, Dhaka: Library Association of Bangladesh. Retrieved from http://eprints.rclis.org/24953/

Rahman, A. I. M. J., Khatun, M., & Mezbah-ul-Islam, M. (2008). Library education in Bangladesh: Strengths, problems, and suggestions. Retrieved from http://digitalcommons.unl.edu/libphilprac/223

Rahman, A. I. M. J., Khatun, M., & Mezbah-ul-Islam, M. (2011). Education for information professionals in Bangladesh: A case study of the University of Dhaka. Retrieved from http://digitalcommons.unl.edu/libphilprac/678

Rahman, F. (2007). *An exploratory study of factors that influence student user success in an academic digital library.* (PhD Thesis). University of North Texas, Denton, Texas. Retrieved from http://digital.library.unt.edu/ark:/67531/metadc5127/

Rahman, M. M. (2015). Challenges, opportunities and use of Digital Libraries in higher education and research in Bangladesh. PowerPoint presentation presented at the 1st Bangladesh Research and Education Network (BdREN) Summit, 15 & 16 March 2015, Dhaka, Bangladesh. Retrieved from http://www.meetbdren.org/?page_id=122

Rahman, M. M., & Mezbah-ul-Islam, M. (2014). Issues and strategy of institutional repositories (IR) in Bangladesh: A paradigm shift. *The Electronic Library*, *32*(1), 47–61. http://doi.org/10.1108/EL-02-2012-0020Reese, T., & Banerjee, K. (2008). *Building digital libraries: a how-to-do-it manual*. New York: Neal-Schuman.

Rehemtula, S., Rosa, M. D. L., Leitão, P., & Avilés, R. A. (2014). Altmetrics in institutional repositories: New perspectives for assessing research impact. In *13th International Conference "Libraries in the Digital Age (LIDA 2014)" held on 16-20th June 2014*. Zadar, Croatia: University of Zadar. Retrieved from http://hdl.handle.net/10362/12398

Rusbridge, C. (1998). *Towards the hybrid library*. Retrieved from https://www.era.lib.ed.ac.uk/handle/1842/1736

Schöpfel, J. (2013). Adding value to electronic theses and dissertations in institutional repositories. *D-Lib Magazine*, *19*(3/4). Retrieved from http://www.dlib.org/dlib/march13/schopfel/03schopfel.html

Schwartz, C. (2000). Digital libraries: An overview. *The Journal of Academic Librarianship*, *26*(6), 385–393. http://doi.org/10.1016/S0099-1333(00)00159-2

Seadle, M., & Greifeneder, E. (2013). Defining a digital library. *Library Hi Tech*. http://doi.org/10.1108/07378830710754 938

Shiri, A. (2003). Digital library research: Current developments and trends. *Library Review*, *52*(5), 198–202. http://doi.org/10.1108/00242530310476689

Shoeb, M. Z. H. (2010). Developing an institutional repository at a private university in Bangladesh. *OCLC Systems & Services: International Digital Library Perspectives*, *26*(3), 198–213. http://doi.org/10.1108/10650751011073634

Shokouhi, M., & Si, L. (2011). Federated Search. *Foundations and Trends in Information Retrieval*, *5*(1), 1–102. http://doi.org/10.1561/1500000010

Shuva, N. Z. (2012). Building digital libraries in Bangladesh: A developing country perspective. *The International Information & Library Review*, *44*(3), 132–146. http://doi.org/10.1016/j.iilr.2012.07.002

Soundararajan, E., Meenachi, N. M., & Baba, M. S. (2010). Semantic digital library - migration of Dublin core to RDF (pp. 250–254). Presented at the Signal and Image Processing (ICSIP), 2010 International Conference on, Chennai: IEEE. http://doi.org/10.1109/ICSIP.2010.5697478

Stabler, K. Y. (1993). Who's on first, what's on second: Patterns of reference services in academic libraries. The Reference Librarian, 18(39), 13–20. http://doi.org/10.1300/J120v18n39_03

Sun, J., & Yuan, B.-Z. (2012). Development and characteristic of digital library as a library branch. *IERI Procedia*, *2*, 12–17. http://doi.org/10.1016/j.ieri.2012.06.044

Tariq, A. S. B. (2010). *Building from the bottom up: Developing and sustaining the Bangladesh INASP-PERii Consortium (BIPC)*. Cambridge Terrace, Oxford: International Network for the Availability of Scientific Publications (INASP). Retrieved from http://www.inasp.info/uploads/filer_public/2013/04/08/building_from_the_bottom_up.pdf

Tedd, L. A., & Large, J. A. (2004). *Digital Libraries: principles and practice in a global environment*. Berlin: De Gruyter.

Tillett, B. B. (2007). FRBR and RDA: Resource description and access. In A. G. Taylor (Ed.), *Understanding FRBR: What it is and how it will affect our retrieval tools* (pp. 87–96). Westport, CT: Libraries Unlimited.

Uddin, M. N. (2009). *Application of information technology (IT) in libraries of private universities of Bangladesh: An analytical study* (PhD Thesis). Jadavpur University, Jadavpur, India.

Uddin, M. N., & Chowdhury, M. H. H. (2006). Developing a digital resources consortium for university libraries in Bangladesh: Proposed role of UGC. In S. Sugimoto, J. Hunter, A. Rauber, & A. Morishima (Eds.), *Digital libraries: achievements, challenges and opportunities*. Kyoto.

Uddin, M. N., Koehlmoos, T. L. P., & Hossain, S. A. S. (2014). Bangladesh: An overview of Open Access (OA) Initiatives. *Library Philosophy and Practice*. Retrieved from http://digitalcommons.unl.edu/libphilprac/1101/

UGC. (2015). *Enhancing quality in higher education: An introduction to higher education quality enhancement project* (p. 26). Dhaka: University Grants Commission, Bangladesh.

University of Dhaka. (2011). Department of Information Science and Library Management: Master of Arts syllabus, session 2010-2011. Faculty of Arts, University of Dhaka.

University of Rajshahi. (2012). Department of Information Science and Library Management: Master of Social Science syllabus, session 2012-2013. Faculty of Social Science, University of Rajshahi.

University of Rajshahi. (2013). Department of Information Science and Library Management: Bachelor of Social Science (honors) syllabus, from session 2013-2014 to 2016-2017. Faculty of Social Science, University of Rajshahi.

Vassiliou, M., & Rowley, J. (2008). Progressing the definition of "e-book." *Library Hi Tech*. http://doi.org/10.1108/07378830810903292

Velagić, Z. (2014). The discourse on printed and electronic books: Analogies, oppositions, and perspectives. *Information Research*, *19*(2). Retrieved from http://www.informationr.net/ir/19-2/paper619.html#.Va1QGPmgt-9

Witten, I. H., Bainbridge, D., & Nichols, D. M. (2009). *How to Build a Digital Library*, (2nd edition). Burlington, MA: Morgan Kaufmann.

Yerkey, A. N., & Jorgensen, C. (1996). A Course in Digital Libraries. *DESIDOC Bulletin of Information Technology*, *16*(1), 31–39.

Yilmaz, M. (2012). *Collaborative virtual reference services in Norway: A case study* (Master thesis). Oslo and Akershus University College of Applied Sciences, Oslo. Retrieved from https://oda.hio.no/jspui/handle/10642/1276

Zhang, L., Zhang, Z., & Zhao, L. (2014). Research on the unbalanced development of digital library in China. Presented at the International Conference on Education, Language, Art and Intercultural Communication (ICELAIC-14), Atlantis Press. http://doi.org/icelaic-14.2014.164

Annexure: Questionnaire

Survey on Digital Resources Management in Libraries 2015

(Online questionnaire for the Heads of libraries)

What is the name of your organization/institution/University?

_____

Please provide the e-mail address of the Head of the library

_____

Does your library have a digital resource management system (including institutional repository)?

- ❍ Yes
- ❍ Work in progress
- ❍ No

If No is selected, Then Skip to End of the Survey

1a) The Integrated Library System of your library belongs to

❍ Open source software ❍ Customized software ❍ Commercial software

1b) Which software are you using for Integrated Library System?

If 1a) Open source software Is Selected, show

❍	KOHA	❍	SLiMs
❍	WIN/ISIS	❍	ABCD
❍	ABCD	❍	OpenBiblio
❍	Evergreen	❍	Others, please mention _____

If 1a) Customized Software Is Selected, show

Please mention the name of the Customized software _____

If 1a) Commercial software Is Selected, show

Please mention the name of the Commercial software _____

1c) Please mention the year of launching the Integrated Library System at your library _____

1d) Which metadata schema are you using in the Integrated Library System?

- ❍ Simple Dublin Core
- ❍ Qualified Dublin Core
- ❍ AgMES (Agricultural Metadata Element Set)
- ❍ METS (Metadata Encoding and Transmission Standard)
- ❍ MODS Metadata Object Description Schema
- ❍ EAD (Encoded Archival Description)
- ❍ MARC21
- ❍ Locally developed schema
- ❍ None of the above

2a) The digital resource management system (Including institutional repository) of your library belongs to

❍ Open source software ❍ Customized software ❍ Commercial software

2b) Which software are you using for digital resource management?

If 2a) Open source software Is Selected, show

❍	DSpace	❍	SLiMs
❍	OMEKA	❍	EPrints
❍	FEDORA	❍	GreenStone
❍	Evergreen	❍	Others, please mention _____

If 2a) Customized Software Is Selected, show

Please mention the name of the Customized software _____

If 2c) Commercial software Is Selected show

Please mention the name of the Commercial software _____

2c) Please mention the year of launching the digital resource management system at your library. _____

2d) Which metadata schema are you using for digital resource management?

- ❍ Simple Dublin Core
- ❍ Qualified Dublin Core
- ❍ AgMES (Agricultural Metadata Element Set)
- ❍ METS (Metadata Encoding and Transmission Standard)
- ❍ MODS Metadata Object Description Schema
- ❍ EAD (Encoded Archival Description)
- ❍ MARC21
- ❍ Locally developed schema
- ❍ Others, please mentioned the name _____

2e) The metadata schema has been selected based on the (Multiple answer possible)

- ❑ Default setup of the software
- ❑ Compatibility with other software
- ❑ Feasibility study
- ❑ SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis
- ❑ Feasibility study, including SWOT analysis
- ❑ Library personnel's expertise
- ❑ Recruit expert library personnel
- ❑ External expertise
- ❑ None of the above, please mention the reasons _____

2f) What types of metadata do you create for the digital collections? (Multiple answer possible)

- ❑ Descriptive metadata (for example, title, subject)
- ❑ Technical metadata (information describing the production process or digital attributes of the work)
- ❑ Administrative metadata (access privileges, rights, ownership of material)
- ❑ Structural metadata (for purposes of linking different parts or units of data)
- ❑ None

3a) Does your library have a WRITTEN POLICY that addresses digital resource management in each of the following areas?

	YES	Under Processing	NO
a) Mission and goals	❍	❍	❍
b) Collection development	❍	❍	❍
c) Emergency preparedness	❍	❍	❍
d) Preservation	❍	❍	❍
e) Rights and licensing	❍	❍	❍

3b) Does your library have a WRITTEN PROCEDURE that addresses digital resource development in each of the following areas?

	YES	Under Processing	NO
a) Mission and goals	❍	❍	❍
b) Collection development	❍	❍	❍
c) Emergency preparedness	❍	❍	❍
d) Preservation	❍	❍	❍
e) Rights and licensing	❍	❍	❍

3c) Do you have IT SUPPORT for the following areas in the library?

	YES	NO
a) Network support	❍	❍
b) File management and storage	❍	❍
c) Backup and disaster recovery	❍	❍
d) Centralized hardware and software acquisition and maintenance	❍	❍
e) Security and protocols (authentication, authorization, etc.)	❍	❍

3d) Do you use the following IT APPLICATIONS for digital resource management in your library?

	YES	NO
a) Digital imaging (for example, scanning, direct digital capture, digital photography	❍	❍
b) Collection management system	❍	❍
c) Backup and disaster recovery system	❍	❍
d) Digital asset management system	❍	❍

4a) What types of digital preservation are prioritized in your library?

- ❑ Born digital materials
- ❑ Digitized materials

4b) How do you digitize your library collections?

- ❑ In-house
- ❑ Outsourced to vendors
- ❑ In-house and Outsourced to vendors

4c) What types of organizational materials do you digitize? (Multiple answer possible)

- ❑ Book
- ❑ Thesis
- ❑ Journal published by the organization
- ❑ Organization's newsletter
- ❑ Official documents
- ❑ Reports
- ❑ Maps
- ❑ Manuscripts
- ❑ Images
- ❑ Newspaper articles
- ❑ Others, please mention _____

4d) Do you seek copyright permission from the creator/s before digitization?

- ❑ Yes
- ❑ No
- ❑ Sometimes
- ❑ Not Applicable

4e) To what kind of subscribed materials do you give access through digital resource management system?

- ❑ E-book Database
- ❑ Thesis Database
- ❑ Journal Database
- ❑ Others, please mention _____

4f) To what kind of Open Access (Freely available in the internet) materials do you provide access through digital resource management?

- ❑ E-book Database
- ❑ Thesis Database
- ❑ Journal Database
- ❑ Others, please mention _____

4g) Which of the following formats of born-digital resources are created or acquired by your library? (Multiple answer possible)

		Creating	Acquiring	Not applicable
i)	Simple text / Microsoft Office formats / Open Office formats	❍	❍	❍
ii)	Encoded text (blogs, websites, PDF documents)	❍	❍	❍
iii)	Licensed e-books (XML format)	❍	❍	❍
iv)	Non-licensed e-books (XML format)	❍	❍	❍
v)	E-journals	❍	❍	❍
vi)	Photography or other still images (JPEG, TIF, PNG, GIF, etc.)	❍	❍	❍
vii)	Digital audio (mp3, avi, wma, etc.)	❍	❍	❍
viii)	Digital video (mpeg, 3gp, mp4, flv, etc.)	❍	❍	❍
ix)	Art or visual materials	❍	❍	❍
x)	Research data	❍	❍	❍
xi)	Geospatial data	❍	❍	❍
xii)	Other numeric data sets	❍	❍	❍

5a) How open is your digital resource management system?

❍ Only accessible through Intranet
❍ Open to the world
❍ Open only to registered user
❍ Open to the world, but some materials are for registered users only
❍ Others, please mention _____

5b) The subscribed online databases are accessible through the:

❑ Descriptive metadata (for example, title, subject)
❑ OPAC only
❑ Library website only
❑ OPAC and the library website
❑ Others, please mention _____

5c) The digital resources are accessible through the

❑ Descriptive metadata (for example, title, subject)
❑ OPAC only
❑ Dedicated interface only
❑ OPAC and the dedicated interface
❑ Others, please mention _____

5d) Which of the following activities have been conducted by the library before starting the digital resource management system? (Multiple answer possible)

❑ Organizational needs assessment
❑ Library users' needs assessment
❑ Feasibility study
❑ SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis
❑ Feasibility study, including SWOT analysis
❑ Provide training to the library personnel
❑ Recruit expert library personnel
❑ Hire external expertise
❑ None of the above

5e) The digital resource management software has been selected based on the (Multiple answer possible)

❑ Feasibility study
❑ SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis
❑ Feasibility study, including SWOT analysis
❑ Compatibility with other software
❑ Library personnel's expertise
❑ Recruit expert library personnel
❑ External expertise
❑ Others, please mention _____

5f) What are the sources of funding for the digital resource management initiative? (Multiple answer possible)

- ❑ Organization's operating budget
- ❑ Grants
- ❑ Fees from activities
- ❑ Fundraising
- ❑ Sales of products associated with digital collections
- ❑ Others, please mention _____

5g) Please indicate whether the following statements are true or false according to your library.

		True	False
i)	The library uses OCR (Optical character recognition) conversion of images of typewritten or printed text into machine-encoded text.	❍	❍
ii)	The library organizes training programs for the Library personnel to use the digital sources.	❍	❍
iii)	The library arranges training for the user community to use digital resources.	❍	❍
iv)	The library conducts market promotion about the digital resources and services among the user community.	❍	❍
v)	The library maintains a Twitter account.	❍	❍
vi)	The library maintains a Facebook account.	❍	❍
vii)	The library provides virtual reference services.	❍	❍
viii)	The library has an online learning module for the user community about the use and access to the digital resources.	❍	❍
ix)	The library has a plan for collaborative digital preservation with similar kind of libraries.	❍	❍
x)	The library has a plan for National level collaboration of digital resource management.	❍	❍

6a) How would you define your organizational digital resource management system?

6b) What are the top five obstacles you have faced during digitization of the library resources?

6c) Please mention a definition of digital library which you prefer most.

6d) Please mention a definition of institutional repository which you prefer most.

7. Please provide any suggestions/comments that you think relevant for the current situation and/or future direction of digital resource management in Bangladesh.

(Online questionnaire for the library professionals)

Q1. Please mention a definition of digital library that you prefer most.

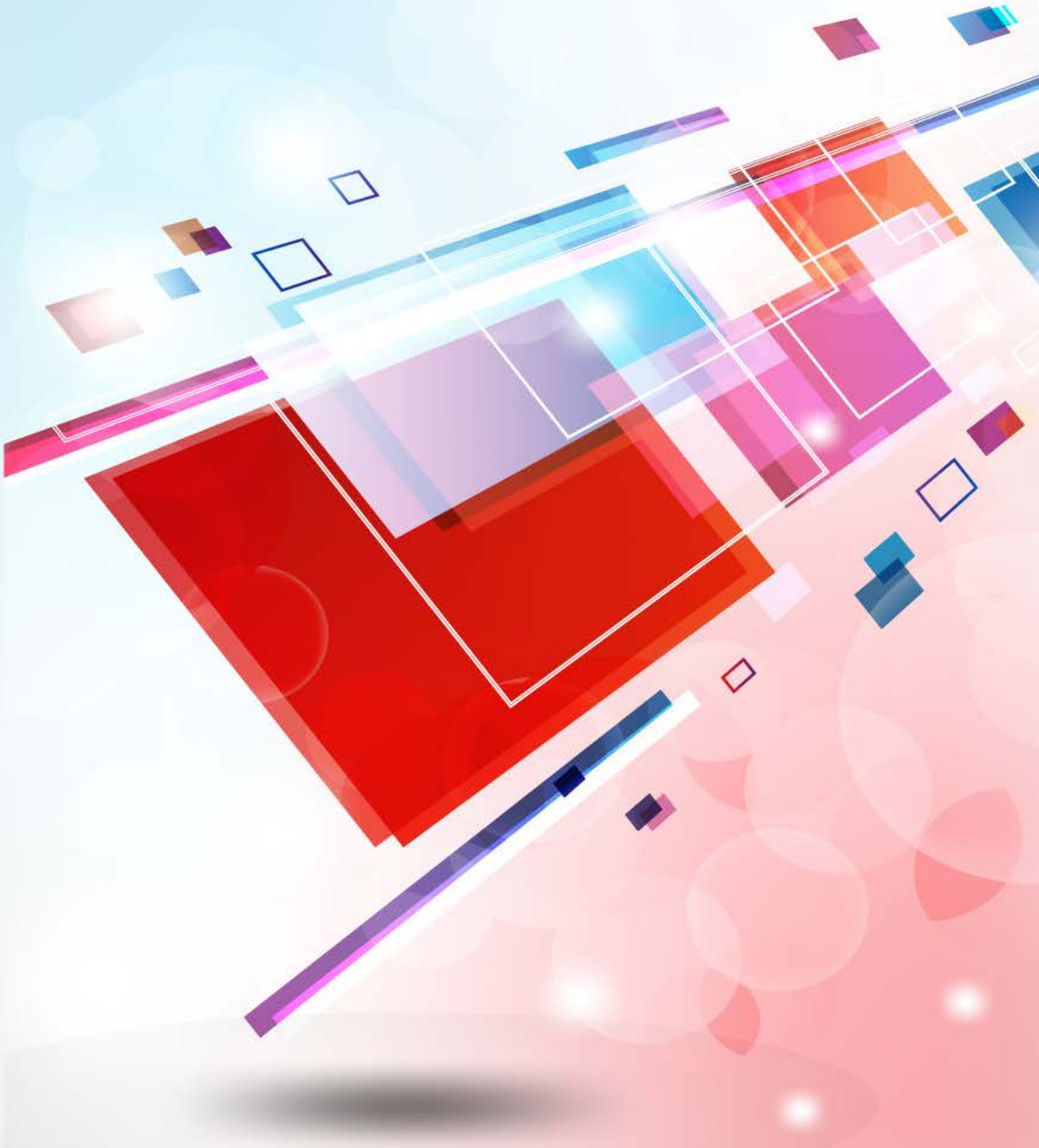
Q2. Please mention a definition of institutional repository that you prefer most.

Q3. Please provide any suggestions/comments that you think relevant for the current situation and/or future direction of digital resource management in Bangladesh.

Proceedings of National Seminar on Cross-talk of Digital Resources Management: Step towards Digital Bangladesh

Dhaka, Bangladesh.

22 August 2015



ISBN 978-984-33-9521-4