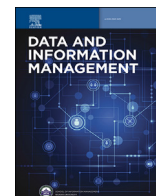




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An effective digital safeguarding system in university libraries: A model plan

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ABSTRACT

The purpose of the study is to present a model plan for developing an effective digital maintenance system with the help of institutional repository software in university library premises. This work is an investigative study of digital maintenance activities for sustainable development of the digital publications and intellectual outputs of universities in Bangladesh. The researchers investigated the university and university website and found that only 11% university libraries were active in preserving their digital resources while 89% of university libraries were either in the dark or less reluctant to adopt the system. Researchers realized that due to lack of proper guidelines and an ideal model plan, most of the university libraries were far behind in adopting a repository system for safeguarding their intellectual outputs. Hence this study describes a model plan for the university libraries of Bangladesh to create a sustainable preservation system easily and effectively. The model plan in this study was based on observation and review of the literature in the concerned field. All university authorities can follow the mentioned model for sustainable maintenance of their intellectual digital assets.

1. Introduction

Bangladesh is one of the probable and on the way of developing country in the world. The universities of Bangladesh are mainly categorized into public and private universities. The public universities are funded by the government, whereas, private universities are funded by non-government organizations and private bodies. There are also a number of international universities in Bangladesh. These are governed and funded by international bodies. At present, there are 46 public (Government), 106 private (Non-government) and 03 international universities in Bangladesh (UGC, 2, 020.). All of them have their library services with more or less modern digital library software facilities. Experience exposed that the university libraries of Bangladesh are almost tended to be placed more overtly on “collections”, rather than on services to users; on “administrative procedures”, rather than on ease of use; and on “rules and regulations”, rather than on what users want. Although a number of researches (Hossain & Islam, 2012) were conducted on digital preservation, but, attention was paid on the judgment of total library services. The most important problem for scholars and researchers in universities and research organizations of developing countries is the lack of access to the current literature in their subjects. Since important research output is most often published in journals with high subscription fees, collecting the required journals exceeds the capacity of most libraries. Moreover, in developing countries also the research

infrastructure and the capacity to absorb scientific and technical knowledge are weak, leading to low levels of scientific output and further under-development (Islam & Akter, 2013; Okerson, 2004). In the last decade a great number of Digital Library (DL) and Digital Repository (DR) systems have been developed and published as open-source software. The variety of available software systems becomes a headache when an organization plans to build a repository infrastructure to host its collections (Pyrounakis et al., 2014).

As it is clear that the usage and present scenario of digital preservation through Institutional Repository software in public and private university libraries of Bangladesh is not satisfactory level to meet the present research demand of the researchers, an attempt has been made to propose a fundamental model plan for establishing effective IR system in university libraries of Bangladesh. The model will help the university libraries those are using IR and other university libraries also those are planning and interested to establish Digital Library Software for building Institutional Repository. The prime objective of the library of a higher educational institution is to fulfill the needs and demands of the students, faculty and research fellows. Most of the public and private university libraries of Bangladesh are contributing tremendously by preserving the digital publications to ensure open access to the institutional repository. A good number of faculty members, research scholars and students are encompassed in teaching and research activities, and they need immense information and resources relating to their research areas. The

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information seekers depend on the university libraries for their required research and advance searching.

2. Objectives of the study

This study is designed and carried out with a view to propose a model plan for sustainable digital preservation system in university libraries of Bangladesh. More specifically:

- > To present a model plan of digital repository and
- > Put forward some recommendations that would be more effective for using the DLS as IR for the university libraries of Bangladesh.

3. Literature review

First OA movement in Bangladesh started from icddr,b by making publicly available icddr,b Journal of Diarrhoeal Disease Research (JDDR) in 1997, later the Journal of Health, Population, and Nutrition (JHPN) in 2000, and then building an Institutional Repositories (IR) in 2005 (Uddin, K. & Hossain, 2014). Mostofa et al. (2015) discussed the roles of IR in enhancing higher education and scholarly communication in Bangladesh. Tabassum et al. (2015) explored the factors that influenced usage of digital libraries based on a case study of East West University Digital Library (EWUDL) in Bangladesh. Chowdhury et al. (2011) particularly focused on the development of institutional repositories using DSpace software in Bangladesh, and provided a review of the current situation and examines prospects of IR. Islam and Akter (2013) focused on the different aspects of OA in developing countries and on the OA status in Bangladesh. The greatest challenge toward digitization programs in Bangladesh is the continuing cost of assembling content and providing access to the inhabitant of the country (Alam, 2012). Ahmed et al. (2014) mentioned the theses and dissertation to be included in institutional repository. Hossain & Islam (2012) discussed on the use of institutional repository software, but attention was paid on the judgment of total library services. Ahmed & Shoeb (2009) described the functionality of institutional repository of DSpace and Greenstone. Although it is very hard to determine which one is the best. DSpace can be used to university libraries at most. Some research mentioned that the theses and dissertation should be included in institutional repository. They suggested that digital publications should be included into institutional repositories. The variety of available software systems becomes a headache when an organization plans to build a repository infrastructure to host its collections (Pyrounakis et al., 2014). However, the success of IR is dependent on the contribution of researchers and faculty members (Alemayehu, 2010). Kumar (2009) stated that most of the institutes adopt the open source IR software for creating/developing their own repositories. Bankier and Gleason (2014) compared the five most widely adopted IR platforms: Digital Commons, DSpace, Eprints, Fedora, and Islandora. Another comparison studied by Castagné (2013) reported an environmental scan of institutional repository software packages and frameworks. DSpace, Eprints, Digital Commons and Fedora Commons were selected based on their ROAR statistics and overall suitability for a large research library. Dhanavandan and Tamizhchelvan (2014) discussed about the recent trends and growth of Institutional Repository (IR) in south Asian countries. They found among the five countries, India 62(82.67%), Bangladesh 7(9.33%), Pakistan 3(4.00%), Sri Lanka 2(2.67%) and Nepal 1(1.33%) institutional repositories have developed respectively. Pyrounakiset al. (2014) discussed 5 widely used institutional repositories namely DSpace, Fedora, Greenstone, EPrint and Invenio and proposed suitable software for the scholarly publication. Alemay (2010) described that IR is considered one of disseminating & preserving method of digital publication of the institution. Jose (2007) tried to identify the world wide extent of adoption of open source digital library software packages in various organizations through an online survey. Jain, Bentley, & Oladiran (2010) discussed the benefits and obstacles of setting up an IR, and librarians' and authorities' roles in the

successful management of an IR. This is a clear indication that the movement of green road to open access through institutional repository in Asian region is in the age of infancy (Nazim & Mukherjee, 2011).

4. Materials and method

4.1. Population and sampling

To examine the study and to get the concept of Digital Library (DL), Digital Preservation and Institutional Repository (IR) literatures on digital preservation, digital library and institutional repository from national and international arena were reviewed. Additionally, to catch the existing scenario of digital preservation in higher educational institutions of Bangladesh an overlook has been carried out in all public and private university libraries of Bangladesh. As a result we found some leading university libraries are using Open Source Digital Library Software (OSDLS) for building IR and most of the university libraries are not using the Institutional Repository for the digital preservation. Finally a survey was carried out in the 17 university libraries of Bangladesh; 7 public (Table 1), 10 private university libraries (Table 2) those are functioning the digital preservation activities fully through institutional repository software. Based on the survey, observation and literature study the researchers made a model plan for successful implementation of IR in university libraries commonly.

5. Statement of the problem

Most of the university libraries of Bangladesh have not been yet used DLS for building Institutional Repository; even there are some libraries those are not conscious about it. Open Source Digital Library Software (OSDLS) as Institutional Repository (IR) system has created opportunities for the universities of Bangladesh though library budgets is comparatively less and cannot afford to purchase, maintain and upgrade proprietary IRS. The OSDLS is more cost-effective than proprietary Integrated Library Systems (ILS). University libraries internationally tended to move towards the adoption of OSDLS for safeguarding the institutional publications. Although the experience of library professionals on repository software is worried with the installation process, they are modestly more satisfied than users of proprietary ILS. From the literature review, it is found that there are some studies have been conducted on practical experience on implementation of specific OSS as Institutional Repository, comparative analysis of different IRs packages, library professionals' perception and satisfaction with the various or particular aspect of IRs worldwide. But comparatively less initiative has been taken to present the overall condition of IR and to present any

Table 1
Public university library repository and URL.

S.N	Library name	IR name	URL
	Bangladesh Agricultural University Library	DSpace	http://dspace.bau.edu.bd/
	Bangladesh University of Engineering and Technology Library	DSpace	http://lib.buet.ac.bd:8080/xmlui/
	Chittagong Veterinary and Animal Sciences University Library	DSpace	http://101.2.160.165:8080/
	Khulna University of Engineering and Technology Library	DSpace	http://library.kuet.ac.bd:8001/jspui/
	Sher-e-Bangla Agricultural University Library	Customized/DSpace	http://www.saulibrary.edu.bd/daatj/public/index.php
	University of Dhaka Central Library	DSpace	http://repository.library.du.ac.bd/xmlui
	University of Rajshahi Central Library	DSpace	http://repository.ubn.ru.nl/

Table 2
Private university library repository and URL.

S.N	Library name	IR name	URL
	Ayesha Abed Library, BRAC University	DSpace	http://dspace.bracu.ac.bd/oai/request
	Daffodil International University Library	DSpace	http://dspace.daffodilvarsity.edu.bd:8080/
	Eastern University Library	DSpace, Greenstone	http://dspace.easternuni.edu.bd:8080/xmlui/ http://gsdl.easternuni.edu.bd/greenstone/cgi-bin/library.cgi
	East West University Library	DSpace, Greenstone	http://dspace.diu.ac.bd/oai/request http://gsdl.ewubd.edu/greenstone/cgi-bin/linux/library.cgi
	International Islamic University Chittagong Library	DSpace	https://dspace.iituc.ac.bd/xmlui/
	Independent University Bangladesh Library	DSpace	http://www.dir.iub.edu.bd:8180/
	North South University Library	DSpace	http://dspace.2283337.n4.nabble.com
	Northern University Bangladesh Library	DSpace	http://202.74.245.22:8080/xmlui/
	Premier University Chittagong Library	DSpace	http://101.2.163.148:8080/xmlui/
	Stamford University Library	DSpace	http://182.160.110.28:8080/jspui/

model plan for implementing IR in other university libraries. In Bangladesh, a few numbers of studies have been conducted on describing the practical experience of implementation of DSpace, and usability of DSpace interface, but no effort has been made to study on the overall status of building institutional repository, factors, challenges for the adoption of IRS in higher educational institutions especially in the university libraries. Most of the university libraries are not yet using repositories due to lack of clear guidelines and model. A model is needed for them and for the convenience of library professionals. The proposed model plan will play an effective role in filling that gap. So, it is expected to determine the extent the application of DL Software in university libraries for building awareness among library professionals, users and university authorities regarding the preservation and distribution through IR. It is also needed to describe the challenges, probable benefits, and actual remedies for the adoption of IRS to enhance the extent of implementation and use of IRS in universities.

6. Model Plan

6.1. Characteristics of the model plan

The university libraries are trying to provide information according to the user's interests. The performance of the respective university libraries depends on the satisfaction level of the faculty members, researchers and students. To meet up the maximum demands of the users regarding repository services the library should ensure an effective IR policy and present an ideal IR model. It is necessary to build a system that can meet the information needs and expectations of the researchers and advance level students. The model plan has the following characteristics:

- It has been proposed based on the economic condition of Bangladesh;
- The plan includes all the necessary elements which elements should be inserted in the repository system;

- The model plan has been proposed to set up a modern IR system by ensuring all modern tools and technological advances;
- The plan has been proposed to set a digital repository system suitable and affordable for all university libraries of Bangladesh;

6.2. Objectives of the model plan

The ultimate goals of the proposed model are to preserve all university publications and intellectual outputs digitally and to establish a useful IR system to meet up needs and demands of the faculty members, research fellows and advance level students of university of Bangladesh. However, based on the survey result, the following objectives have been selected for the proposed model plan:

- To develop a comprehensive mechanism to get access in institutional repository swiftly;
- To establish an effective information dissemination system in university libraries of Bangladesh;
- To help the faculties and other researchers for teaching and research activities;
- To develop and increase the users' satisfaction level;
- To ensure digital preservation of university research outputs;
- To ensure open access to the university resources;
- To propose guidelines for designing very effective IR system for higher educational institutions;
- To propose a standard model for establishing IR system in university libraries;
- To indicate and give the right directions for implanting the IR system in a cost effective way.

6.3. Probable benefit

Probable benefits of the model plan will be as follows:

- Effective IR system of the university libraries for long time preservation;
- All kinds of institutional publications and intellectual research outputs will be properly preserved;
- Better management and maximum accessibility to the institutional resources will be ensured;
- Appropriate utilizations of the institutional publications and research outputs on digital format adopting modern IR systems;
- Development of Digital Library System (DLS) for preserving the valuable publications of respected higher educational institutions; and

6.4. Functions of the model plan

Bearing in mind the current position of the university libraries of Bangladesh the following tasks and actions have been selected for the proposed model plan:

- Collecting and preserving the university resources with the help of modern IR tools and techniques;
- Introducing with new facilities and enhancing the effectiveness of the IR facilities.
- Making a standard format for IR system; and
- Groundwork of development stages to implement the digital library management system in the university libraries of Bangladesh.

6.5. Scope of the model plan

The model plan comprises all the key components required for development of Institutional Repository system in university libraries. Therefore, it makes provisions not only for ensuring the effective guidelines for the university publications policy makers from university

authority to collect, preserve and disseminate the university publications but also the University Grant Commission (UGC) will find a helpful direction to monitor the university publications. The areas which have been covered by the plan are necessities of standard digital library services through the university libraries; providing efficient services to the faculty members, researchers and research students and bringing digital collection to the remote users; introduction of Institutional Repository and development strategies; and proposing standards for the university repository growth and development.

6.6. Strategy of the plan

This Model Plan has been suggested in the perspective of socio-economic condition of Bangladesh and has been prepared with detailed attention and review of the university library atmosphere including university vision, mission, objectives, repository users, annual budget, library staffs, repository collection, users satisfaction, deposit tendency of faculty, university act, UGC regulation, library standard, information needs and demand, impact of repository collections etc.

6.7. Possible barriers of the model plan

Bearing in mind the present university library status in Bangladesh and reviewing the significant literature the following barriers may be faced by suggested model plan:

- Unwillingness of the university authority to build IR;
- Copyright permission for digital preservation of the university publications;
- Inadequate financial support;
- Absence of national and university repository policy/standard;
- Lack of skilled and trained professionals;
- Absence of appropriate library standard;
- Lacking of infrastructural and technological facilities;
- Absence of cooperation for founding consortium and networking from participating university libraries; and
- Reluctance to register in Open DOAR.

6.8. Components of the model plan

The following necessary components were recognized for establishing the repository system in public and private university libraries and distributed commonly for setting an Institutional Repository platform.

- An Open Source Digital Library Software (OSDLS)
- DSpace Institutional Repository Software
- Repository administrator
- Skilled IR professional
- Item collections, such as thesis, dissertation, article, report, presentation etc.
- Structural development of the repository software
- Operational activities
- Target
- Open DOAR/Digital Library Consortium
- Library IR branch
- Monitoring by UGC wing

In view of the earlier discussion, and based on previous theoretical literature review a conceptual model of institutional repository for university libraries of Bangladesh is proposed in Fig. 1 and Fig. 2 respectively.

6.9. Open source Digital Library System (OSDLS)

There are many alternatives for choosing repository software now-a-days. university authority should select an ideal Digital Library System

(DLS) for IR purposes. Like many of the digital library projects, the university libraries should use Open Source Software (OSS) as its repository. The main advantage of open source software is that it provides tractability for homegrown customization and attractive modules enhancements. Many universities have the limitation to build IR for the financial condition. Cost saving software can be the ideal solution in this field.

6.10. DSpace institutional repository software

IR ensures the long time preservation of the institutional publications. Publicly accessible, standard, provision for searching and retrieving the desired documents should be included in the repository software. Considering observational experience and reviewing related literature DSpace has been proposed for the university libraries of Bangladesh as well as considering the following standards:

- a) provide network access and user & repository administrator friendly interface;
- b) easy functions;
- c) support multimedia content; and
- d) allow users to search the text of all documents in different ways etc.

6.11. Repository administrator

For supervising and maintaining the repository work a responsible personnel has been proposed in the model, who will be called repository administrator.

6.12. Skilled IR professional

To operate and coordinate all repository activities a skilled IR professional should be responsible in the IR section of the library premises.

6.13. Items should be collected

IR should have to create in each library for collecting, preserving and showcasing intellectual research items produced by faculty members, researchers and students of the university. Furthermore, administrative documents, reading materials, important presentations, valuable images, teaching materials, curriculums and prospectus etc. can be preserved in the institutional repository. To keep the standard level the following items should be preserved in the repository:

- a) PhD thesis
- b) MPhil thesis
- c) Dissertation
- d) MS thesis
- e) Journal article
- f) Research work
- g) Clinical and productive report
- h) All important university publications

6.14. Structural development competition

To operate the repository software and to search and find the collection easily and smoothly collection should be uploaded properly and effortlessly. The collection should be categorized under the following structure:

- a) Community: all collections should be categorized broadly and primarily in community basis. Every faculty will be included in community.
- b) Sub community: Every community will be consisted with some sub communities.
- c) Department and subject: Department and subject wise collecting will be preserved in community and subcommunity.

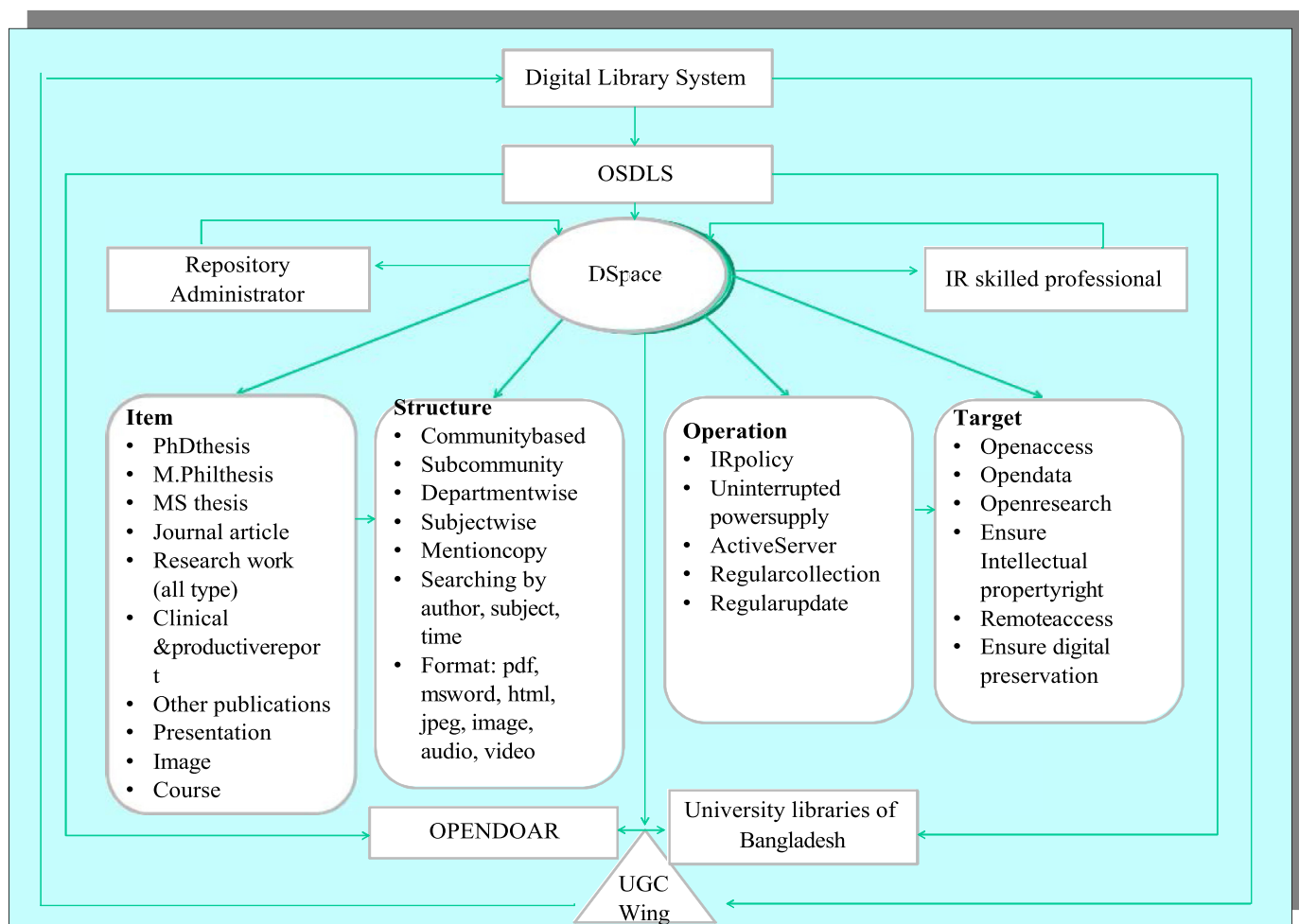


Fig. 1. Proposed model of IR system for university library.

- d) Mention number of copy: Community or all subject basis collection should be mentioned with number of copy.
- e) Multiple search: searching option should be multiple like author, title, subject, year etc.
- f) Format: format should pdf, MS word, html, jpeg, image, audio, video etc.
- g) There should have login option for categoral users.

- d) Regular collection: Authority will make sure the regular basis collection.
- e) Continuous upload and update: The university collections will be collected regular basis and all collection will be uploaded and updated continuously.

6.16. Target

The following options will be targeted of this model plan:

6.15. Operational activities

The following options should be remained in operational activities:

- a) IR Policy: The university authority will make an IR policy. The following policy issues should be included during the early stage of planning of IR:
 - All IR collection totally open and accessible to all. If a faculty member wishes to restrict access to the document, it will not be accepted or will be accepted with some restriction.
 - Researchers will submit the hard copy of the paper giving permission to preserve it for users and repository administrator will take the initiative.
- b) Uninterrupted power supply: The authority will ensure the repository collection publicly accessible always. The users can be frustrated in getting his/her desired documents due to uninterrupted power supply.
- c) Active server: Most of the time the documents can be missed if the server no active properly. So the authority should make sure that the server is always active.

- a) Ensure open access: One of the prime objectives of maintaining repository is to ensure open access to university publications and intellectual writings. For society it provides access to the world's research and activities.
- b) Open Data: The people have right to get right information in right time. To ensure this theme institutional repository can be a good media. Higher educational institutions can take necessary steps to ensure open access to its scholarly publications. All faculty members, students and researchers of institutions should stand to preserve publications and make it free accessible to all through IR.
- c) Open research: For society it provides access to the world's research and ensures the long term preservation of the research publications.
- d) Intellectual property right: Some of researchers are unaware of submitting their works in Repository. They have misunderstanding about open access. Actually it's their misapprehension. They don't know that OA ensures their work originality. It protects work from being plagiarism. IR administrator should make the munderstood.

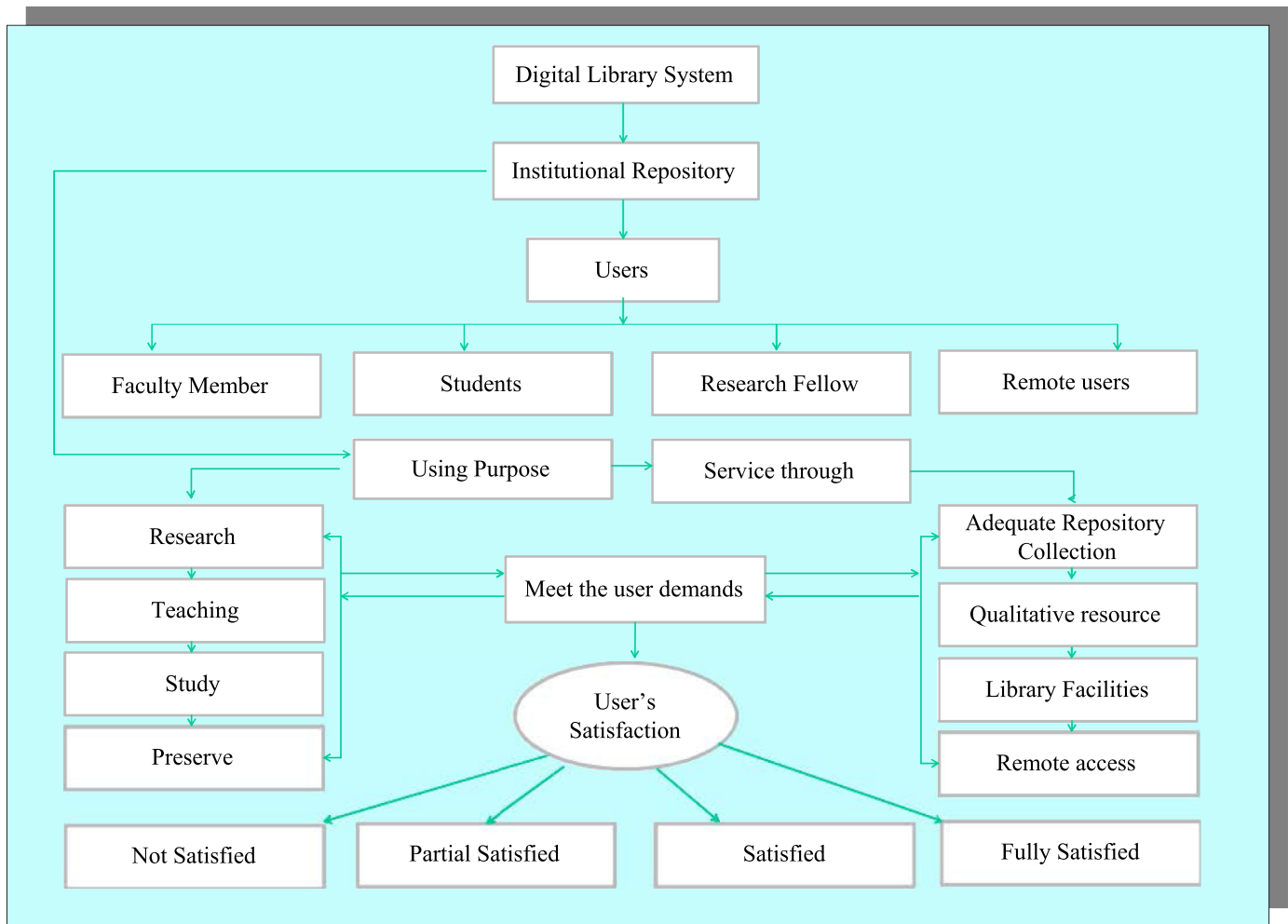


Fig. 2. Proposed user's satisfaction model.

- e) Remote access: The institutional repository acts as a central archive for the university works, representing an outlook that provides a complete list of their research over the years.
- f) Increasing the impact: Because it is open access, it increases the dissemination and impact of the work of the higher educational institutions. For institutions IR acts to preserve the university resources. It increases the visibility and prestige, and can act as an advertisement for funding sources and industrial sponsors.
- g) Ensure digital preservation: It ensures a means for institutions to create archives and make available their wealth of knowledge. It allows researchers to self-archive their own material and make sure the long term preservation of their research items through digital preservation.

6.17. IR section

University authority will create an IR section to ensure the total repository functions in the library atmosphere.

6.18. Monitoring by UGCwing

The aim and role of UGC in higher education is to coordinate, determine and maintain the ethics in higher educational institutions. The commission maintains the interpretation among the universities, government and the communities. UGC has also set some standards for the

universities for being standard university. With the growth of higher educational institutions in Bangladesh, many top, medium, and small universities are being established day by day. For ensuring higher education universities should maintain the standard level. The University Grant Commission (UGC) can play the significant role to keep repository standard in university level. Universities can be asked for accountability of their digital preservation activities or OA movement.

They perform their role observing the following activities:

- a) UGC can make a separate wing which will monitor the preservation activities of university publications through repositorysoftware;
- b) UGC may be right body to ensure OA. UGC authority can make a committee to observe the open access movement by the respected universities;
- c) They should give directions to the university authority and observe the condition occasionally;
- d) Make a repository standard for university; and
- e) They can ask annual report from the university authority about repository development of the respected university.

6.19. User satisfaction

Users' expectations are formed on the basis of adequate resources, services and facilities. Quality library resources, services and facilities can meet the expectations of the users. To meet up the needs and

demands of university faculty member, researchers, research fellow, students and remote users the plan should be flexible and easy to access following the purpose, media and target.

Purpose:

- to develop the research activities;
- to help teaching related education for faculty members;
- to acquire research knowledge related to his/her study; and
- to preserve the university publications and intellectual outputs of the researchers for longtime.

Media:

- adequate repository collection,
- qualitative resource
- library facilities
- remote access

Target:

The target is to meet the users' demand. So that the satisfaction level of the users will be high and reached the standard level.

7. Model validation

A model is an explanation of reality, and there is trade-off between difficulty and usability. Model validation is method designed to ascertain the restrictions of a model and help accomplish the connected threats. An effective model includes probable benefits as well as plausible barriers. There are some steps to validate the effectiveness of model such as usefulness of the model, review of data, assumptions and methodologies, model performance, outcome analysis, validation report. Reflecting these steps the prescribed model plan highlights the characteristics, objectives, probable benefits, functions, scope, strategy, possible barriers, components and suggestions etc briefly which examines the effectiveness of the model and proves as an effective model for the university libraries to implement IR system.

8. Conclusion

The success in implementation of a model plan mainly depends on the methodical approach, economical competency and administrative provision from the concerned authority. As libraries work to define their role in the constantly changing university environment, focusing on how research and scholarship is disseminated will provide unique and important opportunities. Libraries are well suited to support these efforts on both an individual researcher and university-wide basis. However as new tools and services develop, it will be important for library staff to focus on providing qualitative repository services while also meeting individualized needs. The models described in this paper will serve as valuable starting place for libraries wishing to accomplish these goals (Armstrong, 2014). Users are the main focus of the library. The effectiveness and efficiency of the library totally depend on the satisfaction of users (Islam, 2014). Both Public and Private university libraries of Bangladesh are trying to meet the research needs and satisfaction of the users. In this regard an organized system is very necessary especially in repository scheme. University authorities can follow the model for establishing Institutional Repository. It may be concluded that this is the

effort to present model plan or study on use of institutional repository in the university libraries that can be followed by any university libraries.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

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