DIGITAL LIBRARY INITIATIVES IN MEDICAL LIBRARIES OF BANGLADESH

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গ্রন্থাগার

DIGITIZED

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GIFT

Thesis submitted to the University of Dhaka for the partial fulfillment
of the Degree of Master of Philosophy in
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BY
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Department of Information Science and Library Management
University of Dhaka
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Dedicated to

My Parents

My Wife Beauty, Son Fahmid and Daughter Nabila -
Sources of all my encouragements

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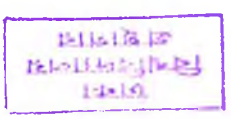

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Certified that the work incorporated in the thesis entitled **Digital library initiatives in medical libraries of Bangladesh** was carried out by Md. Shafiur Rahman under my supervision.

07.8.18

(Dr. S. M. Mannan)
Supervisor

DECLARATION

The work reported in this thesis is original and has not been submitted by me to any university or institution for the award of any degree or diploma.

Such material as has been obtained from other sources is duly acknowledged in the thesis.

Md. Shafiur Rahman

PREFACE

The core objective of the study is to explore the digitization and digital library initiatives by the library administrator/higher authority and information professionals in six selected medical libraries of Bangladesh. To meet this aim, the study analysed the demand for digital contents in medical libraries of the country; explored the existing ICT tools and services to carry out Digital Library System (DLM); analyzed the prevailing digitization practices; identified the major issues and hindrances affecting digital library services; and identified the initiatives for developing Institutional Repositories and Library Automation.

Keeping in view the exploratory and explanatory nature of the objectives of the study, the sequential mixed methods design by using quantitative and qualitative techniques has been used. In this research study the researcher has taken non probability sampling approach and chosen convenience sampling method. The investigator distributed a total of 380 questionnaires amongst the scientists, doctors, students, researchers and staff members of six medical libraries selected for the study. Out of 380 questionnaires distributed a total of 296 filled questionnaires were received with a response rate of 77.89%.

Information is vital for the socio-economic progress of a country like Bangladesh and well-being of the nation or society is due to the fact that 'knowledge is Power'. The wave front of information is expanding at a terrific speed and it is becoming increasingly difficult for an individual, scientist or research worker to keep himself abreast or informed of the latest thoughts in his field of specialization in any part of the world. In this respect, digital medical library system would play a leading role for ensuring the free flow of information to the medical professionals. Realizing the importance of digital library development, this study investigated their readiness in transforming from traditional based, through the extent of library automation and digital library initiatives, examining the existing ICT facilities for developing Digital Library System in the surveyed six medical libraries.

The evolving transition from traditional libraries to digital libraries is prominent to a changing library environment. This condition requires a systematic understanding of the implications of such changes on developing digital library system and services in the new digital environment. The other side of this scenario is the resultant changes in user expectations. In other words accepting the impact of change as a result of transition from conventional library to digital library and aligning library services in

accordance with changing user expectations becomes an important task for a library professional.

The present study aims at understanding various issues related to managing digital libraries in the six surveyed medical libraries in Bangladesh. The findings of this study covered various issues regarding digital library infrastructure, digital library services provided, available e-resources and online databases, Institutional Repository, library networks and consortium etc. The study makes it amply clear that only icddr,b and BSMMU libraries are having basic digital library infrastructure and there is a tremendous scope for development of digital library system services in other medical libraries in Bangladesh. Two major concerns in developing digital library services are right kind of budgetary support from managements and training the staff to enable them to work effectively under emerging digital library environment.

The study was initiated with literature search on various topics of digital resources and management aspects of digital resources. The researcher personally visited different medical libraries in different parts of Dhaka city to know the present status of digital resources management in those libraries and interacted with the professionals involved in the digital resources management in those libraries to know the policies, technical method and the problems they are facing in managing the digital resources. A questionnaire based survey was conducted to find out the present status of management of digital resources in the surveyed medical libraries.

The present scenario of various aspects of digital resources management in the medical libraries in Bangladesh are traced out from the study. From the analysis of data, it is observed that the present scenario of the studied medical libraries with regards to the proper management of the modern ICT tools and technologies is not satisfactory as is predictable. A number of recommendations for proper implementation and improvement of the present position of the medical libraries in Bangladesh regarding e-resources management and digital library services are recommended.

It was exposed that libraries hold a large number of valued information resources which need to be digitized. Most of the libraries present primitive level of readiness to carry out digitization activities. Medical libraries which are better equipped with technological resources i.e. icddr,b library and BSMMU library are relatively advantaged in carrying out digitization activities/projects. Libraries felt the need to

digitize their collections. However, a small number of libraries were actually involved in the process. Digital library initiatives are still in the nascent stage and it is being carried out in a disorganized manner in the absence of a formal policy or plan. Hindrances and issues associated with digital library system process include: absence of modern tools and technologies; no standard digitization plan, policies, and procedures; greater preference to other projects; lack of financial, technological, and skilled human resources; etc. The respondents considered that University Grants Commission of Bangladesh may play a major role in the promotion of digital library systems and services in medical libraries of Bangladesh. Respondents agreed that collaboration among medical libraries can be an effective way to successfully proceed well organized collection of e-resources. This research work can serve as a basic guideline to the Library & Information Professionals to select and implement proper digital resources management methods in near future. The research work will be of utmost value to academic communities, researchers, Library & Information professionals, developers of various tools and methods of digital resources management.

Md. Shafiur Rahman

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I am also thankful to library colleagues and Management of icddr,b, who supported me in completing this study. Among them, I thank Mr. Al-Mamun, Manager, Library; Mr. Harun-or-Rashid Khandaker, Senior Library Officer; Mrs. Humaira Qadri, Senior Administrative Officer and Mr. Ekramul Hasan, Administrative Officer, LISS, icddr,b, for providing valuable suggestions and support. In pursuing the study, I had to depend on different national and international publications. I am indebted to the authors whose work I have used in this study.

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Md. Shafiur Rahman

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LIST OF ABBREVIATIONS

AC	—	Air Conditioner/Cooler
ACM	—	Association for Computing Machinery
AGORA	—	Access to Global Online Research in Agriculture
AHEAD	—	Asian Health, Environmental and Allied Databases
AIC	—	Agricultural Information Center
ALA	—	American Library Association
ARDI	—	Access to Research for Development and Innovation
ARL/ACRL	—	Association of Research Libraries/ Association of College and Research Libraries
ATHENS	—	Advanced Thematic Navigation System
BALID	—	Bangladesh Association of Librarians, Information Scientists and Documentalists
BANBEIS	—	Bangladesh Bureau of Educational Information and Statistics
BanglaJOL	—	Bangladesh Journals On Line
BANSDOC	—	Bangladesh National Scientific & Technical Documentation Centre
BANSLINK	—	Bangladesh National Scientific and Library Information Networks
BAS	—	Bangladesh Academy of Sciences
BBS	—	Bangladesh Bureau of Statistics
BCC	—	Bangladesh Computer Council
BCPS	—	Bangladesh College of Physicians and Surgeons
BCPSL	—	Bangladesh College of Physicians and Surgeons Library
BdREN	—	Bangladesh Research and Education Network
BIRDEM	—	Bangladesh Institute of Research and Rehabilitation for Diabetes, Endocrine and Metabolic Disorders
BIRDEML	—	Bangladesh Institute of Research and Rehabilitation for Diabetes, Endocrine and Metabolic Disorders Library
BRACUL	—	BRAC University Library
BSMMU	—	Bangabandhu Sheikh Mujib Medical University
BSMMUL	—	Bangabandhu Sheikh Mujib Medical University Library
BTCL	—	Bangladesh Telecommunications Company Limited
BUETL	—	Bangladesh University of Engineering and Technology Library
CAS	—	Current Awareness Services
CCC	—	Close Circuit Camera
CDROM	—	Compact Disc-Read Only Memory

CDS/ISIS	—	Computerized Documentation System/Integrated Set of Information System
CDLR	—	Center for Digital Library Research, Glasgow
CMS	—	Content Management Software
CRL	—	Cholera Research Laboratory
CMS	—	Content Management System
DARPA	—	Defense Advanced Research Projects Agency
DC	—	Dublin Core
DCMS	—	Department for Culture, Media and Sport, UK
DISC	—	Dissemination of Information Service Centre
DL	—	Digital Library
DLF	—	Digital Library Foundation
DLMS	—	Digital Library Management System
DLNETSA	—	Digital Library Network South Asia
DLS	—	Digital Library Systems
DLIs	—	Digital Library Initiatives
DMC	—	Dhaka Medical College
DMCL	—	Dhaka Medical College Library
DOAR	—	Directory of Open Access Repositories
DOI	—	Digital Object Identifier
DPC	—	Digital Preservation Coalition
DRM	—	Digital Rights Management
E-Books	—	Electronic Books
E-Journals	—	Electronic Journals
ETD	—	Electronic Theses and Dissertations
EU	—	European Union
EWUL	—	East West University Library
FAO	—	Food and Agricultural Organization
FBI	—	Federal Bureau of Investigation
FOSS	—	Free and Open Source Software
GDP	—	Gross Domestic Product
GLAS	—	Graphical Library Automation Software/System
HEQEP	—	Higher Education Quality Enhancement Project
Hinari	—	Hinari Access to Research for Health Programme
HL	—	Hybrid Library
HTML	—	Hyper Text Markup Language
IBM	—	International Business Machines

icddr,b	—	International Centre for Diarrhoeal Disease Research, Bangladesh
ICL	—	International Copyright Law
ICT	—	Information and Communication Technologies
IEEE	—	Institute of Electrical and Electronics Engineers
IIDL	—	International Islamic Digital Library
ILL	—	Inter Library Loan
ILS	—	Integrated Library Systems
IMLS	—	Institute of Museum and Library Services
INASP	—	International Network for availability of Scientific Publications
INFLIBNET	—	INFormation and LIBrary NETwork
IPs	—	Information Professionals
IPR	—	Intellectual Property Rights
IR	—	Institutional Repository
ISP	—	Internet Service Provider
ITR	—	Information Technology Research
IS	—	Institutional Repository
ISBD	—	International Standard Bibliographic Description
ISLM	—	Information Science and Library Management
ISO	—	International Standard Organization
ISRT	—	Institute of Statistical Research and Training
ITU	—	International Telecommunication Union
JCDL	—	Joint Conference on Digital Libraries
LAB	—	Library Association of Bangladesh
LC	—	Library of Congress
LDC	—	Least Developed Countries
LIC	—	Library & Information Centre
LISS	—	Library & Information Services Section
LOM	—	Learning Object Metadata
MEDLINE	—	Medical Literature Online
MPhil	—	Master of Philosophy
MARC	—	Machine Readable Cataloguing
MARC 21	—	Machine Readable Catalog 21
MBBS	—	Bachelor of Medicine/Bachelor of Surgery
MeSH	—	Medical Subject Headings
MIT	—	Massachusetts Institute of Technology
NA	—	Not Available
NASA	—	National Aeronautics and Space Administration

NDLTD	—	Networked Digital Library of Theses and Dissertations
NHLDC	—	National Health Library and Documentation Centre
NLM	—	National Library of Medicine
NGO	—	Non-Government Organization
OARE	—	Online Access to Research in the Environment
OCR	—	Optical Character Reader
PDF	—	Portable Document Format
PERI	—	Program for the Enhancement of Research Information
PGCB	—	Power Grid Company of Bangladesh
Ph.D	—	Doctor of Philosophy
PMUSE	—	Project MUSE
POPLINE	—	Population Literature Online
POPIN	—	Population Information Network
RFID	—	Radio Frequency Identification
RQ	—	Research Questions
RSS	—	Really Simple Syndication
SGML	—	Standard Generalized Markup Language
SWOT	—	Strengths, Weaknesses, Opportunities, and Threats
TL	—	Traditional Library
UDL	—	UGC Digital Library
ULs	—	University Libraries
UGC	—	University Grants Commission
UN	—	United Nations
UNESCO	—	United Nations Educational, Scientific and Cultural Organization
URL	—	Uniform Resource Locator
VOIP	—	Voice Over Internet Protocol
VSAT	—	Very Small Aperture Terminal
WAN	—	Wide Area Network
WB	—	World Bank
WDL	—	World Digital Library
WHO	—	World Health Organization
WIA	—	Windows Image Acquisition
WLAN	—	Wireless Local Area Network
WSIS	—	World Summit on Information Society
WWW	—	World Wide Web
XML	—	Extensible Markup Language

CHAPTER 1: INTRODUCTION & METHODOLOGY

- Background of the study
- Rationale of the study
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CHAPTER 1

INTRODUCTION & METHODOLOGY

Background of the Study

The rapid acceleration of web based digital resources available passing through the digital library website makes locating high-quality, authentic, and truly reliable and updated health and educational resources challenging for academics, doctors and scientists around the world. In the present information age, digital libraries are raising a foreseeable trend for library development. A digital library contains a vast amount of digital information resources in multiple media. It may provide readers with diversified information resources using digital and network technologies. Digital library provides an excellent opportunity to widely preserve, disseminate and greatly increase access to digital information resources effectively and efficiently. The appearance of digital libraries provides an extraordinary opportunity for comprehensive and easier access to a variety of information resources and new potential for their use. The main components and issues of digital libraries are the collection, digitalization, organization, design, preservation, retrieval, and evaluation of digital libraries. The grassland of digital libraries is frequently shifting with the prologue of new formats, standards, technologies, best practices, and the surfacing concepts of digital library design, evaluation, preservation, and digital curation ("Preface A2 - Xie, Iris," 2016). Recent developments in Information and Communication Technologies (ICT), particularly the World Wide Web, coupled with the increasing availability of research funds in the UK, USA and other parts of the world, have given birth to a number of digital libraries. A growing number of universities, national libraries, medical libraries, etc., are also investing a huge amount in building digital libraries. The development of digital libraries is bringing about significant changes in the creation, access, use and management of information (Chowdhury, 2003). We are passing through an era, which can be aptly called as an era of "Information Explosion". Information is vital for the socio-economic progress of a country like Bangladesh and well-being of the nation or society is due to the fact that 'Knowledge is Power'. The wave front of information is expanding at a terrific speed and it is becoming increasingly difficult for an individual, scientist or research worker to keep himself abreast or informed of the latest information in his field of specialization in any part of the world. In this respect, Digital Library Systems (DLS) and services would play a leading role for ensuring the free flow of information to the medical professionals.

The success of a digital library depends upon the Integrated Library Systems (ILS), strong ICT infrastructure, digital information resources, and knowledge of library professionals in connection with modern technology. Today we stand at a transition from the traditional library to a global digital library. The idea is to provide universal access to digital content available only in a digital library environment. In the information age, we require a digital library because the emergence of digital technology and computer networks has provided a means whereby information can be stored, retrieved, accessed and disseminated in a fast and efficient manner. On a global level, Digital Libraries (DLs) have made considerable advances both in technology and its application (Bhattacharya, 2004). The medical libraries in Bangladesh have not make significant progress towards development of Digital Library Systems leveled with developed countries but they are taking remarkable initiatives towards collection building of Digital Library Systems.

The emergence of digital libraries was in the early 1990's (Singh, 2012). In 1993, Internet revolution has made good shape for digital library development in Bangladesh. The overall digital library initiatives in Bangladesh is not at a satisfactory level so far. Though some leading public and private university libraries, medical and special libraries have been made significant attempts towards digital library initiatives such as library automation, developing Institutional Repositories (IR), Integrated Library Systems (ILS), subscribing to e-journals and online databases, networking through library consortium, scanning a few documents, or digitizing library documents and available these on Library Website/Intranet. So the medical libraries of Bangladesh are now facing new challenges and opportunities for the development of digital library system.

Rationale of the Study

Medical library plays a key role in providing necessary and updated health information services to its users accurately and efficiently. In Bangladesh, a good number of medical libraries are engaged for high quality information services to the researchers, scientists and physicians. Creating digital environment in Bangladesh through a set of well-planned Digital Library Systems is immense necessity to open the information horizon for fulfilling the vision of the Digital Bangladesh. Digital libraries have attracted almost all the developed and developing countries due to its features and the opportunities it extends to the information providers and information

seekers. So a sound digital library environment should be ensured for the medical libraries in Bangladesh.

In today's ICT (Information and Communication Technology) based world, sources of medical information especially E-journals and E-Books are increasing and expanding at a tremendous rate. So it is earnestly essential for medical libraries in Bangladesh to ensure the long-term preservation, availability, search and access to these online resources. Digital libraries are indispensable for a developing country like Bangladesh. The digital medical library is regarded as the centre for education, information and research. It is impossible to carry out proper educational and research activities without the help of digital library. The role of digital libraries is great indeed in changing educational and societal circumstances as well as socio-economic development in the third world countries like Bangladesh. The concept of digital library in Bangladesh is almost new where developed and constructive efforts must be necessary. Thus to ensure greater accessibility of medical information resources, the implementation of Digital Library System in the medical libraries of Bangladesh is of utmost importance. The main motto of this research study is to explore the various initiatives in terms of Digital Library Systems (DLS) taken by medical libraries of Bangladesh and suggest necessary suggestions for the digitization and efficient access and retrieval of e-resources of the medical libraries.

Keeping all these in mind, the present study has been proposed mainly to develop necessary digital library initiatives for Digital Library Systems (DLS) of medical libraries of Bangladesh. It will cover:

- A clear picture on current trends and developments regarding digital library initiatives of the surveyed medical libraries;
- The present scenario of ICT facilities and services in the medical libraries in Bangladesh under this study;
- The availability of infrastructural facilities, manpower, library networking, library budget and digital resources required for accessing digital information resources.

It is expected that the findings of the study will provide useful guidelines in planning and developing Digital Library Systems in the libraries of Bangladesh.

Statement of the Problem

Medical library is an important asset for providing quality medical education and is committed to provide health information sources and library services to support the teaching, learning and research of its parent institution. The medical libraries' functions are very complex. They have to meet and satisfy the diverse demands of a variety of users and also use every possible effort to encourage and aware users to utilize the potential of the libraries. Libraries have to acquire a creative print and online collections and they have also to deploy every possible effort to publicize what they provided for their user community. ICTs (Information and Communication Technologies) have revolutionized library systems around the world; they are potent tools in the acquisition, processing, storing and dissemination of information to library users. But most of the medical libraries in Bangladesh have lack of ICT facilities and shortage of budget and library resources and qualified staff to provide efficient services to library users. The blessings of modern technology have touched library activities throughout the world but most of the medical libraries of Bangladesh are performing activities in traditional ways. Though a few top ranked public and International medical libraries have been providing a few library services using modern tools and technologies but many problems exist. These are mainly (a) proper use of library modern tools and technologies, (b) digitization of resources, (c) traditional library services, (d) creation of database and institutional repository, (e) building architecture and layout plan, , (f) issues related to the human resources, (g) limited computers and other ICT resources, (h) information marketing and communication, (i) poor networking capabilities, (j) reluctant to join library consortium, (k) limited digital tools, technologies and software, etc (M. Z. Rahman, 2013).

The emergence of ICTs has repositioned the resources, operations, and services as well as the expectations of users of medical library. These days the users prefer to browse through the internet for their information needs rather than visiting the library. The medical library cannot compete with the modern information technology in its traditional collection of print materials. To attract the students and faculties in order to provide better services to its users, the medical library should develop access to electronic resources along with print materials. Though the selection, acquisition, dissemination and preservation of e-resources are similar to that of print materials, they differ in various aspects. Medical librarians face numerous challenges while developing Digital Library Systems (DLS) and library consortium. The new information technology has created a new infrastructure for medical libraries and

change the way they function and provide services. Most of the medical libraries in Bangladesh are not fully equipped with modem ICT facilities, latest online collections, necessary budget for subscribing digital resources and fully qualified and experienced staff members. In view of the above situation, it was crucial to ascertain their ICT status through this study in order to explore the extent of library ICT facilities, automation, Institutional Repositories (IR) and online resources, digital library services and digitization works that had so far been carried out by medical libraries in Bangladesh. There has been not too much studies conducted so for to measure the digital library initiatives and to assess factors that may influence the development of digital libraries in medical sector. In the view of the above, the researcher intended to undertake this topic "Digital Library Initiatives in Medical Libraries of Bangladesh".

Medical Libraries and Their Characteristics

In the early past century there were financial, insurance museum and technology libraries which were known as special libraries. In the 1940's with the development of penicillin and other important drugs, medical health libraries came into existence as an urgent requirement for the medico community. In 1950's medical libraries were given the status of special libraries.

Today the word health library exists in at least two senses i.e. the general medical libraries which include medical libraries with a collection of all purpose health information and the specific medical libraries including libraries providing specific information services to the medical researchers, super specialty professionals and R&D units. It is particularly important to point out that communication of medical science information occurs in a variety of formal and informal modes e.g. informal statement among colleges by phone and correspondence, and face to face talk in laboratories and conferences, meetings and seminars, progress reports of research, through formal publications, such as research journals, conference proceedings, books and preprints, electronic documents or non-prints.

In the broad sense, medical health libraries are considered as special libraries, even though they are a division of general academic and research institutions. Another feature of medical college libraries which distinguishes them from other libraries is the nature of books, journal and technical series and reports of WHO etc. The collection of medical health libraries contains more periodicals and technical reports.

ICT Status and ICT Development Index of Bangladesh

The ICT status of Bangladesh is not remarkable without some favorable initiatives by the Government and by private entrepreneurs. The Internet came in Bangladesh in 1993 and IP connectivity in 1996 (A. Islam & Tsuji, 2011). Bangladesh has a relatively long experience in the use of computers – the first "second generation" computer was installed in 1964 at Dhaka by Atomic Energy Center with the installation of an IBM 1620. Subsequently, the use of the computer was established at the Institute of Statistical Research and Training (ISRT) followed by the Bangladesh University of Engineering and Technology (BUET), Janata Bank in 1969, Adamjee Jute Mills Ltd in 1970 and Bureau of Statistics in 1973.

During 1990, Ministry set up the Bangladesh Computer Council which is an autonomous body responsible for encouraging and providing support for ICT-related activities in Bangladesh. More than 600 Million people worldwide have some sort of access to the Internet. That is an astonishing number and reflects the rapid growth of the network since it was invented in 1970s.

The International Telecommunication Union (ITU) published the 2016 version of the Measuring the Information Society (MIS) report on 24th November, 2016. The MIS report has been published annually since 2009. It features the key ICT data and benchmarking tools to measure the information society, including the ICT Development Index (IDI). The IDI 2016 measured the level of ICT developments in 175 countries worldwide and compared the progress for the last 2 years. The IDI is a combined measurement that ranks countries according to their level of ICT access, use, and skills.

Bangladesh has fallen behind two ranks in the global ICT Developments Index and secured the 145th position with a point of 2.35. Korea has ranked number one with 8.84 points among the 175 economies. Among the neighboring countries, Sri Lanka, Bhutan, India, Myanmar, and Nepal are better with a ranking of 116, 117, 138, 140 and 142 respectively. Only Pakistan and Afghanistan is behind Bangladesh with a ranking of 146 and 164 respectively. In Bangladesh, about 14.4 percent individuals are using the internet, 2.4 percent are using Fixed-broadband while broadband users are 13.5 percent (Asia, 2015). Some of the ICT-related key education indicators for the country are shown in the Table 1.1.

Table 1.1 : ICT-related key education indicators (ITU, 2016)

ICT parameters	Value	Year
Population	160411249	2016
Population density	1236.81	2016
GNI per capita	1190	2016
Region	Asia & Pacific, Developing, LDC	2016
IDI 2016 Rank	145	2016
IDI 2015 Rank	143	2015
IDI 2016 value	2.35	2016
Fixed-telephone subscriptions per 100 inhabitants	0.52	2016
Mobile-cellular telephone subscriptions per 100 inhabitants	83.36	2016
Percentage of households with computer	8.19	2016
Percentage of households with Internet access	11.00	2016
Percentage of individuals using the Internet	14.40	2016
Fixed (wired)-broadband subscriptions per 100 inhabitants	2.41	2016
Active mobile-broadband subscriptions per 100 inhabitants	13.45	2016

Digital Bangladesh

Digital Bangladesh is one of the nation's dreams, and so special emphasis is given on the application of digital technologies to realise Vision 2021, which we commonly call Digital Bangladesh. By 2021, after 50 years of independence, our goal is to be a middle-income country with peace, prosperity and dignity. It sounds good but the concept of Digital Bangladesh is still not clear to the citizen, they are not aware of the output of Digital Bangladesh. The scope of Digital Bangladesh is that the government

wants to make Bangladesh fully digitized by 2021 through application of third generation Information and Communication Technology (ICT). The government of Bangladesh implemented a large number of projects relating to digital technologies and a number of these are already underway. National ICT Policy-2009 was developed with a view to achieve middle-income status of the nation by 2021 and developed status by 2041 (L. Rahman, 2015).

The success of digital Bangladesh depends on development of digital knowledge source and its diffusion. Thus the creation of digital base place it on the common platform of the information super highway and ensure the accessibility to the relevant knowledge sources are the real challenges of our information professionals today. Development of sustainable digital information support is really a challenging job particularly for the developing country like Bangladesh. The digital revolution throughout the world has brought about new challenges as well as new opportunities for the information professionals. The information professionals of the developing countries are grappling with problems like weak infrastructure, lack of skilled manpower, financial stringency etc. in implementing information and communication technologies in the libraries and also in the digitization of information resources.

Rapid advances in information technologies have revolutionized the role of libraries. As a result, libraries face new challenges, competitors, demands, and expectations. Libraries are redesigning services and information products to add value to their services and to satisfy the changing information needs of the user community. Traditional libraries are still handling largely printed materials that are expensive and bulky. Information seekers are no longer satisfied with only printed materials. They want to supplement the printed information with more dynamic electronic resources. Demands for digital information are increasing. So the digital or e library is needed to explore. There is no alternative to establishing digital library for building a digital Bangladesh. Introducing ICT studies into school curriculum and equipping libraries in all schools and colleges with computer and internet connections can ensure a future generation educated in technology. Digital Bangladesh cannot be ensured unless digital library is ensured in all government and non-government organizations in the country.

Achievements of Digital Bangladesh

Bangladesh emerged as an independent and sovereign country in 1971 following a nine-month's war of liberation. It is one of the largest deltas of the world with a total

area of 147,570 sq. km. With a unique communal harmony, Bangladesh has a population of about 152.25 (million) as on July-2012 based on population Census making it one of the densely populated countries of the world (Bangladesh Bureau of Statistics, 2016). The current government of Bangladesh pledged to convert Bangladesh into "Digital Bangladesh" by 2021. As part of its "Digital Bangladesh" plan, several initiatives have been taken that are related to information development, digitization and the DL. Some of the initiatives relevant to information development, digitization and the DL are briefly discussed below (Nafiz Zaman Shuva, 2014).

01. National web portal: A very impressive program of the Bangladesh Government is the creation of the National Web Portal of Bangladesh (www.bangladesh.gov.bd/), aiming to provide up-to-date information about government services through a one-stop online portal. This portal provides information related to agriculture, education, market price of products, banking system, law, passport, health system, tourism, postal service information and government ministries and parliaments.

02. Jatiyo e-Tathyakosh: Another notable project of the Bangladesh Government is the creation of Jatiyo e-Tathyakosh (National Information Repository) (available at www.infokosh.bangladesh.gov.bd) under the Access to Information (A2i) Program of the Prime Minister's Office (PMO). Jatiyo e-Tathyakosh contains a vast amount of information on Bangladesh and its people, agriculture, education, health, law and human rights, tourism and employment. It offers this information in text, audio, video and animation formats.

03. E-book project: Textbooks of primary- and secondary-level materials published by the National Curriculum and Textbook Board are now available in an e-book format and accessible through: www.ebook.gov.bd/. This project was developed with technical assistance from the A2I of the PMO.

04. District web portals: 64 District Web Portals of Bangladesh launched in 2010 aimed at providing citizen-necessary information on socioeconomic development, history and culture of each district of the country.

05. E-porcha: The Ministry of Land, District Administration and the A2I Programme jointly digitized records available at the record rooms of 64 districts in Bangladesh. So far, about one and a half million records have been digitized and made available

online. About 45 million records will be digitized under this initiative. Citizens can now get a certified copy of their land records from the relevant office without any hassle.

06. Access to Information (A2I) Programme: The Access to Information (A2I) Programme with technical assistance from UNDP was initiated in September 2006 to support the e-Governance cell at the Prime Minister's Office with the vision of creating a digital Bangladesh by 2021. The National ICT Policy of 2002 gives importance to the issues of e-Governance, declaring that "the Government shall use ICT systems within the public administration to improve efficiency, reduce wastage of resources, enhance planning and raise the quality of services."

07. Swanirvar Bangladesh: For creating self-employment for learners and jobless youths through online outsourcing training all over the country a memorandum of understanding (MoU) was signed at Prime Minister's Office between Support to Digital Bangladesh (A2I) Programme and Swanirvar Bangladesh with the financial support of UNDP, on 4 April 2012 (www.Swanirvar Bangladesh and A2I.htm).

08. Higher Education Quality Enhancement Project (HEQEP): The Ministry of Education, with the assistance of the World Bank, has undertaken a Higher Education Quality Enhancement Project (HEQEP). The project aims at improving the quality of teaching-learning and research capabilities of the tertiary education institutions through encouraging both innovation and accountability and by enhancing the technical and institutional capacity of the higher education sector. The University Grants Commission of Bangladesh is the implementing agency of the project. A HEQEP Unit has been established in UGC for implementation, management, monitoring and evaluation of the activities (Higher Education Quality Enhancement Project, 2010).

09. Bangladesh Research and Education Network (BdREN): University Grants Commission (UGC) of Bangladesh, On behalf of the Ministry of Education (MoE), is currently implementing the Bangladesh Research and Education Network (BdREN) under HEQEP with assistance from World Bank. It will be a high performance data Communications network providing connectivity among education and research institutions in both public and private sectors. BdREN with its multi-gigabit capability aims to connect all universities, research institutions, libraries, laboratories, healthcare and agricultural institutions across the country and to support geographically dispersed academics, scientists and researchers with reliable access

to high-end computing, simulation tools and datasets. With a view to implementing the BdREN backbone, recently UGC has made an IRU contract with Power Grid Company of Bangladesh (PGCB) Ltd. for its country-wide OPGW network (Bangladesh Research and Education Network, 2017) .

The nation now, with over 12 crore mobile subscribers and 4.3 crore Internet subscribers, enjoys the fruits of digitisation in numerous areas of activities. The ultimate objective is to make more and more services available at the doorsteps of the people with increased digitalisation where possible. A few examples of available digital services are: registration for admission to academic institutions, publication of results of examinations, registration for jobs abroad, registration of pilgrimage, collection of official forms, online submission of tax returns, online tendering, etc. Online banking systems have sped up the financial activities of the country. SMS services for lodging complaints to police stations, online bill payments for utility services, instant communication with persons working abroad, and e-passports are some more examples. Telemedicine services, videoconferencing for the treatment of diseases, and video conferencing for administrative activities are examples of e-services available to rural Bangladesh. Setting up of nearly five thousand Union Information Service Canters is a great boost for Digital Bangladesh, especially for rural areas. Turning eight thousand village post offices and approximately five hundred upazila post offices into e-centers and the introduction of mobile money order and postal cash cards are significant achievements in the recent past. Union Information Centers, District Information Cells, National Information Cell are also revolutionary additions (L. Rahman, 2015).

Objectives of the Study

The core objective of the study is to explore the digitization and digital library initiatives by the library administrator/higher authority and information professionals in six selected medical libraries of Bangladesh. More specifically, the objectives of the study are:

1. To explore the present status of digital library initiatives in the selected medical libraries of Bangladesh.
2. To find out the present ICT infrastructure, facilities and services available in the surveyed medical libraries.

3. To highlight the digital collection building procedure through library consortia, online E-Book and E-Journal platform and developing Institutional Repository (IR).
4. To analyze the usage of online databases and Institutional Repository (IR).
5. To identify the impediments and challenges encountered towards the development of Digital Library Systems.
6. To suggest suitable measures to take full advantages of online and digitized information resources in order to develop medical libraries in Bangladesh more resourceful for providing speedy information services.

Research Questions (RQ)

To achieve the objectives of this research the following research questions were framed:

1. What types of digital library initiatives have undertaken by the studied medical libraries?
2. What is the present status of ICT for developing digital library system in medical libraries of Bangladesh?
3. What types of digital information resources are available in the studied medical libraries?
4. What integrated library systems and Institutional Repository had been installed and the extent of library online services?
5. How frequently do students, doctors and scientists use the e-resources available to them through the library web site/ Intranet site?
6. What problems do medical students, clinicians and scientists face in accessing digital information resources?
7. What are the challenges encountered by librarians and users for developing Digital Library Systems and accessing online resources?
8. How to overcome the various challenges led to greater productivity of Digital Library System in Bangladesh?

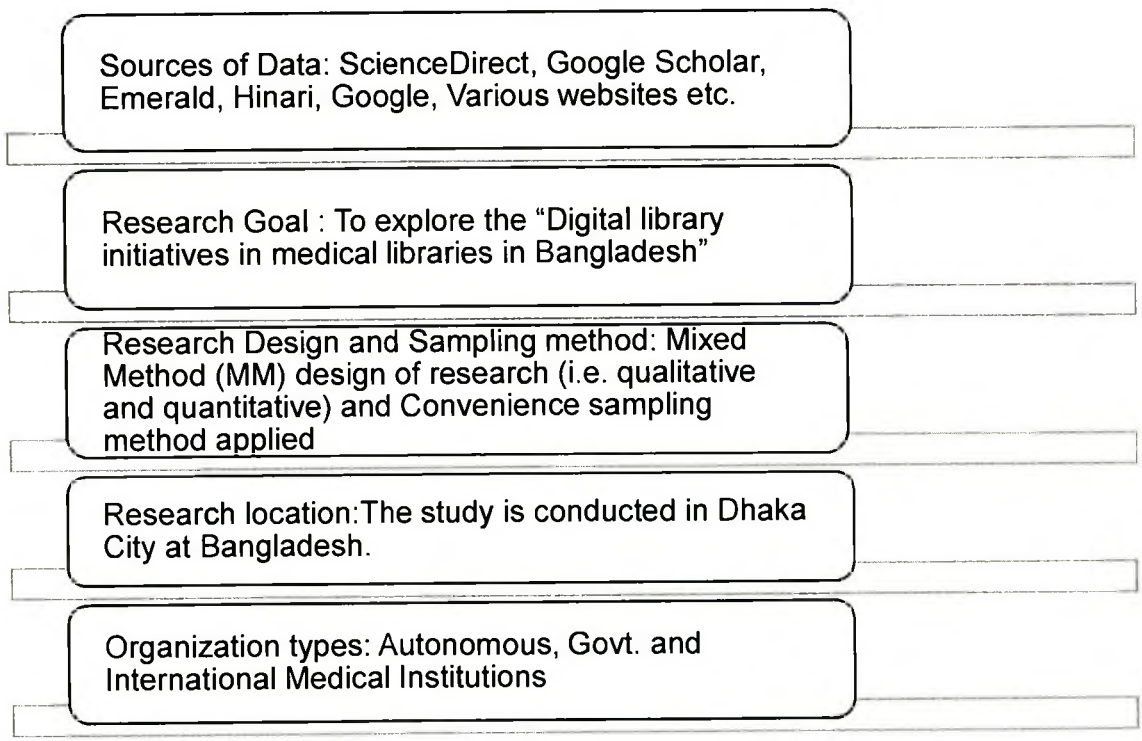
Methodology of the Study

Research Method: In a broad sense, methodology refers to the processes, principles and the procedures by which one approaches a problem to seek solution. A researcher adopts certain techniques and procedures for studying a research problem, which are

enumerated in the methodology. Considering the objectives of the study, the level of digital library development in Bangladesh, the research questions, the limitations and the scope, the researcher felt the appropriateness for adopting both the qualitative and quantitative data gathering techniques i.e. the survey method, using the questionnaire as the instrument and supported by qualitative data obtained through structured interviews. Subsequently, the following research methodology and techniques have been adopted in the following headings:

01. Research Design: Research design essentially refers to the plan or strategy of shaping the research that might include the entire process of research from conceptualizing a problem to writing research questions, and on to data collection, analysis, interpretation and report writing (Creswell, 2007). It provided the framework for the collection and analysis of data and subsequently indicated which research methods were appropriate (Walliman, 2006). Mixed Method (MM) design of research (i.e. qualitative and quantitative) was followed to get the exact scenario of the present practices in six medical libraries and to collect opinion of the subjects under investigation. For the purpose of this research, after examining the objectives of the study and realizing the lack of study and published literature on digital library development in Bangladesh, an exploratory descriptive research design had been chosen. The researcher believes that exploratory descriptive research will suit best.

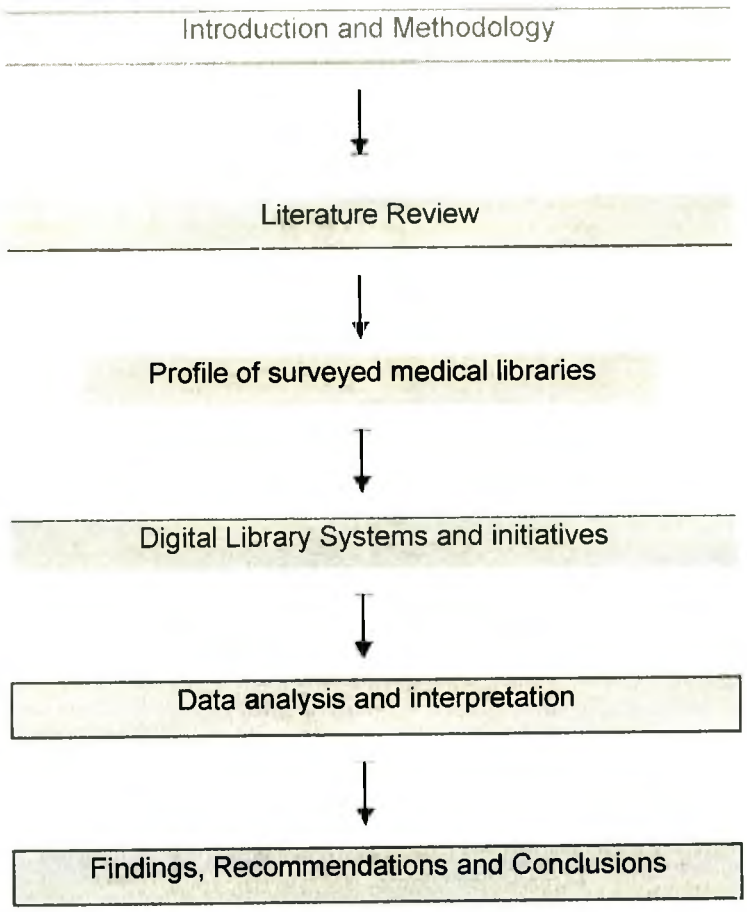
Figure 1.1: Research Design applied for this research



02. Study Design

The research design has been incorporated both the qualitative and quantitative approaches. In the first phase, the theoretical literature from various sources have been explored to assess the type of research conducted on digital library initiative and stakeholder's expectations as well as related issues. Consequently, the quantitative phase has been performed by a survey directly from librarians and users of sampled medical libraries through structured questionnaires. The present study can be visualized as in figure-1.2.

Figure 1.2: Schematic view of the study



03. Review of Relevant Literature

A comprehensive literature review was conducted to identify the relevant concepts, constructs, and variables for in-depth understanding of the phenomena. A large body of literature covers different aspects of digital library. Also identified, located, and searched

out all relevant journals, articles and papers related to the study. The analysis of literature demonstrates that demand for digital contents, digitization policies and procedures, availability of financial resources, technological resources, and human resources are core aspects and fundamental prerequisites for digitization projects.

Sources of Literature

1. LISA: Library and Information Science Abstracts is an international abstracting and indexing tool designed for library professionals and other information specialists. LISA currently abstracts over 440 periodicals from more than 68 countries and in more than 20 different languages. The abstracts are covered from 1970 till present.

2. ACM Digital Library: The ACM digital library covers major digital library science conference proceeding named as Joint Conference on Digital Libraries since 1997. Hence this database was used in depth to know the latest research carried out in Digital Libraries.

3. Google Scholar as well as General Google: Google Scholar covers bibliographic as well as full text database of all articles published from all journals and google covers presentations, articles available from individual web sites for downloading.

4. ScienceDirect : Covers major library science journals such as Information Processing & Management, Library and Information Science Research etc.

5. SpringerLink Services: Covers all articles from the journal International Journal on Digital libraries which is a European Journal.

6. Emerald Database: Covers major library science journals such as Journal of Documentation, Library Hi Tech, Library Management, Library Review, The Electronic Library, Online Information Review, Program: electronic library and information systems etc.

7. Scopus: Scopus is the largest abstract and citation database of peer-reviewed literature: scientific journals, books and conference proceedings. Delivering a comprehensive overview of the world's research output in the fields of science, technology, medicine, social sciences, and arts and humanities, Scopus features smart tools to track, analyze and visualize research.

8. Web of Science: Web of Science connects publications and researchers through citations and controlled indexing in curated databases spanning every discipline. Use cited reference search to track prior research and monitor current developments in over 100 years' worth of content that is fully indexed, including 59 million records and back files dating back to 1898.

04. Population and Sample Design:

By definition, population is the group to which a researcher would like the results of the study to be generalizable. It could also be set of all cases of interest and might be virtually any size or might cover almost any geographical area (Gay & Diehl, 1992). The population for this study was all the teachers, students, doctors, scientists, researchers and staff members of surveyed medical libraries. Sampling methods can be classified as probability and non-probability. In probability samples, each member of the population has a known non-zero probability of being selected. Probability methods include random sampling, systematic sampling, and stratified sampling. In non-probability sampling, members are selected from the population in some non-random manner. These include convenience sampling, judgment sampling, quota sampling and snowball sampling. In this research study the researcher has taken non probability sampling approach and chosen convenience sampling method.

Convenience sampling is a non-probability sampling technique where subjects are selected because of their convenient accessibility and proximity to the researcher. This type of sampling is also known as grab sampling or availability sampling. There are no other criteria to the sampling method except that people be available and willing to participate. In addition, this type of sampling method does not require that a simple random sample is generated, since the only criteria is whether the participants agree to participate (Saunders, Lewis, & Thornhill, 2009).

05. Sample Size: Sample size determination is the act of choosing the number of observations or replicates to include in a statistical sample. The sample size is an important feature of any empirical study in which the goal is to make inferences about a population from a sample. The following two types of sample size are exploited for this study:

A. For ensuring representativeness from medical libraries in Dhaka City considering the digital library initiatives, six medical libraries in Dhaka City were selected and brought under the investigation. The name of the libraries, year of establishment and location are presented in Table 1.2.

Table 1.2: List of surveyed medical libraries

SL No.	Name of the Library	Year of Establishment	Location
1.	International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) Library	1962	Mohakhali, Dhaka
2.	Bangladesh Institute of Research and Rehabilitation for Diabetes, Endocrine and Metabolic Disorders (BIRDEM) Library	1986	Shahbagh, Dhaka
3.	Bangladesh College of Physicians and Surgeons (BCPS) Library	1972	Mohakhali, Dhaka
4.	Bangabandhu Sheikh Mujib Medical University (BSMMU) Library	1965	Shahbagh, Dhaka
5.	Dhaka Medical College (DMC) Library	1946	Dhaka
6.	National Health Library and Documentation Centre (NHLDC)	1974	Mohakhali, Dhaka

B. Data have been collected from a total of two hundred and ninety-six (296) library users such as medical students, doctors, researchers, scientists and the librarians of the aforementioned six libraries through a structured questionnaire (Both the questionnaires are given in Appendix-1 & 2).

06. Survey

Two sets of questionnaires were constructed. One set, based on administration related index instrument for conducting administrative survey focusing the present status of selected medical libraries; and another one was based on expectations and opinions of the stakeholders (for user survey) to reveal their opinions in relation to resources and digital library activities. A strategic survey was also conducted through personal observation and taking interview from appropriate personalities in order to verify the validity of responses (regarding digital resource usage) from different users. The assessment of the user's may be necessary for detecting the usage of e-resources and find out digital library activities as well as explore the barriers facing the library users for accessing e-resources. Both the questionnaires were duly pre-tested and finally structured keeping in view the objectives of the study. Based on the analysis of the general and specific objectives of this study, information on 17 categories of variables for medical libraries and 18 categories of variables for users were identified. The variable(s) and indicators emerging out of the questionnaires for medical libraries and users are shown in Table 1.3 and 1.4 respectively:

Table 1.3: Variables and indicators (Medical Libraries)

SL. NO.	Type of variables	Indicators
01	Institutional Profile	Name of the Library, Year of Establishment, Name of the parent body, Year of Establishment, Present Address, Telephone no, Email, Fax, Website, Type of the organization, Name and Designation of the Head
02	Category of users	Teacher, Student , Doctor, Scientist, Researcher, Staff
03	Library users	Average number of users, library members
04	Library Staff	Academic Qualification, IT background, Chief librarian, librarian, deputy librarian, junior librarian, library assistant, attendant, IT specialist, others
05	Library Resources	Books, Theses/Dissertations, Reports, Loose Journals, Magazines, Bound Journals/ Magazines, Audio-Visual materials, Atlases, Maps, Microfilms, Microfiches
06	ICT (Information and Communication Technologies) and Automation Facilities	Availability of ICT and automation facilities, Year of ICT inception, Status of automation, Type of automation software, software using for Integrated Library System
07	Internet Facilities and Library Website	Internet inception year, number of computers with Internet connection, charge for browsing, Internet users, Internet connection types, browser software, search engine, library webpage, Library Intranet access, electronic security system
08	Library website/Intranet contents	General information on the library, staff, contact numbers, opening hours, services, collections, rules and regulation, Web OPAC, Access to e-books & e-journals, Access to commercial online databases, Access to open Access database, Link to Institutional Repository, New book list, FAQ, Suggestion page, Feedback & comments
09	Digitization activities	Digital initiatives, DL equipment, DL types, DL collections, Acquisition of digital material, DL software, digital preservation methods, digital format, digitization policy, Metadata standard, DL software
10	Institutional Repository (IR)	Name of IR, Inception year, Web address, Number of items, types of items, subject coverage, IR software, Searching option
11	Accessible Digital and Electronic Collections	E-Journals, E-books, Online Databases (Subscribed and registered), E-Reports, E-Theses/E-dissertations, E-Encyclopedias, E-Dictionaries, E-Newspapers

(Contd. Table 1.3)

12	Online databases	JSTOR, Emerald, Oxford University Press, ASM Journals, SpringerLink, Indian Journals, Cochrane Library, Hinari, AGORA, OARE, ScienceDirect, ProQuest, EBSCOHost, ARDI, TRAVAX , ISI Web of Science, Scopus, Ulrichsweb, UptoDate
13	Digital Library services	OPAC, Web OPAC, Online renewal service, Institutional Repository (IR)/Digital Repository (DR) service, Online SDI service, Online reservation, Online reference query, Web 2.0, Electronic document delivery, Mobile based services, Remote access service, RFID based services, Wifi service, Virtual reference service, Distance learning service, Internet service, E-bulletin board service, E-indexing and abstracting service
14	Library consortium	Member of Library consortium, name of consortium
15	Budgets	Source of funding, Amount of budget
16	ICT training	Introduction to computers, Internet and World Wide Web, Application software [e.g. power point, excel, access, word], Web design and home page Development, Online searching skills, Introduction and Overview of Digital Libraries, Metadata and Foundations of Digital Libraries, Architecture and Systems of Digital Libraries, Digital Archiving and Preservation, Digital library services, Access and User Interfaces to Digital Libraries
17	Digitization problems	Lack of budget, Lack of IT staff, Lack of professional staff, Lack of training to make staff efficient, Lack of Integrated library software, Lack of digital library initiatives of the authorities, Concern about cost of preservation and management of digital content, Lack of ICT infrastructural facilities, Low speed of internet connections, Lack of knowledge of digital preservation, Copyright issues/Digital Rights Management, Lack of equipment to digitize library resources, Lack of national digitization policy, Administrative bureaucracy complexity, Inadequate salaries for library personnel, Lack of government concentration

Table 1.4: Variables and indicators (Users)

SL. No.	Types of variables	Indicators
01	User information	Age Gender, Name of the University, educational qualification
02	Category of Users	Student, Teacher, Doctor, Scientist, Researcher, staff
03	Library Use	Individual study, Group study, Reference work, Internet use, preparing assignment, Borrowing books
05	Frequency of library visit	Once in a week, 2 to 3 times in a week, 4 to 5 times in a week, More than 5 times in a week
06	Use of e-resources	At library, At work, At home, Remote access
07	Name of e-resources	E-books, E-journals, E-newspapers, E-maps, E-thesis, E-research reports, Internet/web resources, Online Public Access Catalogue (OPAC), Institutional Repository (IR), Online databases, Journal Citation Reports (JCR), Journal Impact Factors (JIF)
08	Frequency of digital resources	Daily, Weekly, Monthly, Once or twice only, Never
09	Purpose for using e-resources	Research, Learning, Teaching, Current information, Flexibility of use
10	Features of e-resources	Quick retrieve ability, Ease of use, Up-to-date information, Free availability, Full text searching
11	Online databases	PubMed, JSTOR, Emerald, Oxford University Press, ASM Journals, SpringerLink, Indian Journals, Cochrane Library, Hinari, AGORA, OARE, Science Direct, ProQuest, EBSCOHost, ARDI,TRAVAX , ISI Web of Science, Scopus, Ulrichsweb, UptoDate, Google scholar, POPLINE, PMC, BMC, DOAJ, BanglaJOL
12	Preference of library	Traditional Library, Digital Library, Hybrid Library
13	Search technique	Key word, Subject, Author, Publication date, Journal title, Title of the article
14	Search engine	Google, Yahoo, Bing, Baidu, AOL, Ask.com, Excite, Lycos
15	Web browser	Mozilla Firefox, Google chrome, Internet explorer, Opera mini, Safari
16	Digital library impact	Save time, Multiple access to information, Timely access to information, Improved use of information, Updated and Hyperlinked information
17	Barriers	Slow connection speed, Login problems, Low bandwidth, Slow information download, High cost of access, Accessibility of websites, No Internet access, Inadequate searching skills, No training of use of e-resources
18	Valuable suggestions for DL	

07. Techniques of Data Collection

As explained, the study would adopt both quantitative and qualitative data gathering techniques. A survey research method was adopted to address the research questions, using the questionnaire as the main instrument. Techniques of data collection can be classified as follows:

(a) Interview: A survey instrument containing the questions asked by the interviewer in an in-person or phone survey.

(b) Questionnaire: A survey instrument containing the questions in a self-administered survey.

(c) Observation: It is especially used in studies relating to behavioral sciences. In a way, we all observe things around us, but this sort of observation is not scientific. Under observation method, the investigator himself is seeking information on his own direct observation without asking from the respondent

Among the above techniques interview and questionnaire are considered to be the most popular. Survey data was thus obtained through pre-determined semi structured interviews through a predetermined questionnaire were used to gather primary information with the heads of libraries and library users. These primary methods were guided by written interviews with semi structured questionnaire and document analysis.

(A) Libraries

The librarians of the selected medical libraries were interviewed carefully with the structured questionnaire and necessary data were collected for the purpose of the study. The sample was as follows:

Table 1.5: Types of surveyed medical libraries

Public University Medical Library	01
Public Medical College Libraries	02
International Organization Library	01
National Medical Library	01
Autonomous Medical Library	01
Total	06

(B) User(s)

Based on convenience sampling, 380 structured questionnaires were distributed among the different category of library users. This group includes students, teachers, researchers, scientists, administrators and others from the selected six public and private medical libraries of Dhaka City. A total of 296 questionnaires were received and filled up duly by the users which have been tabulated and analyzed with a response rate of 77.89% (Both the questionnaires are given in Appendix -1 & 2). The sample consists of the following:

Table 1.6: Questionnaire received by respondent types

Category of users		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Teacher	18	6.1	6.1	6.1
	Doctor	114	38.5	38.5	44.6
	Researcher	89	30.1	30.1	74.7
	Student	27	9.1	9.1	83.8
	Scientist	17	5.7	5.7	89.5
	Staff	21	7.1	7.1	96.6
	Others	10	3.4	3.4	100.0
	Total	296	100.0	100.0	

08. Conduct of Interviews

It is a type of survey research where a verbal communication is made among six librarians for collecting relevant information. Through this method the researcher is able to explore feelings, attitudes, and other contexts of respondents.

09. Questionnaire

The core component of a survey research is its questionnaire. A questionnaire is a research instrument consisting of a number of questions in order to collect and record information from the sample population under the study. A questionnaire should always be designed keeping in view the objectives of the research. The questionnaire for the present study was designed to elicit responses to a variety of questions on the use of web resources. The questions were divided into the following types depending on the need for the study:

i. Dichotomous: The respondent answers with a "Yes" or a "No".

ii. Multiple Choice Questions: A respondent has several options to choose from. Multiple choice questions involve both single-answer questions (questions allow only one answer to be chosen from the given options) and, multiple-answer questions (questions allow multiple answers to be chosen from the given options).

iii. Scaled questions/ Likert type answers of five choices: Scaled/ Likert questions include such type of questions in which the responses are chosen from a range of values i.e. it involves choosing a number from a lowest possible number to a highest possible number.

iv. Matrix Questions: Identical response categories are assigned to multiple questions. The questions are placed one under the other, forming a matrix with response categories along the top and a list of questions down the side. Matrix questions are very helpful in collecting large amount of data in a single question.

10. Pilot study

Pilot study is an important element of a good research design. It is a trial study which is carried out before the main study to check the feasibility and reliability of the research tool. Pilot study for the present study was conducted with the purpose of getting respondents opinion on the questionnaire and also to rule out the presence of ambiguities and doubts so as to get clear and accurate responses. Pilot study was conducted among the researchers of the selected libraries from January 2017.

11. Research Visit

The researcher visited almost all of the medical university and colleges in Dhaka city and makes on the spot observation and study. The researcher physically examined and checked the overall scenario and ICT, automation and digitization status of those libraries. The duration of data collection was from 01 February to 30 April, 2017.

12. Data Processing and Analysis

Two sets of questionnaire of this study were duly edited to verify that the data recorded in the questionnaire have been carefully and accurately filled in. All the questionnaires were duly coded after editing for computer input. The steps followed in the process of data input are:

- entering data into the computer;

- conducting validation checks to ensure that data have been correctly entered into the computer;

- preparation of output table.

The SPSS (20th edition) and MS Office Excel 2016 have been used to enter, edit, and analyze data. Findings of the study have been presented in various Tables and Figures using bivariate and multivariate analyses as per their applicability.

13. Interpretation of Results

After processing and analysis of the data, appropriate physical meaning and interpretation to the numerical results in real life was given for each of the Table and Figures. Findings of the study have been presented in 101 Tables and 67 Figures.

Significance of the Study

Most of the libraries in Bangladesh today are in a hybrid environment, with both print and electronic resources existing side by side. In this hybrid environment, in order for the user to be aware of and access information resources in both print and electronic format, the libraries have integrated print and electronic resources and make print resources almost as easily accessible as the electronic resources. During the last two decades, the amount of electronic information available in medical libraries and the diversity of tools to locate and access this information have increased tremendously. Both the increase in the amount of information available and the improvement in its accessibility have had a huge impact on academics' information behavior. In our view, it is important to investigate these changes both in order to redefine the collections and services provided by medical libraries and to improve the technological platforms that make these electronic contents available to users. Electronic resources are invaluable research tools which complement print-based resources in any traditional library. Electronic resources provide access to information that might be restricted to the user because of geographical location or finances. They also provide access to current information as these are often updated frequently. Through their various search techniques, electronic resources provide extensive links to explore additional resources or related content. In addition, electronic resources are convenient to use since users are able to access information from the library, internet cafe', offices or at times from the comfort of their homes at any time of the day. With falling library budgets, there is the need to maximize the

use of available electronic resources to justify the financial investment involved in the maintenance of these systems in medical libraries of Bangladesh.

Rapid advances in information technologies have revolutionized the role of libraries. As a result, medical libraries in Bangladesh face new challenges, competitors, demands, and expectations. Libraries are redesigning services and information products to add value to their services and to satisfy the changing information needs of the user community. Traditional libraries are still handling largely printed materials that are expensive and bulky. Information seekers are no longer satisfied with only printed materials. They want to supplement the printed information with more dynamic electronic resources. Demands for digital information are increasing. So the digital or e library is needed to explore. There is no alternative to establishing digital library for building a digital Bangladesh. Introducing Digital Bangladesh cannot be ensured unless digital library is ensured in all government and non-government organizations in the country. The significance of the study is argued on the basis of the following points:

- The study aims to make aware the e-resources available in the six medical libraries in Bangladesh with a special focus on an international organization library i.e. icddr,b library.
- The study attempts to highlight the present digital library initiatives available in the sample medical libraries in Bangladesh.
- Simultaneously the study investigates the use of e-resources by academic community of the surveyed libraries.
- The study focuses on the skills of user in using e-resources available in the library.
- The study attempts to highlight the problems faced by the respondents while accessing e-resources and provides users' opinion on level of satisfaction with e-resources.
- This study assesses the need for digitization in medical libraries by assessing the demand for electronic contents.
- The study might help policy makers, top management, librarians and government about the importance of digital library implementation in academic

and special institutions in Bangladesh and take necessary initiatives for establishing digital libraries for digital Bangladesh.

Scope of the Study

Research and development in the field of digital libraries has grown significantly over the last decade, and a large number of operational digital libraries are now in existence. These include hybrid libraries through which users can get access to digital information resources alongside traditional print-based information resources. The idea of digital library is new in Bangladesh. A very few limited number of studies were conducted to find out the digital library initiatives status of medical libraries in Bangladesh. Only a few articles and reports are available which have discussed the present digital library scenario in medical libraries in Bangladesh. The present study will cover digital library facilities and services for the surveyed medical libraries in Bangladesh. This is likely the first original research study focused on the digital library initiatives of selected medical libraries in Bangladesh, with special reference to International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b). icddr,b for more than 50 years has been a beacon of high-quality research in South Asia. It has led research that has saved millions of lives. From its origins as a research centre specializing in diarrhoeal diseases, it is now an internationally recognized centre of excellence across a wide range of conditions.

Under this study, an attempt has been made to conduct an in-depth and a comprehensive study of the existing scenario of medical libraries and understood various dimensions of managing libraries in the technology-driven digital era. In this age of information technology, the medical libraries of Bangladesh are legged behind because of poor ICT infrastructure, financial constraints and negative evaluation of top management regarding the importance of digital libraries. The scenario of medical library digitization is very frustrating. It is assumed that, where even the ICT and automation scenario are at very elementary level, Digital Library System is still a dream in most of the medical libraries of Bangladesh.

To identify the present status of library digitization in medical libraries, the following issues are very important in this regard:

- As reflected in the research topic, the main concerned of the study was to see medical libraries' digital library readiness through the extent of library automation, Institutional Repository, subscription and registration of e-resources,

consortium development and digital library initiatives that they had done, to derive at more general conclusions.

- The other focus of the study would be to examine the general and digital library related problems and the perceived conditions that might influence digital library future growth in Bangladesh.

- To review the available literature on digital library both nationally and internationally.

- To substantiate and consolidate the data collected through the questionnaire, qualitative data were also obtained through the interview sessions conducted with 6 librarians and 296 respondents of the surveyed libraries.

- These were the areas covered: digital library planning, budget for digitization projects, online services and operations, human resource/staffing, management support, digital library related problems, digital library training, facilities, Integrated Library Systems, Institutional Repositories, Library Consortia and the perceived conditions for digital library future growth in medical libraries of Bangladesh.

- Hardware configuration was totally excluded because it was beyond the scope of the study.

- Providing some recommendations for the betterment of these libraries to adopt Digital Library Systems.

Limitations of the Study

This present study entitled "Digital Library Initiatives in Medical Libraries of Bangladesh" is an attempt to know the present scenario of digital library initiatives in Dhaka Region of Bangladesh. The investigation is stressed on the attempts taken by the libraries and digitization programs undergoing. Limitations of the study are stated below:

1. The study confined within the six medical libraries in Dhaka city.

2. The impact of digital technology on medical libraries in Bangladesh has received little investigation, and this has led the researcher to rely on some fragmented literature to build up a background upon which the study could be carried out. The scarcity of literature is one serious limitations of this study.

3. The phenomenon of library digitization is just beginning to emerge in medical libraries of Bangladesh.

4. Because of time limits other type of medical college libraries (e.g. dental college, training institutes, and homeopathic college etc.) are not covered for the study.

5. The study covers only Dhaka based medical libraries.
6. Convenience sampling method was used in this study and the size of the sample represents a limitation of this study.

However, care has been taken to ensure that these limitations will not have any major impact on the findings and conclusions of this study.

Operational Definitions of Digital Library and Related Terms

Digital Library (DL): Digital libraries are becoming an integral part of digital learning environments. At the same time, the notion of "digital library" is subject to a broad range of definitions. Different audiences associated with a digital library have different interpretations; they evaluate a digital library differently and use different terminologies. On one end of the range, digital libraries are considered to be related to physical libraries performing similar functions, thus creating a hybrid library (combining traditional and electronic resources). On the other end, digital libraries are considered to be knowledge repositories, and services, organized as complex information systems.

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' (Chartier, 1993; Fayen, 1986), 'hybrid libraries (Pinfield et al., 1998; Rusbridge, 1998) have been used interchangeably to define the concept of digital library (A. J. 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 (William Y Arms, 2000; Borgman, 1999; G. Chowdhury, 2010; Shiri, 2003; Witten, Bainbridge, & Nichols, 2003). 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 (A. J. Rahman, Rahman, & Chowdhury, 2015; Smet, 2014).

The partners involved in the Digital Library Federation have put forward the definition that "Digital libraries are organizations that provide the resources, including the

specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities" (D. Raitt, 1999).

Russian scholars Sokolova and Liyabev indicate that a digital library is a distributed system that has the capability to store and effectively utilize various electronic documents, which may be conveniently accessed by end users via network transmission (Xiao, 2003).

Many Chinese scholars agree that "A digital library is actually not a library from a spatial prospect; instead, it is digital information resources center containing multimedia information resources. A digital library exists by digitizing information, such as characters, videos, and audios, and providing users with quick and convenient information services via the internet, to deliver a digital information system in which share of resource is available" (Wang, 2003).

The term was first popularized by the NSF/DARPA/NASA Digital Libraries Initiative in 1994. Bush (1945) created a vision based on experience (Digital library)
One of the primary outcomes of the NSF- sponsored Social Aspects of Digital libraries was a definition of the term 'Digital Libraries'. We broadened the scope to encompass two complementary ideas (Borgman, 1999)

"1. Digital libraries are a set of electronic resources and associated technical capabilities for creating, searching and using information. In this sense they are extension and enhancement of information storage and retrieval systems that manipulate digital data in any medium (text, images, sounds, static or dynamic images) and exist in distributed networks. The content of digital libraries includes data, metadata that describe various aspects of data (e.g. representation, creator, owner, reproduction rights) and metadata that consists of data and relationships to other data or metadata, whether internal or external to the digital library.

2. Digital libraries are constructed, collected and organized by (and for) a community of users and their functional capabilities support the information needs and uses of that community. They are a component of communities in which individuals and groups interact with each other and using data, information and knowledge resources and systems. In this sense they are an extension, enhancement and integration of a variety of information institutions as physical places where resources are selected, collected, organized, preserved and accessed in support of a user community. These information institutions include, among others, libraries, museums, archives and schools, but digital libraries also extend and serve other community settings, including classrooms, offices, laboratories, homes and public spaces."

The Association of Research Libraries in 1995 signifies digital library broad diversity. According to ARL, *the digital library was not a single entity as it requires technology to link the resources of many (technology driven) and universal access to a digital library and information services was the goal and that digital library collections were not limited to document surrogates as they extend to digital artifacts that could not be represented or distributed in printed formats* (Association of Research Libraries, 1995) .

The National Science, Technology, Engineering, and Mathematics, US defined a digital library as *a managed environment of 7 multimedia materials in digital form, designed for the benefits of its user population, structured to facilitate access to its contents, and equipped with aids to navigate the global network, with users and holdings totally distributed but managed as a coherent whole* (Mischo, 2004a).

Christine Borgman defined in her presentation at the LIDA conference "Libraries in the Digital Age" digital libraries as follows:

- *Systems that support searching, use, creation of content*
- *Institutions with people, digital collections, and services.*
- *Repositories of digital data and documents, as a component of cyber-infrastructure, e-research, e-science, e-social science, e-learning... (Institutional repositories, open archives, data collections)* (Borgman, 2000).

Although literal difference exists among various definitions, the different definitions are very similar to each other on the essential nature. Thus, from these definitions we may conclude that the unique characteristics of digital libraries include (Zhou, 2005):

- *mass storage of information resources;*
- *information resources in diversified media;*
- *network transmission of information resources;*
- *distributed information resources management;*
- *highly shared information resources;*
- *intelligent retrieval technologies; and*
- *information services without space and time limitations.*

So we can say that, digital library is the system of providing users with coherent access to a very large, sophisticated, organized and automated repository of information which are captured, stored, distributed and retrieved e-resources digitally or electronically. Digital libraries may be treated as repositories of massive amounts of high-quality information content in digital form in multiple servers on diverse

formats permitting access over different electronic networks in a distributed environment (Jeevan, 2004).

Hybrid Library: Combinations of traditional collections, licensed e-resources and openly available digital collections produced in-house or elsewhere. Rusbridge called for the development of technologies, systems and services for the 'hybrid library,' which would integrate all four categories of resources: legacy (non-digital), transitional (legacy resources that have been or will be digitized), new digital resources (those expressly created as digital) and future digital resources. (Calhoun, 2014). Borgman (2000) pointed out that we would have hybrid libraries, archives and other information institutions for the indefinite future and new media would continue to be invented and would supplement, rather than supplant, the old. Millions of documents would be digitized, so digital libraries must be hybrid, including digital materials and pointers to other formats (Barnes, 2004).The British eLibrary program exemplified this hybrid model recognizing that paper and electronic access would continue for the foreseeable future through the Hybrid Library Toolkit (Hylife, 1998).

Institutional Repository (IR): An institutional repository is a new method for identifying, collecting, managing, disseminating, and preserving scholarly works created in digital form by the constituent members of an institution. IR remains an open access model, and operates by centralizing and preserving the knowledge of an academic institution with the purpose to make that accessible to anyone with Internet access (Anuradha, 2005). Institutional repository, which may be called an extension of digital library, is now becoming a platform for the sharing of knowledge. An Institutional Repository consists of formally organized and managed collections of digital content generated by faculty, staff and students at an institution. This is the collective intellectual output of an institution, recorded in a form that can be preserved and exploited. There is the result of the vision to collect, secure and provide access to scholarly publication in a novel, digital way, mostly initiated by the institutional library. Institutional repositories are spreading, as they have become a dispensable component for information and knowledge sharing in the scholarly world.

Library Digitization: It refers to the process of digitising library collection materials. Utilising computer software and other computer devices, library digitization is a process of collecting, copying, scanning and transforming library materials from a printed format to a digitized format. Digitization is defined for the purpose of this study as —the process of converting, creating, and maintaining books, art works, historical documents, photos, journals, etc. in electronic representations so they can

be viewed via computer and other device (IMLS, 2002). Digitization of valued information resources opens up new avenues of access, use, and research and is an important aspect in the development of digital libraries.

Medical Library: A health or medical library is designed to assist physicians, health professionals, students, patients, consumers, medical researchers, and information specialists in finding health and scientific information to improve, update, assess, or evaluate health care (Wikipedia, 2016) . With ongoing changes in health care as a result of information technology, health sciences libraries and librarians can play an important role in bringing high-quality, evidence-based medical information to the bedside, helping to make patient care both efficient and effective. Health care libraries and librarians are adapting to the changing information needs of physicians, other health care professions, researchers, and patients (Sollenberger & Holloway, 2013).

Digital Library Initiatives: The extent of digital library initiatives refers to the amount of projects and the amount of digitization works that had been done by libraries. The degrees of changes in terms of library services and operations that had been transformed from manual to digital systems were the manifestations of the said digital library Initiatives that could further be used as an indicator of digital library development. These developments include an electronic access information system (Lynch, 2003), from centralized to decentralize library system and a managed collections of digital objects (Deegan & Tanner, 2002), distributed information repositories, interoperability (Secker, 2004),openly accessible and accessible over a network (W. A. Arms et al., 2002). The Joint Conference on Digital Libraries (JCDL) had even included electronic publishing (Harun, 2010).

Standard Used for Bibliographic References

American Psychological Association Formatting and Style Guide (APA, 6th ed., 2009) format has been followed to provide the bibliographic references. Some examples for citing references *in text* and in *reference list* or bibliography are given as under.

In-Text Citations

a) A work by single author

Rieh (2002) considered making judgments of information quality and authority a difficult task owing to the overall dearth of quality control mechanism on web.

Growing importance of digital information in our lives, has guided researchers to study information access, utilization and evaluation (Eastin, 2008).

b) A work by multiple authors

Web resources possess hyperlinks which sometimes turn out to be dead or broken and needs to be evaluated. (Grimes & Boening, 2001)

Metzar, Flanagin and Zwarun (2003) expressed concern over the potentially dubious nature of information on the web.

Reference List

Books

Busha, C. H., & Harter, S. P. (1980). *Research methods in librarianship: Techniques and interpretation*. New York: Academic Press.

Journal Article (print)

Grimes, D. J., & Boening, C. H. (2001). Worries with the web: A look at student use of web resources. *College & Research Libraries*, *62*(1), 11-22.

Journal Article (online)

Firdaus, S., & Haridasan, S. (2015). Awareness and use of web resources among the post graduate engineering students of ZHCET, Aligarh Muslim University (AMU), Aligarh. *International Research: Journal of Library and Information Science*, *5*(2). Retrieved from http://irjlis.com/wp-content/uploads/2015/08/2-IR-280-52.pdf

Dissertation or Thesis (Online):

Rusch, L.C. (2010). Depression stigma reduction: The impact of models of depression on stigma and treatment seeking (Doctoral dissertation). Available from ProQuest dissertation and theses database. (Document ID 1865749061)

Organization of the Thesis

The whole work has been arranged in six major chapters including preliminaries and appendices.

Chapter 1: Introduction & Methodology, which introduces general introduction about why the study is undertaken including objectives, rationale of the study, methodology, scope and limitation of the study, and designing the structure of the text.

Chapter 2: Review of Related Literature on the study; An efforts have been made in this chapter to review briefly the relevant literature and studies on Digital libraries in general, digital library initiatives, digital library s9ervices, infrastructure facilities, DL software and hardware, digital library projects, conferences, digital library resources etc., using LISA, LISTA, Emerald, EBSCO, etc., databases including printed and online journals published from both India and abroad are used to reviewed the literature.

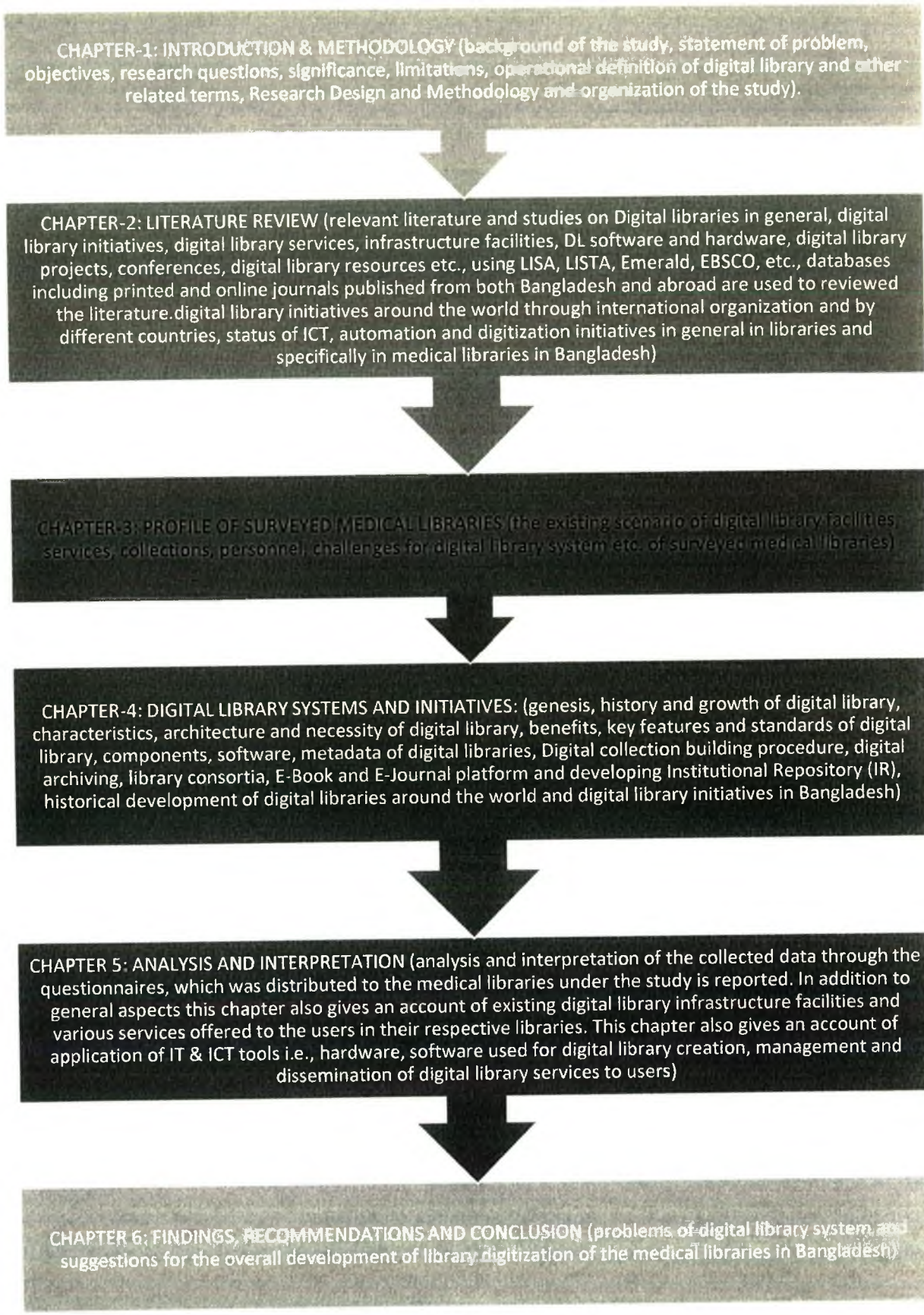
Chapter 3: Profile of Surveyed Medical Libraries, in this chapter mainly the existing scenario of digital library facilities, services, collections, personnel, challenges for digital library system etc. of surveyed medical libraries will be described.

Chapter 4: Digital Library Systems (DLS) and Initiatives: The chapter highlight genesis, history and growth of digital library, characteristics, architecture and necessity of digital library, benefits, key features and standards of digital library, components, software, metadata of digital libraries, Digital collection building procedure, digital archiving, library consortia, E-Book and E-Journal platform and developing Institutional Repository (IR), historical development of digital libraries around the world and digital library initiatives in Bangladesh.

Chapter 5: Data Analysis and Interpretation: This chapter deals with the analysis and interpretation of the collected data through the questionnaires, which was distributed to the medical libraries under the study is reported. In addition to general aspects this chapter also gives an account of existing digital library infrastructure facilities and various services offered to the users in their respective libraries. This chapter also gives an account of application of IT & ICT tools i.e., hardware, software used for digital library creation, management and dissemination of digital library services to users.

Chapter 6: Findings, Recommendations and Conclusion, this chapter will be devoted to problems of digital library system and suggestions for the overall development of library digitization of the medical libraries in Bangladesh.

Figure 1.3: Outline of the thesis



Summary

With new ICT tools and services in library, Digital library Initiatives and projects are establishing tremendously round the globe and touching different aspects of digital library activities such as library accessing, providing services, acquisition, processing, digital preservation and information dissemination through innovative ways. Digital materials and digitization programs are concurrently being planned, produced and developed. The importance and acceptance of digital libraries had resulted in many foreign literatures reporting on digital library initiatives and projects at local, regional, national and international levels, thus consolidating global resource sharing through online digital library services.

The main aim of this study is to present the current state and use of digital resources by medical libraries in Bangladesh and to examine digital library initiatives by some medical libraries in order to fulfill the diversified information needs of students, doctors and scientists. In this respect, the progress could be seen through the initiation of either digital library initiatives or projects or hybrid libraries. The issue is to determine the amount of medical libraries in implementing electronic and digital operations and services as their western counterparts, so that we would be able to know the extent of our progress against worid digital library development. More importantly, it is necessary to examine digital library challenges and initiatives in terms of health science libraries in Bangladesh and to solicit the perceived conditions for digital library future growth.

In today's ICT based environment, digital library plays an important role for preservation and dissemination of digital information. Proper initiatives must be undertaken for delivering right information to right user at right time in an access mode of 24x7. The medical libraries in Bangladesh are trying hard in establishing digital libraries through the process of computerization of their library and information centers. Health is universally regarded as an important index of human development. The Constitution of the People's Republic of Bangladesh ensured that "Health is the basic right of every citizen of the Republic" as health is fundamental to human development. Bangladesh is committed to achieving the Sustainable Development Goals (SDGs) by 2030 but it would not be possible until and unless the health information resources are fully accessible to all the scientists and researchers through a sound digital library environment. The medical library professionals should take more initiatives for the development of digital medical library for providing modern library services effectively and efficiently.

CHAPTER 2: LITERATURE REVIEW

- Introduction
- Purpose and Approach to Literature Review
- Concept of Digital Library
- Digital Library Frameworks
- Emergence of Digital Libraries
- Development of Digital Library
- Digital Library Initiatives by International Organization
- Digital Library Initiatives in Selected Countries
- Automation Initiatives in Bangladesh
- Status of Library Digitization in Bangladesh
- Summary

CHAPTER 2

LITERATURE REVIEW

Introduction

The review of literature is very essential to any research investigation, which gives necessary input to the investigator to frame for her/his research study on the chosen topic. A literature review was an account of what had been published on a topic by accredited scholars and researchers, a piece of discursive prose (Taylor & Procter, 2006) and explaining the intellectual progression of the field including major debates. Literature review might present the historical perspective, initial development and the current situation, possibilities of new inventions, including problems and issues raised, arguments discussed, strengths and weaknesses, to enhance knowledge, sharpens understanding and broadens researchers" perspective on that topic.

This chapter consists of literature review related to digital library initiatives worldwide, at national, regional and international levels. Secondary data were searched from print and online resources. Literatures on digital library initiatives of Bangladesh were very limited, but foreign literatures were plenty and some of these had been highlighted for us to peruse and emulate. Several digital library initiatives of Bangladesh were also looked at and reported.

Purpose and Approach to Literature Review

The purpose of literature review was to establish the potential topics and suggest ideas for another research, reporting published materials on existing conceptual framework, theories, techniques, processes, styles and instruments of other researchers related to the topic under investigation. At the same time to identify why some of the literature was noteworthy and which literature had made important theoretical contributions to the field being studied (Anderson & Kanuka, 2003).

The used of information retrieval tools such as OPAC, abstracts, indexes and bibliographies allowed greater insight of the subject in a more organized manner. Among the online databases and e-journals searched were LISA, Emerald,

EBSCO Host, D-Lib Magazine, Libri, Ariadne and the websites/homepages of many foreign digital libraries.

Predetermined keywords used during the search were digital library, virtual library, e-library, hybrid library, digital library initiatives, digital library problems, digital library research, digital services, digital reference, resource sharing, distributed information resources, Intellectual Property Rights, digitization, online databases, e-resources/digital information resources, born digital materials, information surrogates, digital objects, information revolution, library automation, digital library systems, cyberian, information professionals, digital librarian, global access, Institutional/Digital repositories, Bangladesh and interoperability (Harun, 2010).
The review of literatures is categorized into following areas:

- Concept of Digital library: This is subdivided into several parts; they are:
  (a) Definition of Digital Library
  (b) Digital Library Frameworks
  (c) Emergence of Digital Libraries
- Development of digital library: this is also subdivided, which are: -
  (a) Digitization by international organizations
  (b) Initiatives by several countries
  (c) Automation Initiatives in Bangladesh
  (d) Digitization initiatives in Bangladesh

Concept of Digital Library

The concept of digital libraries as unique or complex phenomena has emerged in studies examining their actual use and in the context of constructing such systems. Marchionini (Marchionini, 2000) stresses that digital libraries have a combination of traditional library roles as well as aspects of computing. However, in his reflections on the multiyear evaluation of the Perseus Project, he describes digital libraries as "emergent complex systems".

Lagoze et al. (2005) reflect on the state of digital library development in the age of Google and argue that digital libraries should move away from the legacy of the traditional library information model built around metadata repositories. The new information model should move beyond search and access functionality and enable creating collaborative and contextual environments where information

resources are "shared, aggregated, manipulated, and refined" (Lagoze, Kraffti, Payettei, & Jesurogaii, 2005).The authors don't propose yet another definition but describe digital libraries in terms of desired characteristics, including

- Selection of resources according to the criteria relevant to the digital library mission
- Services to facilitate the use of resources by the target community
- Collaborative features, allowing users to contribute knowledge and reuse resources
- Contextual features enabling the relationships between the resources

Table 2.1: Selected Concepts of Digital Libraries (Xie & Matusiak, 2016)

Author(s)	Digital Library Components	Emphasis
Single-field perspective		
(Association of Research Libraries, 1995)	Not a single entity = bibliographic control + digital objects + enabling network technologies	Digital nature of collections; access to full-text documents; universal access
(E. Fox, 1995)	Networked information systems = information resources + new ways to organize + new ways to access and retrieve	Distributed networks; information retrieval; extended access to information resources
Digital Library Federation (Waters, 1998)	Organizations = distributed digital resources + staff + library services	Extension of traditional libraries as organizations; traditional library roles and services
Multifaceted perspectives		
(Borgman, 1999)	Digital libraries = digital resources + associated technical capabilities + network distribution User-centered approach = services supporting user needs	Digital format and enabling technologies; community of users; user support
(William Y Arms, 2000)	Managed collection of digital information = resources in a digital format + associated services + network access	Curatorial responsibility: selection, organization, and preservation; user services
(Witten et al., 2003)	Heterogeneous systems = digital resources in multiple modes of representation + metadata + methods for access and retrieval	Selection, organization, and maintenance; new ways of creating knowledge
(Bishop, Van House, & Buttenfield, 2003)	Sociotechnical systems = networks of technology +	Digital technology; knowledge work; social practices; user-

(Contd. Table 2.1)

	information + documents + people + practices	centered approach
(Lagoze et al., 2005)	Multilayered resource-centric model = network of selected resources + structural and semantic relationships	New information model going beyond search and access; collaborative and contextual environment
(Calhoun, 2014)	Digital libraries = systems and services + managed collections of digital content + repository-centered architecture	Open access; support for the advancement

Digital Library Frameworks

Digital library frameworks have emerged in recent years as a sign of the digital library research field. The DELOS Manifesto is a conceptual framework developed by the members of the DELOS Network of Excellence in Digital Libraries, a research group funded by the European Union (Candela et al., 2007) consists of three interrelated tiers:

- Digital Library—represents an organization that collects, manages, and preserves the rich digital content on behalf of users.
- Digital Library System (DLS)—a software system that is based on a defined architecture and provides all functionality.
- Digital Library Management System (DLMS)—a generic software system that provides the infrastructure to produce and administer a digital library.

Six core concepts are associated with the proposed digital library framework: content, user, functionality, quality, policy, and architecture (Xie & Matusiak, 2016).

The 5S—Societies, Scenarios, Spaces, Structures, Streams model provides a theoretical foundation for defining key constructs of digital libraries, which are viewed as complex systems of digital content, people, and technology. The authors propose a simple definition of digital libraries and define a set of abstractions representing the fundamental entities involved in the process of digital library development and use (Edward A Fox, Goncalves, & Shen, 2012). This model builds on the authors' previous work in which the concepts of streams, structures, spaces, scenarios, and societies were defined (Goncalves, Fox, Watson, & Kipp, 2004). Digital libraries are defined as complex systems that

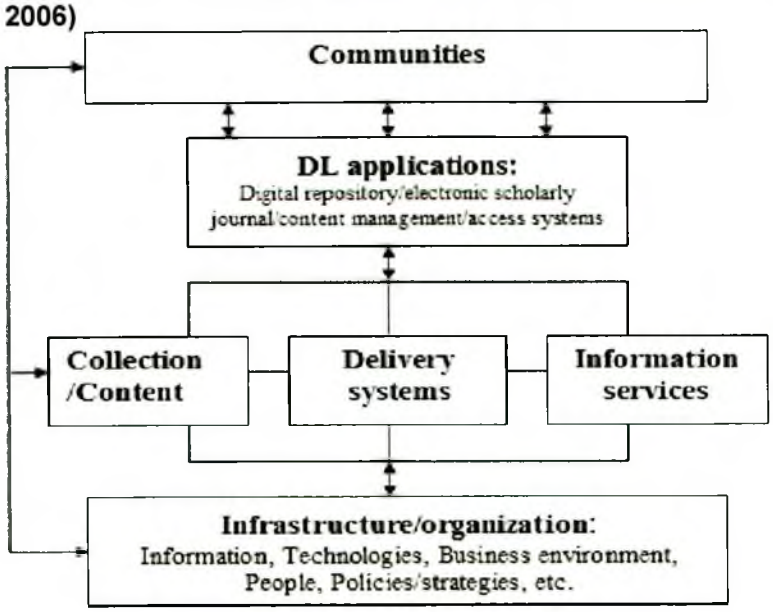
- Help satisfy info needs of users (societies)
- Provide info services (scenarios)
- Organize info in usable ways (structures)
- Present info in usable ways (spaces)
- Communicate info with users (streams) (Edward A Fox et al., 2012)

Table 2.2: Digital Library Frameworks (Xie & Matusiak, 2016)

Name/Authors	Digital Library Components	Emphasis
The DELOS Manifesto (Candela et al., 2007b)	A three-tier framework = Digital libraries as virtual organizations + DLS that users interact + DLMS providing software infrastructure	Six fundamental concepts: content, user, functionality, quality, policy, and architecture
The 5S (Fox et al., 2012)	Complex systems defined in terms of Streams Structures Spaces Scenarios Societies	Theoretical constructs capturing the essence of an information lifecycle

Choi and Rasmussen (2006) provided a digital library model based on a practice community. From a traditional librarian's point of view, digital libraries present a transformative model of a large-scale, user-centric organization that is moving towards an integrated form with various components.

Figure 2.1 : Digital library based on a practice community (Choi & Rasmussen, 2006)



Emergence of Digital Libraries

Vannevar Bush and J.C.R. Licklider are widely recognized as digital library pioneers (William Y Arms, 2000; Calhoun, 2014; Lesk, 2012). Lynch also points to H.G. Wells and Paul Otlet as early thinkers in the "prehistory" of digital libraries (Lynch, 2005). Computing was introduced in libraries in the 1960s and the library community developed their own online services and standards, such as the machine readable cataloging (MARC) format and the Z39.50 protocol. MARC was developed in the 1960s as a standardized format for exchanging cataloging records. The Library of Congress began distributing MARC records in 1969 (William Y. Arms, 2012; Calhoun, 2014; Lesk, 2012). Online library catalogs were developed in the late 1970s and became part of automated library systems. Z39.50 was one of the first protocols for distributed computing and enabled searching collections on remote systems (William Y. Arms, 2012). MARC and Z39.50 were used in some early digital projects, and although later replaced by newer standards, nonetheless, they provided a foundation in the initial phase of digital library development. Improvements in scanning technologies in the late 1980s encouraged libraries to experiment with the digitization of selected cultural heritage materials. The first digitized collections were available on CD-ROMs or through local library networks. The invention of the web by Tim Berners-Lee in 1990 changed the landscape dramatically. The early experimental projects moved to the web, and the development of digital libraries began in earnest (Xie & Matusiak, 2016).

Digital libraries had been under development since the early 1990's (Edward A. Fox, Suleman, Gaur, & Madalli, 2005) and their emergence had opened up new horizons related to the design, implementation, development and evaluation (Shiri, 2003),involving a number of social, cultural and behavioral, economic and legal issues (G. Chowdhury & Chowdhury, 2003).The idea of a "computerized library" was first invented by H.G. Wells, with writings about "world brains" (Sharifabadi, 2006). Then in 1945 Vannevar Bush wrote about his imaginary machine *Memex*. Douglas Engelbart later developed what was to be called hypertext and Ted Nelson coined the term hypertext in the mid 1960"s. Finally it was Tim Berners-Lee who proposed the global hypertext called World Wide Web (WWW) (Tedd Lucy & Large, 2005). Deegan and Tanner (2002) regarded these developments as the greatest advancement in ICT and the widespread usage had revolutionized library operations (Cathro, 1999).

One of the early attempts towards digital library development was the 1971 Ohio Computer Library Center"s WORLDCAT (Deegan & Tanner, 2002), now a union catalog of more than 1 billion items (Hickey & O'Neill, 2005). Others were Project Gutenberg 1971 at the University of Illinois, *Perseus*, a large hypertext collection of materials on the ancient Greek world (G. Chowdhury & Chowdhury, 2003) and the 1970"s full-text document databases, supported by software called STAIRS (Cathro, 1999). Most of these early attempts involved the digitization of journal articles, such as the pre-digital Mercury Electronic Library project (1989-1992) at Carnegie Melon University in Pittsburgh and OCLC (Tedd Lucy & Large, 2005),TULIP (The University Licensing Project) 1993-1995 by Elsevier Science (Hickey, 2004), CORE (Chemistry Online Retrieval Experiment) a project involving OCLC, Cornell University, Bellcore and the American Chemistry Society.

Development of Digital Library

Secker, 2004 stated that "Digital library developments that had resulted from automation because Online Public Access Catalogue (OPAC) was the earliest product of such development" (Secker, 2004). As we would see in the following segments, the progress was growing at an unprecedented rate, looking at the many digital library initiatives that were taking place in many countries around the world. However, Borgman (2000) had cautioned that if global infrastructure could link together electronic resources, whether public or private, large or small, located around the world, it would serve as a global digital library.

The European digital library, Europeana, started in July 2007 had initially 2 million digital collections of texts, images, audio files and movies and the number was projected to reach 6 million items by 2010 (Landon, 2009).

The American Library Association had reported in its annual report 2007 that the investment in e-books at academic and research libraries rose an astonishing 68% from 2002 to 2004 (www.worlddigitallibrary.org).

The American Library Association had reported in its annual report 2007 that the investment in e-books at academic and research libraries rose an astonishing 68% from 2002 to 2004. According to a June 21, 2007 *Amazon.com press release*, it planned to digitize thousands of books through agreements with universities and public libraries. An article in *The Chronicle of Higher Education* reported that Google too had signed a book digitization agreement with 25 universities with the Committee on Institutional Cooperation (Wilson, 2007).The climax to these

developments was when UNESCO, Library of Congress and Google joined forces to build the *World Digital Library* (UNESCO, 2007) that was finally launched on 21 April 2009, offering information resources from all over the world, in 7 languages from 32 partner institutions (www.worlddigitallibrary.org).

i. Digital Library Initiatives by International Organization:

Even with little funding, a large international digital library had emerged, grown and improved and National libraries of G7 countries had collaboratively created the Bibliotheca Universalis, thus establishing a global e-library system and the national libraries of 35 and Belgium, the Czech Republic, the Netherlands, Portugal, Spain and Switzerland had since joined the project (David Raitt, 2000). Hewlett-Packard Digital Library was launched in 1992, thus expanding services for the 126,000 HP employees in more than 150 countries (Pack, 2000). During 2003 e library services established by world bank by making full text of its document available online (Tedd Lucy & Large, 2005).

With many projects the for promoting digital library initiatives European Union too had taken several steps at European level with many projects such as Candle, Cecup, Debora, Decomateii, Dieper"S, Euler, Nedlib, Digicult and Miracle. Caspar was another European Union integrated project with cooperation from UNESCO, University of Leeds, University of Glasgow and International Business Machine (Collier, 2004; J. Liu, 2005). DSpace is an open source dynamic repository developed by MIT Libraries and FEDORA (Flexible Extensible Digital Object and Repository Architecture) project developed by Universities of Cornell and Virginia were examples (Dunn, Davidson, Holloway, & Bernbom, 2004).

ii. Digital Library Initiatives in Selected Countries

What follows next were glimpses of some of the digital library initiatives in eight countries worldwide: Australia, Canada, China, New Zealand, Singapore, Taiwan, United Kingdom and Unites States. Australia was noted for having developed many digital library initiatives. Canada had manifested a good collaboration between libraries, archives and museums. New Zealand is well known for its *Greenstone* digital library software. The United Kingdom and the United States were among the pioneers, trend setter and main digital library players. Liu (2005) supported this when he said generally speaking all over the world the pioneering digital library initiatives took place in the United States. And according to Andrews and Law (2004) the projects undertaken under the auspices of the United Kingdom and the

United States had a fundamental impact on the development of digital libraries we saw today. Meanwhile, China, Singapore and Taiwan represented some of the digital library developments in Asian countries (Andrews & Law, 2004).

Australia

Iannella, 1996 stated in his article, Australian libraries at the federal, state and university levels, together with commercial and research organizations were supporting diverse set of digital library projects. He also explored that, REDD – an Electronic Document Delivery Project, developed by the University of Queensland, Queensland University of Technology and Griffith University Libraries, had been used by staff and students of eight institutions. And revealed that, Sydney University had developed the Scholarly Electronic Text and Image Service (SETIS), a digital library of humanities databases and theses. Electronic Reserve Project was the virtual library for Monash University Library"s new branch on the Berwick campus (http://www.lib.monash.edu.au/wwwlib/). REDD – an Electronic Document Delivery Project, developed by the University of Queensland, Queensland University of Technology and Griffith University Libraries, had been used by staff and students of eight institutions (http://lib83.library.uq.oz.au/) (Iannella, 1996).

Project Gutenberg of Australia produced e-books and made them freely available online. It was interesting to note that some of the e-books available here might still be under copyright in the United States. One of the recent digital library project was PILIN (Persistent Identifier Linking Infrastructure), funded from 2006-2008 to strengthen Australia"s ability to use global persistent identifier infrastructure particularly in the repository domain (Nicholas, Ward, & Blinco, 2009).

Canada

CIDL News exposed that with a membership of more than 50 Canadian libraries of all types, Canadian Initiative on Digital Libraries (CIDL) promoted, coordinated and facilitated the development of Canadian digital collections and services in order to optimize national interoperability and long-term 45 accesses to Canadian digital library resources. Began in 2000 when they first did the CIDL Membership Survey, they had progressed steadily (Tedd Lucy & Large, 2005).

Harun 2010 told us that, Toronto Public Library, which is the largest public library system in Canada, had started the Virtual Reference Librarian, made possible through the collaborative efforts of TPL, the TPL Foundation,

Telecommunications Access Partnerships, Ontario Ministry of Energy, Science and Technology, and the Ontario Ministry of Citizenship, Culture and Creation. Toronto Public Library loaned over 25 million items and answered 8 million reference questions a year (http://vrl.torontopubliclibrary.ca/vrl.portal) (Harun, 2010).

China

In 1996 saw the development of the Chinese Pilot Digital Library project, undertook by nine public libraries and the National Central Library, with the aim to set up multimedia repositories, provided digital information services and developed e-commerce (W. Liu, 2004). Completed in 2001 and became the first digital library project in China and the first to give a solution to issues in developing digital library in the country. The National Central Library then launched in 1998 its www-based „Remote Electronic Access / Delivery of Document Services" (http://readopac.ncl.edu.tw/eindex.html) or *READncl* enabling users to retrieve information via the Internet. *READncl* comprised more than 9 systems with over 1.5 million entries and 5 million pages of text images and linked to over 22,000 articles via the internet.

New Zealand

The New Zealand Digital Library project, a research program at the Department of Computer Science, University of Waikato had developed in collaboration with UNESCO, *Greenstone* Digital Library Software (Witten et al., 2003). As illustrated by Witten (2005) *Greenstone* was in widespread use in many corners of the world and as of October 2006, there were 28 sites using it (http://www.greenstone.org) and as of November 2009, the latest *Greenstone3* was still a research version (http://www.greenstone.org/greenstone3-home).

Singapore

Chowdhury and Chowdhury, 2003 tried to establish on his article that, Singapore's digital library development was spearheaded by the Library 2000 Committee, comprising of librarians as well as the Singapore National Computer Board, to establish Singapore as 53 an international information hub. The plan included a detailed rework of 500 libraries and information centers that would enable access to information from anywhere, at any time, within the next 20 years. In 1999, iGEMS an Internet-based university portal was launched giving

a number of digital library services to Nanyang Technological University. Tedd and Large, 2005 and Theng, 2005: following the above article also state that in April 2002, the e-Library Hub service was launched as part of the National Library Board's Digital Library system, done in collaboration with Shanghai Library in China that included some 13,000 e-journals and online databases, 10,000 e-books and more than 700 CD-ROM and 900 video-on-demand titles (Harun, 2010).

United Kingdom

In the United Kingdom, early attempts towards library automation in the 1960"s were the Birmingham Libraries Cooperative Mechanization Project (BLCMP) and South West Academic Libraries Cooperative Automation Project (SWALCAP) (Brophy, 2006). However digital library initiatives started in 2003 with the British Library"s strategic objective which stated that by 2000 it would be a major center for the storage of and access to the digital texts (Secker, 2004). Following the Follet Report, the electronic library program – *eLib* – was set up by the Joint Information Systems Committee, focusing mainly on the higher education sector (Pinfield, 2001).

United States

Digital library moves in the United States began in 1989 by the Library of Congress when a consultant surveyed 101 members of the Association of Research Libraries and the 51 state library agencies, disclosing genuine needs for online collections. The United States federal government responded by spearheading Digital Library Initiatives 1 (1994-1998) and 2 (1999-2004), that dramatically changed the country"s digital library scenario. Defense Advanced Research Projects Agency (DARPA), National Aeronautics and Space Administration (NASA), National Science Foundation (NSF), National Library of Medicine (NLM), National Endowment for the Humanities (NEH) too played their roles in terms of giving digital library research grants (Mischo, 2004b).

The Library of Congress National Digital Library Program was launched in 1995, after a 5-year pilot (1990-1995) of the American Memory Project, working with the National Science Foundation, universities, foundations, publishers, museums and educational bodies. It began digitizing collections of Library of Congress archival materials that chronicle the nation's rich cultural heritage (http://memory.loc.gov/ammem/index.html). They planned to present online 5 million

items in 5 years (Kresh, 2004) and reached its goal of digitizing 5 million items in its bicentennial year of 2000 (Library of Congress, 1998). Even though the American Memory Project had successfully digitized 9 million historical images as at June 2007, this represented a mere fraction of more than 120 million items in its inventory.

iii. Automation Initiatives in Bangladesh

Ahmed, Munshi and Ahmed (1997) conducted study on "Computerization of Libraries in Bangladesh". The paper inspects the status of library computerization in Bangladesh and also presents initiative taken by different organizations and institutions in the country to computerize their library operations and reveal problems faced by the libraries, which succeeded in automating some of their functions. They also provide idea as to how libraries can implement new computer technologies in order to improve their functions and services to users (Ahmed, Munshi, & Ahmed, 1997).

Uddin made a focus on "Library automation: a study of the AIC, BANSDOC and the national libraries" where he discussed about present status of those libraries and also focused about basic library operation, automation scenario and future plan of those libraries (H. Uddin, 1998).

Uddin, Chowdhury and Islam conducted a study on "Automation scenario of some leading agricultural libraries of Bangladesh: An overview" where he provided an overview of application of automation in leading agricultural universities in Bangladesh. They present on tabular form of various IT tools use by these libraries and status of automation of in house function. They also highlighted the challenges faced by libraries and recommended the appropriate steps (H. Uddin, Chowdhury, & Islam, 2003).

Munshi (2003) presented "Library automation in Bangladesh: the Dhaka University Library experiences" where he attempts to discuss the concept of library automation, status of library automation in Bangladesh, Dhaka University Library and their Automation project. He also presented the model of Dhaka University Library Automation Project (DULAP). He discussed the online access and internet browsing system and how to use GoPAC. He also focused the features and objectives of DULAP, requisite hardware and software, functions and activities of the program, facilities offered to users and tasks still to be accomplished (Munshi, 2003).

Siddike, Munshi and Sayeed (2011) discussed in their article level of adoption of ICT in university libraries in Bangladesh and this article was the basic on this topic. This study explored that, through installation of IBM 1620 at Atomic Energy center, Bangladesh entered into the computer era and from 1980's automation introduced in Bangladesh. Form the survey they found some problems in the adoption of ICT in Bangladesh according to their experiences they also recommended some suggestions (Siddike, Munshi, & Sayeed, 2011).

Shuva and Akhter (2012) carried out a study to explore present status of non-government public libraries in Bangladesh. With the establishment of four public libraries in 1854, library movement in Bangladesh started, also the nongovernment public library movement and at present there are 972 non-government public libraries. They found out through focused group discussion the establishment, membership, collection, financial status, ICT status to those libraries and the problems faced by those libraries (Nafiz Zaman Shuva & Akter, 2012).

Dilara Begum attempted to give a bird's eye view of the present scenario of library automation in the East West University and discusses the satisfaction level of its users after improving the automation system in this era of information technology (Begum, 2009).

Shuva, Banerjee, Naningrum, Madrid, Agabirwe, Kulisooma (2011): The article discussed the importance to introduce ICT in libraries to satisfy the demand of customers, in this regard role of national libraries. The prime objective of this study was to explore the present status of ICTs in National Libraries of Bangladesh, Indonesia, Philippines and Uganda. The result of this survey was to, the National Libraries of Bangladesh and Uganda leg behind in providing ICT services than the National Library of Indonesia and the National Library of Philippines. Also stated digital library initiatives in these national libraries, problems that impede the growth of ICT development and suggest some issues that should be used by these national libraries (Nafiz Zaman Shuva et al., 2011).

iv. Status of Library Digitization in Bangladesh

In 2008, Awwal conducted a comprehensive study where the research deeply focused on, to create a high speed state of-the-art research and education network and a flagship digital library consortium for all public and private universities and research institution of Bangladesh. The University Grants Commission of Bangladesh would like to invigorate the ICT infrastructure of the

universities of Bangladesh befitting to the 21st century and to provide access to the latest ICT tools of education to all students, faculty and researchers in Bangladesh (Awwal, 2008).

Islam in 2011 attempted to investigate mainly the problems and prospects related to library digitization in Bangladesh. The findings of this paper is almost shocking, very few libraries of Bangladesh have been taken digitization program successfully where most of the libraries are still far behind from any sort of digitization efforts to their library. On the basis of the survey, the study ends up with some important suggestions which will definitely help the libraries of Bangladesh to overcome the problems and step forward to the digital world (S. Islam, 2011).

Rahman and Mezbah-ul-Islam in 2012 focused on the core concept of preserving information in the digital environment and present digital preservation practice in Bangladesh. Around the world archival institutions and research centers are actively planning and developing digital preservation policy for their resources but this practice is lagging behind in Bangladesh. In this regard this article also identified major issues and challenges of digital preservation (M. M. Rahman & Mezbah-ul-Islam, 2012)

Islam1 & Mostofa investigated a study in 2013 to explore the present status of digital resources in different types of libraries in Bangladesh. The survey in this article revealed that, some digital resources were found in case of special libraries and a notable number of resources were found in the academic and university libraries and in the collections of national and public libraries there were no digital or electronic resources available, though most of the libraries in Bangladesh have very limited resources. In that case, they suggest three ways to increase digital resource in Bangladesh: By Digitized Existing Materials, Through Institutional Repository, and Digital Collection Developed through Consortium (S. Islam & Mostofa, 2013).

Alam and Islam in 2011 explored the digitization initiatives by the librarians and information professional in the private and public university libraries of Bangladesh. The study found that, the evolution of digitization and digital librarianship in Bangladesh is very much related to the initiatives of ICT adoption in libraries. According to survey, it has been evident that there exists neither digital library nor any integrated automated library system in the country and

around 60% urban based libraries and information centers have brought computer and other ICT equipment in use (M. Alam & M. Islam, 2011).

Reza in 2006 explored the status of higher academic libraries of Bangladesh and the issues related to digital Libraries are also highlighted. The study explored that, the major problem of library digitization in Bangladeshi university libraries has been the lack financial support from the parent organizations, the university authority is not much aware about the library and its role in an academic environment. Most of the university libraries do not have minimum ICT facilities which reveal that full-fledged digital libraries in an academic environment have not yet been realized (Reza, 2006).

Rahman carried out a study in 2012 of digital libraries including its present context and future directions and various technical issues related in the concept of digital library also has been analyzed. The results from the paper reveal that, Digital libraries have created tremendous opportunities for information and computer science researchers and practitioners and can meet the needs of user communities through a variety of services connected with complex collections and various structuring mechanisms for managing data and Every issue related to digital library concept needs to be handled in both local as well as global contexts (M. Z. Rahman, 2012).

Alam and Islam conducted a survey in 2011 to find out the, the problems and potential of ICT and digitization in context of the library and information sector of Bangladesh. This scenario entails that there exists a long gap between the vision 2021 and the reality of 2021. Considering these issues and socio-economic condition of Bangladesh, this paper explores existing policies, current scenario and professional challenges toward digitization and digital information systems development in Bangladesh (M. S. Alam & M. S. Islam, 2011).

In 2012, Shuva conducted a study on "Building digital libraries in Bangladesh: A developing country perspective" to trace out the ways used to build digital libraries in Bangladesh as well as the problems that might be encountered during digital library system development. It shows the existing status of digital library development, particularly the status of digitization in Bangladesh as well as government initiatives to build digital library system (N. Z. Shuva, 2012).

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

acquire the digital information resources has been started though the rate of adopting ICT & modern technology in library is very low. However, the scenario of digitization and digital collection maintenance is obscure. Based on the literary evidences, it is assumed that the initiatives for bibliographic database, full-text database, hosting indigenous information product over the internet, technology based information communication activities are at the elementary level at the maximum number of the university libraries of Bangladesh (S. Islam, 2011).

Chowdhury in 2013 carried out a study on "Database Management Systems and Use of Digital Resources in Some Selected Public University Libraries of Bangladesh: An Overview" to find out present status of database management practices and use of digital resources of five selected Public University Libraries of Bangladesh (M. F. Q. Chowdhury, 2012).

In 2013, Islam conducted a study on "Library Digitization in Bangladesh: A Developing Country Perspective" to explore the digitization and digital librarianship initiatives by the librarians and information professional in the private and public university libraries of Bangladesh (S. Islam, 2013) .

Rahman in 2015 conducted a study in order to investigate the existing digital resource management systems and practices in Bangladeshi libraries. 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. 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 (A. J. Rahman et al., 2015).

In 2015, Uddin et al. investigated a study for Web-based library services of icddr,b. They mentioned that icddr,b library is the pioneer in Bangladesh for adapting digital tools and technologies in order to meet the ever changing needs and expectations of its research communities. The number of e-resources facilities and services in

electronic format is growing increasingly in the library due to advances in information technology. The main objective of this article was to examine the present status of significant Information and Communication Technology (ICT) infrastructure development of icddr,b library including web-based library facilities and services. Besides, this study investigates the various forms of digital collection building procedure are being practiced in icddr,b library using proprietary and open source software. Finally, the present study explored the e-resource usage status of icddr,b and discovers the challenges and prospects of developing digital resources management at icddr,b library (M N Uddin, Rahman, Mamun, & Khandaker, 2015).

Summary

Literature review on digital library developments worldwide had disclosed some prominent points as below (Harun, 2010):

a) *"Digital library is the library of the future, characterized by e-resources, distributed information resources, dematerialization of library materials, global resource sharing and universal user based. The key concept was the provision of access to digital information and linkages to relevant websites worldwide.*

b) *Digital library researches had been extensively carried out especially at universities and organizational levels.*

c) *Digitization programs were carried out extensively at all levels, national, regional and international, by libraries, archives, museums, universities, governmental organizations and private institutions.*

d) *Digital library initiatives were more than just information surrogates and subscription to commercial online databases.*

e) *Special subjects or disciplines and rare materials had been given priorities together with the digitization of the national heritage.*

f) *Financial supports were available from the governments, foundations and private institutions / corporations.*

g) *All of the coordinating and facilitating digital library initiatives and projects were done on collaborative efforts, thus ensuring resource sharing and virtual re- unification of digital resources.*

h) *Understanding of digital library issues and several main issues related to digital library had been worked out, specifically relating to the actual definition of what constitute a digital library, preservation of digital objects, ownership, copyright and intellectual property rights, multi lingual digital library, interoperability, and the expansion of legal preservation to include digital objects.*

i) *Literatures and publications on digital library endeavor, reporting the research, planning, monitoring of digital library projects, status and success of foreign digital library undertakings were many, reflecting a tremendous increase in networking and inter-organizations collaborations of different expertise and backgrounds.*

j) *The success of digital library development was dependent on several conditions / factors that must co-exist especially on the human aspect, technology and resource factors."*

CHAPTER 3: PROFILE OF SURVEYED MEDICAL LIBRARIES

- Background
- Scenario of Surveyed Medical Libraries
- icddr,b library
- BSMMU library
- DMC Library
- BCPS Library
- BIRDEM library
- NHLDC library

CHAPTER 3

PROFILE OF SURVEYED MEDICAL LIBRARIES

Background

The nature of medical education in Bangladesh was inherited from the British and the then Pakistan period. In early nineteen sixties the Pakistan College of Physicians and Surgeons with its sister Institute of Postgraduate Medicine and research (IPGMR) and Bangladesh College of Physicians and Surgeons were established to offer UK based Postgraduate Degrees such as MRCP, FRCS in various discipline in Medical Science.

In Bangladesh, medical education at the graduate level is provided by medical Colleges. Medical colleges are under the jurisdiction of the Ministry of Health and are affiliated with a university on the respective region. Until the early 1990s, all the medical colleges were established by the government. Since then, several private medical colleges have been set up. In the year 1946 the first Public or Government medical college of Bangladesh named — Dhaka Medical College (DMC) was established.

Shortly afterwards, in 1947 the Partition of India divided colonial Bengal into West Bengal which remained part of India and East Pakistan. As a result of partition, some students left Dhaka for Calcutta across the border and vice versa. Rajshahi Medical College was the second to be established in 1956. East Pakistan later became independent Bangladesh after the 1971 liberation war. The first non-government medical college, Bangladesh Medical College, was established in 1986 (Amin, Merrylees, Hanif, & Talukder, 2008).

There are now 29 Government Medical Colleges and 09 Govt. dental Colleges recognized by the Bangladesh Medical and Dental Council (BM&DC 2016). Of these eight are "old" medical colleges and the remaining twenty one are "new" medical colleges. As a direct result of this shortfall, the past ten years have seen a prolific growth of many 'private' or non-government medical colleges. As of October 2016, there are 67 non-government medical colleges and 23 private dental colleges in Bangladesh.

The growth of private medical colleges in Bangladesh mirrors neighboring countries' experience. For example, a recent report on India suggests an astounding 1120 percent increase in the number of privately-funded medical colleges between 1970 and 2005 (Singer, 2006). Non-government medical colleges in Bangladesh have given opportunities to many students to pursue their dreams that would have remained largely unfulfilled and un-catered for by the few government medical schools. Several private medical schools admit significant number of foreign students especially from SAARC (Southeast Asian Regional Cooperation) countries such as Sri Lanka, Nepal, Maldives, India, Bhutan, Pakistan, Afghanistan as well from the UK and the USA. Both government and private medical colleges are regulated by the BM&DC. Unlike the governmental medical colleges where the cost of education is highly subsidized and tuition fees are kept to a minimum, private medical colleges rely heavily on student fees for existence.

The medical education of the country has been constantly improving to keep pace with the worldwide progress of medical science. The medical science is advancing with the enrichment of educational science and technology. Global changes are happening in medical education in accordance and conformity to these advancement and changes. With the application of these knowledge and skill of medical science, future doctors should satisfy their patients with the changing need of the community. As a nation of third world countries, as have to keep pace with the latest development in Medicine.

Scenario of Surveyed Medical Libraries

The advent of Information and Communication Technologies and influence of Information explosion have brought many advances in the field of knowledge, especially in medical sciences which had profound impact on medical professionals, practitioners, students in pursuing their research and patient care. The medical professionals require accurate and speedy information for updating their knowledge. Due to the elasticity of budgets and increases in journal and book prices every year, keeping in view of user needs, libraries are forced to join a consortium. Medical education aims at developing medical manpower suitable to the needs of the country.

The profile of the surveyed medical libraries is described in the below-stated sections.

icddr,b Library

icddr,b is an international health research institute. Based in Dhaka, Bangladesh, we are committed to solving public health problems through innovative scientific research – including laboratory based, clinical, epidemiological, and health systems research. By developing, testing and assessing the implementation of interventions specifically designed for resource poor settings, we aim to improve the health and wellbeing of people living in the world's poorest nations. For more than 50 years, we have been carrying out high-quality research and promoting the uptake of evidence-based interventions. Our initial focus was on diarrhoeal disease, but we now study multiple infectious diseases, other threats to public health, and methods of healthcare delivery. icddr,b has had a profound impact on health policy and practice both locally and globally.

The Cholera Research Laboratory (CRL), set up in Dhaka on 5 December 1960, was internationalized, through the promulgation of a national Ordinance, as the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) on 6 December 1978, which was formally inaugurated on 1st July 1979. Researchers at the Centre have made major scientific achievements in diarrhoeal disease control, maternal and child health, nutrition, HIV/AIDS, food and water borne diseases, chronic diseases, communicable diseases, Vaccine Sciences, population, urbanization and climate changes. These significant contributions have been recognized worldwide (icddr, 2016).

The icddr,b Library was established in 1962. A five year project proposal named DISC (Dissemination of Information Service Centre) project initiated in May 1982 and this was considered as a remarkable achievement for icddr,b library (icddrb library file, 1982). Mr. M. Shamsul Isalm Khan, former head of icddr,b library, taken major initiatives and achieved success towards introduce ICT facilities and services in icddr,b as well as other organizations in Bangladesh. The implementation of DISC project was the turning point of icddr,b library and most important ICT facilities of icddr,b library was achieved.

Modern libraries are presently faced with challenges as a result of the introduction of new information technologies which has led to an increase in competition among information providers. Libraries must improve the quality of their services to enable them face the challenges of information explosion in the 21st century. Service oriented organizations have identified the customer or user as the most critical voice

in assessing service quality. For assessment of service quality to be effectively carried out in medical libraries, it is imperative to investigate what new and modern information services are available to users. In this regard, icddr,b library is running to a separate section as Library and Information Services Section (LISS) under direct management of icddr,b. It occupies presently about 6,000 sq.ft floor spaces with modern ICT tools and technologies and has a total of 08 staff members (M N Uddin et al., 2015).

Library services: The services provided by the library to the scholarly community of icddr,b and outside are circulation and dissemination, Online Public Access Catalogue (OPAC), reprints, photocopying, guidance, reference and bibliographic, internet/online (cyber corner), collaboration and partnership development, inter-library loan, image of book information, current awareness, bulletin information, referral, document request, literature search, citation management, indexing, and training program on literature search, information literacy and reference management (EndNote) services in scholarly writings. The library has its own database, Institutional Repository (IR) where most of published & unpublished materials are available on the website along with other e-resources. icddr,b library identifies, assesses, acquires, processes, preserves and maintains learning resources, and disseminates their availability. The library prepares list of icddr,b publications for the weekly bulletin for the incoming materials and disseminates it in the electronic format to the Centre's researchers and its users.

RFiD Technology: icddr,b library has successfully implemented RFID (Radio Frequency Identification) technology in May, 2016 by which we will be able to tracking of materials throughout the library efficiently, including easier and faster charge and discharge, inventorying, and materials handling. This system will be available in icddr,b library in a short span of time ("icddrb library file," 2015).

Wi-Fi access: Three Wi-Fi routers are available with the range of 100 sq. m. in the library. Password is required to use this Wi-Fi.

Other key facilities: The whole library is under air-conditioning system. A total of five latest reproduce machines are connected with Local Area Network. Facilities for photocopying and printing are available through these machines. There are 15 computers at Cyber Corner inside the Library. Facilities for browsing Internet and Intranet are available. Library has the provision to organize training programs for icddr,b researchers to enhance their skill. Training programs are organized for

literature search on the Internet. This will help researchers to save time to get desired reading materials. Internship program is available in the icddr,b library for the students of the Dept. of Information Science and Library Management (ISLM). Facilities of using EndNote software are available for the researchers of icddr,b. icddr,b library has inter-library loan facilities. Information about new arrival books to the researchers of icddr,b, library initiates a circulation systems where images of books with bibliographical information are used. Liberty is the library management software used by icddr,b library, where facility of book reservation is available through OPAC. Facilities for personal membership, corporate membership, and Institutional membership are available for outside users. Guidance facility to the new users is available to use the library resources properly (M N Uddin et al., 2015).

Bangabandhu Sheikh Mujib Medical University (BSMMU) Library

Bangabandhu Sheikh Mujib Medical University (BSMMU) is the premier Postgraduate Medical Institution of the country. It bears the heritage to Institute of Postgraduate Medical Research (IPGMR) which was established in December 1965. In the year 1998 the Government converted IPGMR into a Medical University for expanding the facilities for higher medical education and research in the country. It has an enviable reputation for providing high quality postgraduate education in different specialties. The university has strong link with other professional bodies at home and abroad. The university is expanding rapidly and at present, the university has many departments equipped with modern technology for service, teaching and research. Besides education, the university plays the vital role of promoting research activities in various discipline of medicine. Since its inception, the university has also been delivering general and specialized clinical service as a tertiary level healthcare center.

Core Facilities: Bangabandhu Sheikh Mujib Medical University (BSMMU) has a well-equipped modern academic library known as Central Library. The Central Library can accommodate over 750 users at a time in its well-furnished reading area. On an average 1000 doctors/ members/ teachers use the library every day. Collection consists of over 26,551 volumes of books; 5,201 volumes of bound local and international journals; 2,731 copies of thesis; 329 copies of CDs/DVDs; 1583 copies of WHO (World Health Organization) publications; 690 copies of news clippings and 652 copies of other reports. The key facilities are (BSMMU, 2017):

- They introduced ICT from 2005 and they have 13 computers.

- All collection of the Central Library is possible to search by library management software system which is named as Library Management System "LMS" and they are currently using open source automation software named "KOHA".

- Its website is dynamic containing all the important information including explain the library in an organized way through a separate link.

- They have a separate webpage for their institutional journal named Bangabandhu Sheikh Mujib Medical University Journal which is a double blind peer reviewed journal. It starts publishing afresh from July 2008. It is published biannually in January and July each year by Bangabandhu Sheikh Mujib Medical University. It publishes original articles based on laboratory work, field work, clinical trials and various other studies by scientific means related to the disciplines of biomedical science and health science conducted in this university and other institutes in Bangladesh and other countries.

Digital Library: Bangabandhu Sheikh Mujib Medical University (BSMMU) also has a modern electronic library known as Digital Library which is located at the 5th floor of "A" block. The project proposal of digitization was taken in 2010 and started digitization work from August, 2011.

They are using DSpace for their library digitization. They have digitization policy to select and acquire digital collections. So their digital library chooses and has born digital materials. At present the digital library has 86 new DELL brand computers with internet browsing facilities. The internet and e-mail facility uses 10 Mbps dedicated bandwidth. Through university LAN connection all department has access with the BSMMU Central Library and Digital Library. Other faculty members, students & staffs of BSMMU can use the following services provided by digital library.

a. Internet browsing, e-mail check.

b. More than 10,000 medical electronic journal's full text using many publishers like as Hinari, PERI, Medline/Pubmed, Blackwell, Springerlink, and Wiley inter sciences and many more.

c. 2,300 medical related free online journals have link with BSMMU webpage.

d. They have laser printer, scanner and CD/DVD writing facilities.

e. Digital Library arranges some training program such as:

Basic Computer Fundamental, Microsoft Office (Word, Power point, Excel etc.) and Internet Browsing for section officers, online Journal surfing & e-Books browsing techniques for faculty members, KOHA, MARC 21 & Ubuntu for library professionals.

f. Drawbacks:

- IT professionals who are doing the work of digitization they do not understand clearly the term digitization; they even do not understand the difference between library automation and digital library.
- There is so much gathering in the library ground floor.
- For this library's huge collection there is no institutional repository.
- Still even the users of BSMMU do no access full text document on the digital library
- Though the project begins from 2010, the input of collection to DSpace is not completed yet.

Dhaka Medical College (DMC) Library

Dhaka Medical College is a medical college and hospital located in Dhaka, the capital city of Bangladesh. It is situated in the Bakshibazar area of the city, close to the University of Dhaka and the Bangladesh University of Engineering and Technology.

After beginning the journey in 10th July 1946, Dhaka Medical College established a new era in the history of medical education in Bangladesh. The original idea for the establishment of a medical college in Dhaka was placed to the British Government in 1939 but shelved because of World War II. After the war, a committee was formed in 1945 and on recommendation of the committee; Dhaka Medical College started its glorious journey on July 10, 1946.

In keeping with the modest beginning, the newly created medical college started in

the present hospital building with only four departments- Medicine, Surgery, Gynae and Otolaryngology. Now, Dhaka Medical College has 42 departments offering both MBBS and post graduate courses. Now, the MBBS course admitting around 190 students each year. Post graduate courses offering MD, M.Phil and Diploma in 42 disciplines and this courses now conducted by Bangabandhu Sheikh Mujib Medical University. Some short term training courses of different disciplines are running in collaboration with various organizations (DMC, 2017).

Established in 1946 during the British colonial rule. Since its establishment, Dhaka Medical College is continuously playing a pioneering role in dispersing medical education among young pupils. In its website, all the information about the college including library site are under construction. DMC has a well decorated library which has a collection of 30,735 books, 1205 monographs and 1 own institutional journal. Still the library follows manual processes for all services. It has no internet facilities at all. The library is very big in which it has only one computer and one photocopy machine. It is planning to automate the library system.

Bangladesh College of Physicians and Surgeons (BCPS) Library

Bangladesh College of Physicians and Surgeons (BCPS) was established in 1972 by a parliamentary act to develop postgraduate medical education in the country. The College confers two tiers medical degrees, FCPS and MCPS in 41 and 15 subspecialties respectively. The FCPS degree is considered the highest degree in the country. The BCPS has got reciprocity with the Royal College of UK, College of Physicians and Surgeons of Pakistan and the identical institutions in the regional countries.

The library of the College came into being immediately following the establishment of the College. Now it is an important contributor to the aim of the college aim of developing independent learners.

Library Mission:

BCPS Library aims at remaining dynamic and responsive to serve all members and fellows, to reflect good professional practice and foster quality, creativity & effectiveness with its collection and services.

Objectives:

- To select, organize and exploit learning resources for all members of the library.
- To provide an environment which stimulates the use of library materials, services and supports a variety of learning modes and resources.
- To understand the objectives and information needs of members of the library and to provide user-centered services to meet these needs.
- To provide the techniques for all members on how to use libraries and information services and to promote their use as a learning and research tool.
- To pursue quality and good professional practice in all activities.

Access to the Library: The library is open to the Fellows of the College. Non-fellows may avail the library facilities after being enrolled as a member on payment of Tk. 300.00 for each year. All categories of users should follow certain rules and regulations of the library.

Opening Hours: BCPS Library remains open six days a week. It is open from 9.00 AM to 9.00 P.M Saturday through Thursday. It remains closed on public holidays.

Library Collections: Most of the collections of the BCPS Library are closely related to the medical professionals and those are classified, catalogued and displayed using international professional standards. The Library resources include books, periodicals, dissertations, audiocassettes, video cassettes, CD-ROMs etc. At present the users of BCPS Library have accesse to around 5,130 books, 5,200 dissertations and 125 national and international current periodicals. In addition, the library also ensures easy access to the internet for the users to browse, download, and print information from HINARI online database.

Books: The number of book in the library is over around 5,130. Most of these books are broadly categorized into the 26 (twenty-six) areas.

Library Services:

Information retrieval service: An on-demand information retrieval service is available for all Fellows and Members. In addition, the library provides a current awareness service to the Fellows of the College.

Electronic library service: The Library maintains an electronic library equipped with seven computers with radio-link internet connection. All Fellows and Members of the library can browse, download and print materials from the web recourses. The charge for the same is: per hour browsing Tk. 10.00 and Tk. 4.00 for printing of each page.

Medline service: The library provides Medline services to the Fellows and Members through internet.

Photocopying service: The Fellows and members may get photocopies of learning resources from the library materials if permitted under the national and international copyright laws, rules and regulations on payment of Tk 1.00 per impression.

Reference and bibliographic service: The Library provides reference and bibliographic service to the members on request basis. Library staffs assist in locating information and provide instruction in the use of resources, card catalogue, indexes and abstract if the users request (BCPS, 2017).

BIRDEM Library

BIRDEM (Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders) a multi-sectoral health care center, educational and research institute at Shahbagh in Dhaka. This central institution of the Diabetic Association of Bangladesh (DAB) was established in 1980 on a government plot and financed by the government, and accommodated in three large multi-storied buildings. The hospital, housed in a 15-storied building, now provides for 542 beds of which 80 are meant for poor diabetic patients on gratis. On an average, about three thousand patients attend and have their check-ups every day. It is one of the largest health-complexes in Bangladesh providing almost all types of clinical and diagnostic facilities.

BIRDEM Library is a well-established medical and health science library of the country. It is started in 1975 at Segun Bagicha and shifted to Shahbagh in 1981 and re-shifted to present premises in 1985 (BIRDEM, 2017).

Table 3.1: A short description of the BIRDEM library

Library hours:	Saturday to Thursday
	From 7.30 am to 9.00 pm
Annual budget:	Tk. 37 lac for 2014-2015
Library manpower:	10 persons (Professional-5, Non Professional-5)
Total number of books:	7413 copies
Total number of international journal:	21 titles (List enclosed)
Back volume bound journal:	2748
Floor area:	5200 S.ft
Number of reading accommodation:	82 persons (65pprox.)
Electronic facilities:	Internet Facilities
MEDLINE:	Available in Online as PubMed
Photocopy service:	Instant photocopy service

Types of Services:

- Use of library visits by patrons: (users)
- New member collection
- Books & Monographs processed (automated & manual)
- Lending service to users
- Electronic communication media for storage and retrieval and dissemination of information
- MEDLINE : Available in Online as PubMed

National Health Library and Documentation Centre (NHLDC)

The National Medical Library, subsequently renamed as National Health Library and Documentation Centre (NHLDC), was established in Dhaka in 1974 with the assistance provided by Asia Foundation in collaboration with the Government of Bangladesh. Since then, the progress in dissemination of health science information has been made. National Health Library and Documentation Centre (NHLDC) regularly organizes (if WHO or other sponsorship is available) a number of training, workshops, seminar & symposium on Library administration & Management, Internet, Literature Search for librarians, teachers, and physicians under the auspices of World Health Organization or other sponsor.

History: the recognition of medical library potentials for education, research and health-care purposes by our authorities, coupled with a survey the medical institutions by the Asia Foundation in 1973 to assess the extent of damage inflicted on the medical institutions during the War of Liberation and the requirements for their rehabilitation, called for the immediate establishment of a central information agency of meet the information needs of the country's health professionals. As a result of this, the National Health Library and Documentation Center was established 1974 at Mohakhali, Dhaka based on an agreement between the Asia Foundation and the Government oh Bangladesh.

Aims and objectives: The aims and objectives of NHLDC are to:

01. Collect, organize, and preserve all health science literature issued in the country and abroad and promote their use:

02. Establish national standards and criteria for health science library activities:

03. Provide leadership among the health science libraries of the country for planning, development and promoting information services

04. Conduct training course for librarians and library users

Library functions: The library's functions include:

01. Preparation of the national bibliography on health science publications and indexing of current and retrospective literature published in the indigenous health science serials

02. Offering bibliography services to provide access to recorded information manually and with microcomputer

03. Contributing to national and international bibliographical projects

04. Preparation and publication of a directory of health science libraries and librarians taking part in the resource network, newsletters, library manuals, and union catalogue of periodicals

05. Providing information services to the government and to the library patrons

Staff, budget and space: The library has a total of 34 staff members. WHO provides a fund of US$ 34,000 per year for journal subscription it has also provided personal computers and photocopier and assistance for publishing library publications NHLDC has a total floor space of 10,000 sqft.

Facilities available and services offered: NHLDC has four functional units: a) Administration b) Technical services c) Information services and d) Audio-visual teaching. The library has the following equipment: microcomputers, microfiche reader- printer, photocopiers duplicating machine and overhead, slide, film-strip and sound projectors. Photographic equipment includes: cameras, copier, camera, black and white automatic processor, manual color transparencies and print processing equipment micro photo equipment.

NHLDC has a collection of 15,000 books and 15,000 bound journals. It receives 141 forcing journals on subscription and receive 85 indigenous journals (90% on complementary basis). It has also 5,000 microfiches, 150 motion picture, 2,590 slides, 22 tapes, 101 filmstrips, and 18 CD-ROM discs.

Students and teachers from the postgraduate medical institutes, medical colleges, pharmaceutical industries universities, foreign agencies and researchers, paramedics and doctors, health administrators, and policy-makers avail of reading –room facilities. The library remains open from 8.00 pm from Saturday through Thursday, except Friday and government holidays.

CHAPTER 4: DIGITAL LIBRARY SYSTEMS & INITIATIVES: THEORETICAL CONSIDERATION ON GLOBAL & BANGLADESH SCENARIO

- DL Systems
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- Features of Digital Library
- Metadata for Digital Libraries
- Information Access in Digital Libraries
- Digital Library Software
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- Digital Library Initiatives in Bangladesh
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CHAPTER 4

DIGITAL LIBRARY SYSTEMS & INITIATIVES: THEORETICAL CONSIDERATION ON GLOBAL & BANGLADESH SCENARIO

With the emergence of Internet and ICTs, Digital and web-based information resources can become widely available in library since the cost of digital storage and processing is going down. On the contrary, many libraries have to reduce the acquisition of books and journal subscriptions, for rising in cost of paper publications and library storage. Digital library system can solve this problem because it is an automated information system with all resources in digital form. Digital libraries consist of integrated and interactive digital information systems (Das & Dutta, 2004). Das stated that "Digital library is the concept of information stored digitally and made accessible to users through digital systems and networks, but having no single location" (Das & Dutta, 2004). Digital library has the facility for accessing digital resources remotely. Digital library systems are now dominating worldwide libraries (M. H. H. Chowdhury, 2012). Digital resources are getting importance to all types of libraries and they are consuming larger share of library budgets in many cases (White & Crawford, 1997). At present, it is an urgent need for the libraries of Bangladesh for taking necessary initiatives developing digital library systems as well as consortia may be formed for exploring more digital resources at an affordable price. Users will take interest for research since the availability of digital resources remotely.

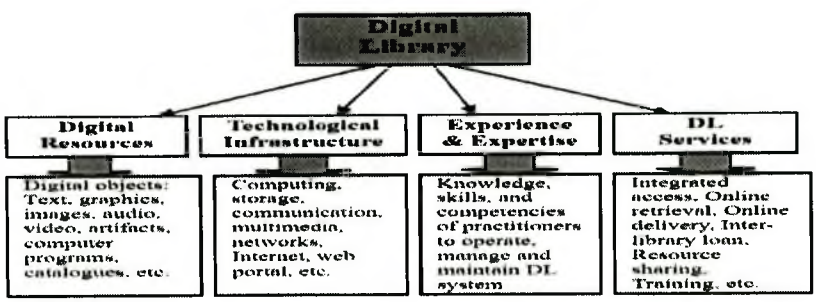
Generally, digital libraries may be viewed as federated databases; from a hypertext perspective, the aspects of digital libraries may be treated as an application of hypertext technology; from a wide-area information service perspective, digital libraries could appear to be one use of the World Wide Web; and from a library science perspective, digital libraries might be seen as continuing a trend toward library automation. Marchionini, Plaisant and Komlodi (2003) consider DL as the logical extension and augmentations of physical libraries in the electronic information society, while Lesk (1997) describes that DLs combine the structure and gathering of information, which libraries and archives have always done, with the digital representation that computers have made possible (Roknuzzaman, Kanai, & Umemoto, 2009).

Rowlands and Bawden (1999) explore three domains of the digital library: informational domain, systems domain, social domain. The elements of these three domains can be reflected in the model of Yang et al (1997) which comprises of four structural levels supporting five basic kinds of functionality. The structural levels are: user interface; networks and communications; information resources; and reference service system, while the functionality includes digitization; large repositories; fast data transfer; privilege; and management. When framing digital library design space, Marchionini and Fox (1999) identified four dimensions of digital libraries: community, technology, service, and content. Fox and Urs (2002) describe building blocks of digital libraries emphasizing which parts are "digital" versus "library". Of the six parts, computing and networking belong to "digital" while collections, services, and community are related to" library", and content shares the common aspects of both the terms. A conceptual framework for digital library systems as described by Del Bimbo, Gradmann and Ioannidis (2004) consists of three major layers: contents, management, and usage. As a core system, *management* is responsible for the management of the *contents* and for providing the necessary functionality. Being the user interaction component, *usage* deals with all aspects of the interface between the users and the system.

DL Systems

DL emerged as a field of computer science, and LIS community found a strong affinity with its professional practice in the virtual or digital world. Basically, DL is the logical extension of traditional library system in digital environment. Regarding the components of digital libraries, a DL system should be a combination of digital resources, networking technologies, a digital community as well as digital repositories for preservation of digital assets, advanced search mechanism, and a set of well-structured personnel to handle digital contents as the components of digital libraries.

Figure 4.1: Components of a DL System



Source: (Roknuzzaman et al., 2009)

System Components

Digital library is extending and integrating both the approaches of traditional library, and distributed information system, and user interfaces serving as a gateway. Kahn and Cerf (1988) examined eight major digital library system components. These include (Kahn & Cerf, 1988):

a) *"import/export server (which acts as a primary interface between the digital library system and the outside world),*

b) *registration server (which is responsible for receiving massages from or hosting new information to be added to the digital library, and registering new users, sources of information or other components newly added to the system),*

c) *indexing, cataloguing, and reference servers (whose principle function is to provide global cataloguing and indexing services for the retrieval of library content),*

d) *database servers (that bridge the gap between existing database services and digital library system),*

e) *accounting and statistics servers (where the function is to collect and store data relating to the use of the digital library system and to send the accounting portion of it to the billing server),*

f) *billing system (that generates invoices for use of the digital library system based on information it gets from the accounting and statistics server),*

g) *representation transformation servers (which can accept a standard library object and convert it into any of several output representations for delivery to a user), and personal library system (which tends to provide a basis for a completely standalone instance of a library system that can operate independently from the collection of other digital library system and for interacting with the other distributed components of DLS)."*

Digital library may consist of five major component parts (Dennis, 2001)

- *"Host server or computer to store digital objects and to establish communication between end-users and server.*
- *System and application software to support the functions of the digital library.*
- *End-user desktop workstations which enable users to access, display, download, and manipulate information.*
- *Interconnecting networks that provide users with access to collection stored in the*

database.

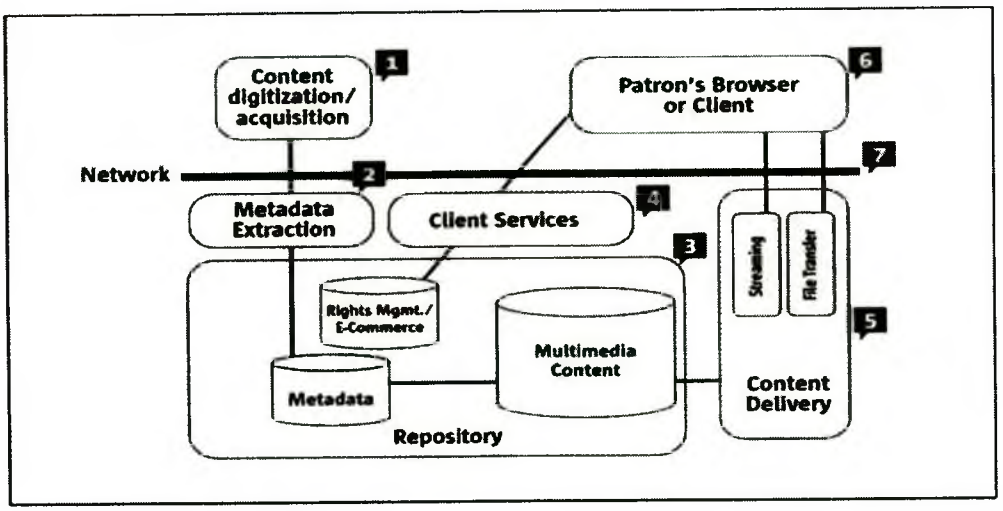
- *Creation and conversion of digital information."*

A fully developed digital library environment involves the following elements (Pasquinelli, 2002):

1. *"Initial conversion of content from physical to digital form.*
2. *The extraction or creation of metadata to assist in object viewing, management, and preservation.*
3. *Storage of digital content and metadata in an appropriate multimedia repository.*
4. *Client services for the browser, including repository querying and work flow.*
5. *Content delivery via file transfer or streaming media.*
6. *Patron access through a browser or dedicated client."*

Digital libraries thus provide new technological platform for implementing functionality of traditional library systems by making them much more powerful. Digital libraries developed today are based on innovative web technologies such as Semantic Web, Ontology Specification, Database Technologies, XML databases, text retrieval in different languages etc.

Figure 4.2: Functional Components of a Digital Library



Source: (Pasquinelli, 2002)

Digital Library is a product of modern Information and Communication Technologies (ICT). The term Digital Library refers to 'organized electronic collection of information'

in its various forms, and its search and retrieval by users through electronic interfaces. There are some essential components to set up a Digital Library.

Amar Nath and Jaspreet Kaur (Nath & Kaur, 2006) list the components as follows :

a. *"Hardware – Servers, PCs, Modems, storage devices, book scanner, CD/DVD writers, and Digital camera, video digitizer, UPS back up etc.,*

b. *Software – OCR, Linux/Solaris, Digital Library Software, MS Windows, Windows NT, Windows 8, Windows 10, Windows 2000, ORACLE, publishing software etc.,*

c) *Relational database that support a variety of digital format.*

d) *Search engines to index and provide access to resources.*

e) *Electronic document management functions that will help in the overall management of digital resources.*

f) *Conversion of materials to digital format with proper licensing agreements.*

g) *A variety of systems functions to coordinate, manage the entry and to retrieve data.*

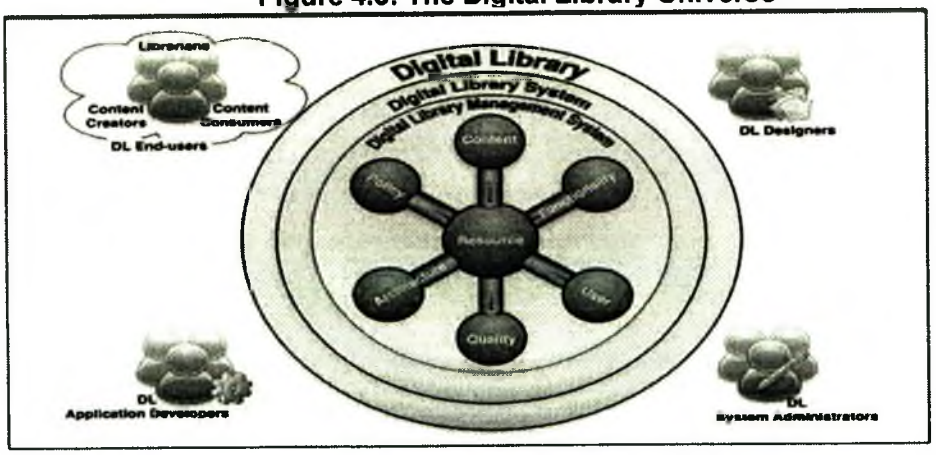
h) *Well-trained manpower.*

i) *High speed LAN and fast connection to Internet."*

Digital Library Universe in Brief

The Digital Library Universe is a complex and multifaceted domain that cannot be captured by a single definition. The Digital Library Manifesto organizes the pieces constituting the puzzle into a single framework.

Figure 4.3: The Digital Library Universe



Source: (Candela et al., 2011)

In particular, it identifies three different types of systems operating in the Digital Library universe (Candela et al., 2011):

1. Digital Library (DL) – the final 'system' actually perceived by the end---users as being the digital library;
2. Digital Library System (DLS) – the deployed and running software system that implements the DL facilities;
3. Digital Library Management System (DLMS) – the generic software system that supports the production and administration of DLSs and the integration of additional software offering more refined, specialized or advanced facilities.

The Manifesto also identifies the seven core concepts characterizing the digital library universe. These corresponds to orthogonal and complementary domains that together strongly characterize the Digital Library universe and capture its specificities with respect to generic information systems.

These specialized domains are:

1. Organization – represents the social arrangement characterizing the expected DL service. It is a super domain that comprises the remaining six domains that actually characterize the service;
2. Content – represents the information managed;
3. User – represents the actors interacting with the system;
4. Functionality – represents the facilities supported;
5. Policy – represents the rules and conditions, including digital rights, governing the operation of the whole;
6. Quality – represents the aspects needed to consider digital library systems from a quality point of view;
7. Architecture – represents the software (and hardware) constituents concretely realizing the whole.

Unifying the above is an 8th domain

8. Resource – captures generic characteristics that are common to the other specialized domains.

Features of Digital Library

Digital libraries differ from traditional libraries not only from the perspective of library collection, but also from some other aspects, which denote the prominent features of digital libraries:

- Digital libraries are digital face of traditional libraries, including both digital and traditional collections

- Enable users to access anytime and from anywhere as it is available 24 hours a day and 7 days a week.
- Based on a wide range of technologies (computer hardware and software, server, scanner, WWW, etc.) facilitating the storage, retrieval, use, and exchange of digital resources.
- Ideally provide a consistent and coherent view of all of the information contained within a library regardless of form and format.
- Require support of distributed network, communication and collaboration to ensure the global connectivity.
- Offer access to current and up-to-date information as there is little or no time lag between creation and availability of resources.

Metadata for Digital Libraries

Metadata is another issue central to the development of digital libraries. Metadata is the data that describes the content and attributes of any particular item in a digital library. It is a concept familiar to librarians because it is one of the primary things that librarians do they create cataloguing records that describe documents (Cleveland, 1998). Metadata is important in digital libraries because it is the key to resource discovery and use of any document. Lack of common metadata standards - ideally, defined for use in some specified context - is yet another barrier to information access and use in a digital library, or in a coordinated digital library scheme.

Metadata forms the foundation of a digital library in that it allows us to design a structure for better organization of and access to information. Metadata standards are created by expert communities of practice that specify the data elements and the corresponding features to be created in order to design a digital library database of one or more specific types of content and data. Metadata serves many important purposes like data description, data browsing and data transfer. It provides additional context that makes a document or record more meaningful, accessible, and useful. Discussions of metadata in the library community have largely centered on issues of resource description and discovery. There is, however, a growing awareness that metadata has an important role in digital resource management, including preservation. Regardless of whether emulation-based or migration-based preservation strategies are adopted, the long-term

preservation of digital information will involve the creation and maintenance of metadata. Properly used metadata can identify the name of the resource, the creator, who reformatted it, and other descriptive information.

In libraries metadata is commonly used for formal scheme of resource description, applying to any type of digital object. The Digital Library Foundation (DLF), a coalition of 15 major research libraries in the USA, defines three types of metadata which can apply to objects in a digital library: -

- **Descriptive metadata:** information describing the intellectual content of the object, such as MARC cataloguing records, finding aids or similar schemes
- **Administrative metadata:** information necessary to allow a repository to manage the object: this can include information on how it was scanned, its storage format etc (often called *technical metadata*), copyright and licensing information, and information necessary for the long-term preservation of the digital objects (*preservation metadata*)
- **Structural metadata:** information that ties each object to others to make up logical units (for example, information that relates individual images of pages from a book to the others that make up the book itself)

Table 4.1: Category and type of information in the metadata

Category	Description	Usage
Descriptive metadata	Title, Creator, Subject, Description, Publisher, Contributor, Date, Type, Format, Identifier, Source, Language, Relation, Coverage, and Rights.	Search and indexing
Administrative metadata	Library, scanning, and processing locations, persons involved etc.	Identification of bottlenecks and report generations
Structural metadata	Size of each page, blank pages, context, beginning and end of chapter, index, preface, etc.	Easy navigation, better search and retrieval

Popular Metadata Standards

1. Dublin Core (DC) is a simple metadata standard that represents a metadata element set to facilitate the discovery of electronic resources. Dublin Core is a kind of unifying set of metadata that permit discovery across all types of digital records and resources. Dublin Core is the most prominent metadata scheme

used in digital libraries. The first workshop took place in at OCLC headquarters in Dublin, Ohio hence the name 'Dublin Core' was given. The Dublin Core workshops defined a set of fifteen metadata elements — much simpler than those used in traditional library cataloguing. Version 1.1 of the Dublin Core metadata element set focuses on bibliographic elements and defines 15 elements to describe a resource.

2. Metadata Encoding and Transmission Standard (METS): The Metadata Encoding and Transmission Standard (METS) was developed to fill the need for a standard data structure for describing complex digital library objects.

3. Machine Readable Catalogue Format (MARC) 21: MARC originated in the 1960s as a means of exchanging library catalogue records. As library systems became computerized, MARC was used in library automation software as the basis for manipulating library records for display and indexing. As MARC became more widespread users and system vendors began to adapt the format to their own needs and requirements. Today there are several derivations of MARC: USMARC, UKMARC, IBERMARC, CATMARC, UNIMARC (http://www.loc.gov/marc/)

Information Access in Digital Libraries

Digital libraries are created to facilitate access to digital information by local or remote users. To be more precise, a digital library is created for a designated local or remote user community so that users can easily search, retrieve and use digital information that is relevant to their specific information needs. Thus information search and access is at the heart of digital library research and development activities (G. Chowdhury & Foo, 2012). Initial access to a digital library is through a gateway, which needs to be attractive and easy to use. Many digital libraries, especially those sponsored by educational institutions, offer free and immediate access to their materials. Commercial digital libraries, such as e-journal and paid e-book collections, embed security procedures, such as IP recognition or password control, into their gateways.

The following techniques are commonly used for Information access in digital libraries:

A. **Login ID and Password-based Access:** The most common and familiar

authentication process is login ID and password-based access5. Log-in is also called logon, sign-in, or sign-on to identifies oneself to the system in order to obtain access. The primary use of a computer login procedure is to authenticate the identity of any computer user attempting to access the computer's services. To login to a system usually requires a user name—a unique sequence of characters the user chooses to represent him/herself (Shoeb, 2009).

B. **IP Filtering or IP Authentication:** This process is a packet filter that analyses TCP/IP packets. Institutions or organisations are encouraged to register for accessing digital contents using IP addresses (ranges) if they are static. This allows (i) seamless access (no logon screen), (ii) usage statistics for the institution, (iii) greater security as there is no misuse of usernames and passwords, (iv) access to all computers thereby releasing other terminals and staff time, and (v) direct recognition of institutional networks by publishers and vice versa (Shoeb, 2009).

Digital Library Software

Digital library software is the most important and central aspect of the technology infrastructure for the digital library. It is essential to have robust and flexible digital collection management and preservation software for creating and delivering digital collections. Digital library software works with the web server (and the operating system) in providing various digital library functionality including creation, organization and maintenance, indexing, search and retrieval.

The creation of digital libraries and repositories involves the use of suitable software, hardware and the content. While selection and acquisition of hardware is not a major concern today (considering the decreasing cost and increasing capabilities of computer hardware), the selection and implementation of digital library and repository software has been a problem area. The digital library and repository software available can be broadly classified into (Mahesh, 2008):

01. Open Source Software (OSS), such as DSpace, ePrints, Fedora, ARNO, i-TOR, CDSware, and Greenstone Digital Library (GSDL). Jose, S. (2007), in a global survey on adoption of OSS in this area, identified some 20 OSS packages, with DSpace being the most popular followed by ePrints, GSDL and Fedora.

02. Commercial software, such as CONTENTdm, DigiTool from ExLibris, and digital library software by VTLS Inc, etc.

03. Custom-made software

Table 4.2: Leading Digital Library/IR Software

Name of Software	Working Environment	Developed / Marketed	License	URL
CONTENTdm	System requirements for installing the OCLC CONTENTdm include considerations for operating systems (Windows), web servers (Apache and Microsoft Internet Information Services IIs), and server side scripting language (PHP: Hypertext Preprocessor)	OCLC (2006)	Commercial	http://www.contentdm.org/
CONTENT Pro	Content Pro handles any digital file format, including documents, images, video, and audio	Innovative Interfaces Inc. (III)	Commercial	http://www.iii.com/products/contentpro
Fedora repository	Apache Tomcat and Jetty function are used as open source web servers and servlet containers	DuraSpace	Open source	http://fedorarepository.org
EOS.Web.Digital	modules in EOS.Web.Digital include "Electronic Resource Management, Electronic Content Management, Content Aggregator, Reference Tracking, IP Authentication, Classification Management, and Knowledge Builder	Electronic Online Systems (EOS) International	Commercial	http://www.eosintl.com/eos-web/digital/
SimpleDL	Contains Apache HTTP Web Server, MySQL database, and a server-side scripting language called PHP (Hypertext Preprocessor) for web application	NA	Commercial	http://www.simpledl.com/index.html
ArchivalWare	Web-based digital archiving management system that enables users to capture, manage, and search a diverse set of digital content	Progressive Technology Federal Systems, Inc. (PTF Ex Libris Group Limited S)	Commercial	http://www.archivalware.net/
DigiTool	DAM system for collecting, managing, preserving, searching, and retrieving library digital collections and institutional repository	Ex Libris Group Limited	Commercial	NA
FocusOpen digital asset manager	Powerful web-based open source DAM system	FocusOpen Software	Open source	http://focusopen.com/

(Contd. Table 4.2)

DSpace	It uses a relational database, and supports the use of Postgre SQL and Oracle	HP-MIT Alliance in 2002	Open source	http://www.dspace.org/introducing
Greenstone	It can run on different operating system platforms, such as Mac OSX, Windows, and Unix/Linux.	New Zealand Digital Library project research group at the University of Waikato and is sponsored by the UNESCO	Open source	http://www.greenstone.org
ResourceSpace	Developed by the framework of Apache HTTP server, MySQL, and PHP, ResourceSpace is a web-based open source DAM platform running in Linux, Mac, and Windows computing environments	Montala Limited	Open source	http://www.resourcespace.org/
EPrints	Built on the platform of LAMP (Linux, Apache, MySQL, and PHP) architecture, EPrints uses the open archives initiative protocol (OAI-PMH) for metadata harvesting.	School of Electronics and Computer Science at the University of Southampton	Open source	http://www.eprints.org

Digital Library Initiatives: International Scenario

During 1990s, the research development and practice related to digital libraries took off in a large scale. Researchers focused on digital libraries as contents collected on behalf of user communities, while librarians focused on digital libraries as institutions or services. Many new initiatives came through the research sponsored by the US National Science Foundation (NSF) and UK Joint Information Systems Committee (JISC).

Digital Library Initiative (DLI) projects in the USA and the eLib projects in UK have played a key role in the development of digital libraries. In addition many digital library projects are currently under way in Australia, Asia, Europe, Africa and Latin America. While some of them have their own funding, others are funded under digital library-specific funding initiatives.

Today many other groups as well are involved in the expansion of digital library technologies and techniques such as European Union, Association for Computing Machinery (ACM), the Institute of Electrical and Electronics Engineers (IEEE), The International Federation of Library Associations (IFLA), the American Library Association (ALA), the Coalition for Networked Information (CNI), and the Digital Library Federation (DLF).

During the past decade thousands of digital libraries in a variety of forms were built globally and are functioning operationally, with more to come. Hundreds of research projects were then devoted to many aspects of digital libraries in many countries, and more are reported each year.

A large number of digital libraries have been developed throughout the world over the past few years. Many of these have been born in the course of digital library research and development activities. Some of the prominent digital libraries are listed below;

- Akron-Summit County Public Library's Digital Media (http://www.akronlibrary.org/browse/digital)
- Alexandria Digital Research Library (https://www.alexandria.ucsb.edu/)
- Arizona Memory Project (http://azmemory.lib.az.us/index.php)
- California Digital Library (http://www.cdlib.org/)
- Collaborative Digitisation Program (https://sustainableheritagenetwork.org/publisher/collaborative-digitization-program)
- Goethe University Frankfurt Digital Collection (http://www.uni-frankfurt.de/51164732/pub_DigBib?)
- Digital Library of Georgia (https://dlg.usg.edu/)
- Digital South Asia Library (http://dsal.uchicago.edu/)
- Digital Library for International Research (http://www.dlir.org/)
- Indiana University Digital Collections (https://libraries.indiana.edu/digital-collections)
- Library of Congress Digital Collections (https://www.loc.gov/collections/)
- Michigan Digitisation Project (https://www.lib.umich.edu/michigan-digitization-project)
- National Digital Library of India (https://ndl.iitkgp.ac.in/)

Table 4.3: Top Digital Library Worldwide

Name	URL	Location	Nature	Type of Information
ACM Digital Library	*http://www.acm.org/dl*	Association for Computing Machinery, USA	Specifically built digital library	Full-text journal articles, conference papers, etc.
Alexandria Digital Library	*http://www.alexandria.ucsb.edu/adl.html*	University of California at Santa Barbara, USA	DLI-1 project	Spatial information including text and images.
American Memory	*http://memory.loc.gov*	Library of Congress, USA	Digital collection of a national library	Full texts, photographs, audio and video from the Americana collection.
BUILDER	*http://builder.bham.ac.uk*	University of Birmingham, UK	eLib Phase 3 project	Printed and electronic resources.
The British Library Digital Library Programme	*http://www.bl.uk/*	The British Library, UK	Digital collection of a national library	Text, moving and still images on various subjects.
California Digital Library (CDL)	*http://www.cdlib.org*	University of California, USA	Digital library as part of a University library	Manuscripts, full text of journal articles, reference sources, databases,e-journals.
DeLIver	*http://dli.grainger.uiuc.edu*	University of Illinois at Urbana-Champaign, USA	DLI-I project	Full-text articles from over 50 journals in engineering, computer sc. and physics.
DIGILIB	*http://www.architect.uq.edu.au/digilib/*	University of Queensland, Australia	Specifically built digital library	Architectural image database.
GEMS	*http://www.ntu.edu.sg/library/media/gems/gems.htm*	Nanyang Technological University, Singapore	Digital library as part of a University library	CD-ROM databases, full texts of articles, project reports, etc., and digital video.
Gutenberg	*http://www.gutenberg.net*	Project Gutenberg, USA	Specifically built digital library	Full texts of documents mainly on literature.
HEADLINE	http://www.headline.ac.uk	London School of Economics, UK	eLib Phase 3 project	Printed and electronic resources in economics, finance, business and management.
IEL Online	http://iel.ihs.com	Institute of Electrical and Electronic Engineers, USA	Specifically built digital library	Journal and conference papers, technical standards.
National Library of Canada Electronic Collection (NLC DL)	http://collection.nlc-bnc.ca/e-coll-e/index-e.htm	National Library of Canada, Canada	Digital collection of a national library	Canadian online books and journals.
NCSTRL	http://www.ncstrl.org	Cornell University, USA	Specifically built digital library	Computer science research reports and papers.
NDLTD	http://www.ndltd.org	Virginia Tech, USA	Specifically built digital library	Theses and dissertations.
New Zealand Digital Library (NZDL)	http://www.nzdl.org	University of Waikato, New Zealand	Digital library as part of a university library	Computer science technical reports, literary works, Internet FAQs, the Computists' Communique magazine.
SETIS (Scholarly Electronic Text and Image Service)	http://setis.library.usyd.edu.au/	University of Sydney, Australia	Digital library as part of a university library	Full-text databases in humanities.
THOMAS	http://thomas.loc.gov	Library of Congress, USA	Digital collection of a national library	Full texts of legal information.

(Contd.Table 4.3)

The UC Berkeley DL Project	http://elib.cs.berkeley.edu/	University of California at Berkley	DLI-1 Project	Biological and environment information including text and images.
The Universal Library	http://www.ul.cs.cmu.edu/	Carnegie Mellon University, USA	DLI-1 project	Electronic books,

Source: (G.G. & Sudatta, 2000)

Use of information technology in libraries of Bangladesh is increasing steadily and significantly. The use of information technology in libraries has tremendously increased due to its enhanced user satisfaction, cost effectiveness, faster and simpler programs, rapid communicative interaction (resource sharing) and easier operational procedures. Afterwards, traditional materials and sources are replaced by digital equivalents and libraries were undergoing fundamental changes in all aspects. But, most of the libraries in Bangladesh are hampered by lack of funds, lack of ICT infrastructure, and lack of skilled professionals to embark on digital library system of all library management activities and application of ICT. A good number of the library users were not satisfied with the application of ICT in their libraries and indicated "inadequate ICT infrastructure" as their major reason for dissatisfaction.

Digital Library Initiatives in Bangladesh

DL can help move a nation towards realizing the enormously powerful vision of any timely-access to the best and the latest of human thought and culture, overcoming all geographical barriers so that no faculties, students, researchers and above all library users are isolated from knowledge resources. In Bangladesh few institutions, as well as universities, both private and public have initiated national and regional level capacity building initiatives on digital libraries (Begum, Rashid, & Mahamud, 2012). The Internet originated to Bangladesh with e-mail beginning in 1993 and Internet Protocol connectivity in 1996. In mid-June 1996, the Very Small Aperture Terminal (VSAT) base data circuit was commissioned for the first time in the country. Upon VSAT commissioning, Internet connectivity was established, and its services were made available to the public (Nafiz Zaman Shuva, 2014). The Atomic Energy Commission first time in Bangladesh started the use of computers in 1964 with the installation of IBM 1620 model computers (Bangladesh Association of Software and Information Services (BASIS), 2005); however, libraries in Bangladesh started using computers only in the 1980s. The icddr,b (International Centre for Diarrhoeal Disease Research, Bangladesh) Library and the AIC (Agricultural Information Centre) are considered pioneers in introducing automation activities in Bangladesh in 1985

(Khan, 1989) with CDS/ISIS (Computerized Documentation System/Integrated Set of Information Systems) software. In addition, AIC used to provide services through the Food and Agricultural Organization's (FAO) CD-ROM databases – AGRIS (International System for Agricultural Science and Technology) a global public database providing agriculture related bibliographic information. Further, icddr,b Library offered full text and bibliographic databases on CD-ROM namely Medical Literature Online (MEDLINE), Population Literature Online (POPLINE), and Asian Health, Environmental and Allied Databases (AHEAD) respectively from 1989, 1993, and 1994 (M. H. H. Chowdhury & Khan, 2011).

At present, installing Library Automation, developing Institutional Repositories (IR), subscribing e-resources, building e-resource consortium and digitizing thesis, newspapers, books, valuable documents etc. are some core initiatives for establishing a Digital Library System in Bangladesh. Automation is required for improving the efficiency of the services to be delivered at all levels. Medical Libraries not only possess vast store of information in the form of books, bound volumes of journals, and information generated by researchers, but some of them have good collection of manuscripts which are precious and valuable sources of information. The direct access to this huge source of information can be made available all over the world only by digitization of medical Libraries in Bangladesh. Without automation of Medical Libraries, the development of digital library is not possible.

The Open Access and Open Archive movement have added fuel in the establishment of Digital Institutional Repositories. IR trend has enhanced the role of information centers as this concept links with the sharing and managing of scholarly information, copyright and publisher's policies, retrieval of information and preservation of information as well. Over a period of time IR have emerged rapidly accompanying various researches on it. In Bangladesh, the trend of IR was started in 2005 with the first attempt by icddr,b Library. And now most of the modern Library and information centers have got into the tradition of building IRs which gives libraries a new direction and more focus in research and development.

There is no recent institutional statistics supporting neither the actual number of libraries and information centers in Bangladesh in terms of ICT usage in the existing library systems. According to different personal investigation and survey it has been evident that there is no any full-fledged digital library system in the country in true sense. Another fact is that at present most of the urban based libraries and

information centers have brought computer and other ICT equipment in use. Digitization and automated library systems in Bangladesh are still in the infancy level. However, in the recent times a very few initiatives have been noticed taken by different institutions. The advent of the Internet acted as a catalyst for digital library initiatives. The digital library initiative in Bangladesh is still at a nascent or embryonic stage.

A brief account of the initiatives taken by different libraries are described below:

Table 4.4: Major core initiatives for digital library systems of Bangladesh

Contributing Institution	Core initiatives	Year
Dhaka University Library (DUL)	Digitizing its 30,000 handwritten manuscripts, 20,000 rare books, 5,000 microfilms and many special materials.	2000
National Archives of Bangladesh	Digitized the District Records Collected from 1760- onto 1000 DVDs	2002
North South University Library	Subscribed JSTOR, IEEE, ACM & 39 titles of other online Journals	2002
BRAC University Library	Subscribed JSTOR	2002
World Health Organization (WHO)	Accessed to Hinari platform for first time in Bangladesh with a zero cost (accessing up to 13,000 e-journals of STM publishers in 45 different languages, 56,000 e-books, and 120 other information resources)	April 2003
IUB and icddr,b Library	Subscribed JSTOR	2003
North South University Library	Offered "Certificate Course in Digital and Online Librarianship"	2004
icddr,b Library	Developed its Institutional Repository (IR) using DSpace Software for the first time in Bangladesh	2005
Bangladesh Academy of Sciences	Formed Bangladesh INASP-PERii Consortium (BIPC)	2007
International Network for the Availability of Scientific Publication (INASP)	Developed Bangladesh- published journals in all disciplines i.e. BanglaJOL	September 2007
BSMMU Library	Developed Institutional Repository (IR) by Dspace	2007
BRAC University Library	Developed Institutional Repository (IR) by Dspace	2008
Daffodil International University Library	Developed Digital Repositories by procured software Bright Soft (Malaysia)	2008
BANBEIS	Developed modern facilities to the user of the BANBEIS by digitizing the important & rare materials and available them in the online environment Library building repairing, modern library equipment purchase and also make certain modern library facilities such as digitization.	December 2008 to December 2009
East West University Library	Set up digital library system by using the Greenstone Software	2010

(Contd.Table 4.4)

BRAC University Library	Launched Integrated Library System (ILS) using Koha (Open Source) software	2010
Government Public Libraries	Developed digital public libraries by providing ICT support to 64 government public libraries in Bangladesh	2010
Higher Education Quality Enhancement Project (HEQEP) of UGC, Bangladesh	Enrichment of BSMMU Central Library	2010
Higher Education Quality Enhancement Project (HEQEP) of UGC, Bangladesh	Enhancing Teaching and Research Capabilities though Library System Automation at Khulna University of Engineering Technology (KUET)	2010
Department of Information Science and Library Management, University of Dhaka	Organized a national seminar on DLs entitled "Building Digital Libraries for Digital Bangladesh"	2010
Dept. of Information Science & Library Management, University of Rajshahi	Introduced "Digital Library" course in Masters Level	2011
Library Association of Bangladesh in cooperation with the Department of Information Science and Library Management, University of Dhaka and the Department of Information Science and Library Management, University of Rajshahi	Organized an international conference on "Vision 2021: Role of Libraries in Building Digital Bangladesh"	2011
Higher Education Quality Enhancement Project (HEQEP) of UGC, Bangladesh	Total Computerization of Shahjaiai University of Science and Technology (SUST)	2011
Dept. of Information Science & Library Management, University of Dhaka	Introduced "Digital Library System" course in Masters Level	2012
Higher Education Quality Enhancement Project (HEQEP) of UGC, Bangladesh	Built an e-resources access center and RFID-based library management system at North South University (NSU) Library	2012
University Grants Commission (UGC) of Bangiadesh funded by the World Bank's Higher Education Quality Enhancement Project (HEQEP)	Formation of UGC Digital Library (UDL) consortium	June 2012
Shahjalal University of Science & Technology (SUST), independent University, Bangladesh (IUB), Rajshahi University of Engineering & Technology (RUET),Bangladesh University of Professional (BUP), Eastern University, (EU)	Developed Institutional Repository (IR) by Dspace/GSDL	2012-2014
Library Association of Bangladesh (LAB)	Organized an International Seminar on 'Digital Libraries for Digital Nation'	2012 (October 17-18)
Higher Education Quality Enhancement Project (HEQEP) of UGC, Bangladesh	Digitalization of Central Library of BUET	April 2012 to March 2014
Higher Education Quality Enhancement Project (HEQEP) of UGC, Bangladesh	Modernization of Central Library and Establishment of an E-resource Centre at CVASU (Chittagong Veterinary and Animal Sciences University)	April 2012 to March 2014
Higher Education Quality Enhancement Project (HEQEP) of UGC, Bangladesh	Establishment of IT Network and Digital Library in Sylhet Agricultural University	April 2012 to March 2014

(Contd.Table 4.4)

Ministry of Cultural Affairs	Developed a digital library infrastructure at National Library of Bangladesh and facilitate full-text digital conversion and preservation of collections; and Create a digital Repository of National Library collections	2013
University of Dhaka Library	Developed Institutional Repository (IR) by Dspace	2013
Bangladesh Central Public Library	Created online Digital Repositories of 1169 books by using customized software	2014
Bangladesh Secretariat Central Library	Developed Digital Repositories of its all Govt. Circulars, Gazettes, Reports, etc. (3 lac pages) by using customized software	2015
Bangladesh Association of Librarians, Information Scientists and Documentalists (BALID)	Organized a national seminar on 'Cross-talk of Digital Resource Management: Step Towards Digital Bangladesh'	2015 (22 August)

Status of e-Resource Consortium in Bangladesh

Bangladesh INASP-PERi Consortium (BIPC)

A significant progress for e-resource usage has been achieved by building e-resource consortium. 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. As a first step, Bangladesh became a member of the network. Through this network a large number of journals of world renowned publishers are made available to the Bangladesh stakeholders who can down-load all these information at their work places at any time (N. Z. Shuva, 2012). Second, later on, all the public and private universities, research institutes, laboratories in the country were informed of this services & benefit of the network and they were invited to join the network. Consequently, a good number of universities & research organizations participated to the network. (Shuva, 2010). From January 2007, Bangladesh started subscribing INASP-PERi and 13 organizations paid subscription for the network for an amount of US$ 67,000. In 2008, the number of members rose to 22 and the network paid US$ 87000 to INASP. The subscription paid to INASP by now is in the tune of US$ 1, 60,000. Currently, more than 47 libraries are subscribing 39 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 (A. J. Rahman et al., 2015). Consortium (BIPC) was formed with the Primary Contact Officers of the participating organizations. The BIPC is being operated by a National Coordination Committee with Dr. M A Mazed, Director, BAS, as coordinator with all Primary Contact Officers as members.

UGC Digital Library (UDL)

Another initiative to provide high quality electronic resources is the formation of UGC Digital library in June, 2012. UDL is hosted by the University Grants Commission (UGC) of Bangladesh and is largely funded by the World Bank's Higher Education Quality Enhancement Project (HEQEP). This scenario of access to electronic information resources by public and private universities of Bangladesh has improved dramatically with the formation of UGC Digital Library (UDL) in June 2012. The major objectives of UDL are to (University Grants Commission of Bangladesh, 2014) :

1. Provide access to a high-quality and scholarly electronic resources to all member universities at substantially lower rates of subscription;
2. Promote rapid and efficient access to online information to the users and to promote the use of ICT in teaching and learning in the member universities;
3. Promote interaction and inter-library cooperation among the participating universities;
4. Evaluate the usage of the subscribed resources regularly and to identify new resources that are required to be subscribed under the programme;
5. Bring qualitative change in teaching, learning and research in the member institutions;
6. Increase the research productivity of the institutions both in terms of quality and quantity of peer-reviewed publications.
7. Organize training for the librarians, researchers and faculty members of the participating institutions to optimize the use of e-resources.

From 1 July 2012, UDL is offering access to three major online information resources: ACM Digital Library, Emerald and JSTOR. JSTOR agreed a zero annual price increase until June 2016 and granted UDL 15% discount on its Annual Access Fee (AAF) for 2012-2016.

In order to encourage participation by the public and private universities in Bangladesh, UDL has been offering subsidy on the subscription fee from the HEQEP fund. A total of seventy nine organizations in the country, are currently the members of UGC Digital Library and are accessing online resources through UDL. UDL is currently evaluating proposals for subscribing/purchasing e-books from a number of world-leading publishers/providers like Oxford Scholarship Online, ebrary, Emerald e-books and journal archives, Pearson, Sage, IEEE, Wiley, Springer, etc. It is expected

that the access to e-books will be launched very soon (Nafiz Zaman Shuva, 2014). The UDL provides access to subscribed e-journal, e-book and other online databases only. The UDL is practically a gateway to e-resources, not a Digital library (A. J. Rahman et al., 2015).

Research4Life: e-resource Platform

Research4Life is an umbrella of private–public partnership of four programs namely Hinari focusing on health, AGORA focusing on agriculture, OARE focusing on environment and ARDI focusing on innovation- – that provide developing countries with free or low cost access to academic and professional peer-reviewed content online. Research4Life is a public-private partnership of the WHO, FAO, UNEP, WIPO, Cornell and Yale Universities, the International Association of Scientific, Technical & Medical Publishers and up to 185 international scientific publishers. The goal of Research4Life is to reduce the knowledge gap between high-income countries and low- and middle-income countries by providing affordable access to critical scientific research. Since 2002, the four programmes – Research in Health (Hinari), Research in Agriculture (AGORA), Research in the Environment (OARE) and Research for Development and Innovation (ARDI) – have provided researchers at more than 8300 institutions in more than 115 low- and middle-income countries with free or low-cost online access to up to 79,000 leading journals and books in the fields of health, agriculture, environment, and applied sciences (Research4Life, 2017a).

Hinari: Launched in 2002, Hinari Access to Research for Health Programme is managed by the World Health Organization (WHO) in partnership with Yale University Library and up to 165 publishers. More than 6,200 public institutions in over 115 eligible countries have already registered to Hinari, which provides access to up to 13,000 journals (in 30 different languages), up to 56,000 e-books, and up to 120 other information resources. The journals can be searched through a special version of PubMed (Medline), and other article indexes.

AGORA: Launched in 2003, AGORA (Access to Global Online Research in Agriculture) is managed by the Food and Agriculture Organization (FAO) in partnership with Cornell University and up to 65 publishers. Over 3,100 institutions have registered for access to AGORA which provides access to up to 8,200 journals, up to 22,000 e-books, and up to 40 other information resources. covering agriculture,

fisheries, food, nutrition, veterinary science and related biological, environmental and social sciences in public institutions across the world.

OARE: Launched in 2006, OARE (Online Access to Research in the Environment) is managed by theUnited Nations Environment Programme (UNEP) in partnership with Yale University and up to 80 publishers. OARE provides to more than 3,000 institutions access to up to 10,000 journals, up to 22,000 e-books, and up to 55 other information resources in a wide range of disciplines contributing to our understanding of the natural environment, including environmental toxicology and pollution, zoology, botany, ecology, environmental chemistry, geology, hydrology, oceanography, meteorology, climatology, geography, environmental economics, environmental law and policy, conservation policy and planning, environmental biotechnology, environmental engineering, energy, and many other disciplines. More than 3,000 institutions are now registered for access to these journals which can be searched through a number of abstracting and indexing databases.

ARDI: Launched in 2009, ARDI (Access to Research for Development and Innovation) is coordinated by the World Intellectual Property Organization together with its partners in the publishing industry with the aim to promote the integration of developing and least developed countries into the global knowledge economy, allowing them to more fully realize their creative and innovative potential. By improving access to scholarly literature from diverse fields of science and technology, the ARDI programme is designed to reinforce the knowledge infrastructure in developing and least developed countries and to support researchers in these countries in creating and developing new solutions to technical challenges faced on a local and global level. ARDI provides access to up to 7,800 journals and up to 21,000 e-books (Research4Life, 2017b).

DLNETSA (DIGITAL LIBRARY NETWORK SOUTH ASIA):

DLNETSA (Digital Library Network South Asia) is a regional consortium of South Asia Region. The objective is to create an operational and sustainable digital library network with focus on providing support for integrated library system and digital library activities with emphasis on use of GreenStone Digital Library (GSDL) and Koha ILS software. To reach to this goal, DLNETSA (Digital Library Network in South Asia) is established with support of UNESCO for spreading digital library in this sub continental. The financial and technological infrastructure of information agencies in Bangladesh is not in such a condition that all of them will adopt digital technology

very soon. Because of lack of proper financial ability, technological knowledge and resources it is not so easy for the libraries in Bangladesh to develop digital library. GreenStone's flexibility, robustness, ease of use and free availability make it a particularly useful resource for developing countries like Bangladesh. UNESCO has been providing support to the developing country to build their digital library for years (Begum et al., 2012).

BdREN (Bangladesh Research and Education Network)

University Grants Commission (UGC) of Bangladesh, on behalf of the Ministry of Education (MoE), is currently implementing the Bangladesh Research and Education Network (BdREN) under HEQEP with assistance from World Bank. It will be a high performance data Communications network providing connectivity among education and research institutions in both public and private sectors. BdREN with its multi-gigabit capability aims to connect all universities, research institutions, libraries, laboratories, healthcare and agricultural institutions across the country and to support geographically dispersed academics, scientists and researchers with reliable access to high-end computing, simulation tools and datasets. (BdREN, 2017) .

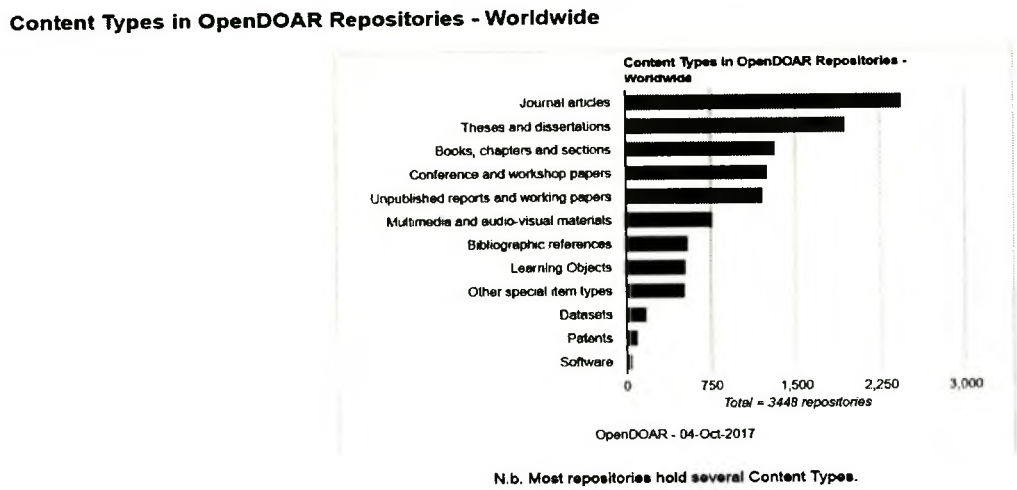
Status of Institutional Repository (IR) in Worldwide and Bangladesh

Another possible solution for the libraries of Bangladesh to increase their digital collections/digital information resources is to create "Institutional Repository". A digital Institutional repository can be any collection of digital materials hosted, owned or controlled or disseminated by an academic or research institution. A particular type of Institutional Repository is; a digital archive of the intellectual products created by the faculty, research staff and students of an institution and accessible to end users both within and outside of the institution. In the term Institutional Repository (IR), 'institution' refers to the library's parent organization. The rise of the IR is an innovative form of scholarly communication within the digital environment. The IR refers to research output digitally such as journal articles or research data, e-thesis, e-learning objects, and teaching materials, or any other scholarly work such as theses and dissertations created by the faculty, research staff, and students of an institution, and accessible for end users both within and outside of the institution with few, if any, barriers to access (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 (M N Uddin, Koehlmoos, & Hossain, 2014). An institutional repository is the best way to provide open access to research output visible for knowledge sharing. Several software – such as DSpace, EPrints, Fedora, or GreenStone – provide a web-based OAI-complaint institutional repository for free (Shoeb, 2009).

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

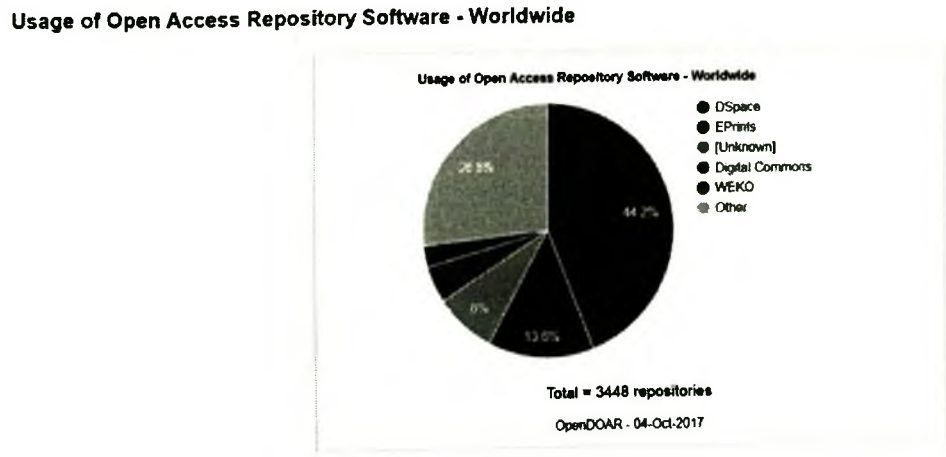
Figure 4.4: Content types of repositories



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

Software: Software is one of the most crucial factors of building IR for an organization. According to the OpenDOAR database as of October 04, 2017 most of the IR institutions (44.2 percent) use DSpace followed by EPrints as 13.6% as their IR software (OpenDOAR). Figure 4.5 illustrates the usage of IR software worldwide.

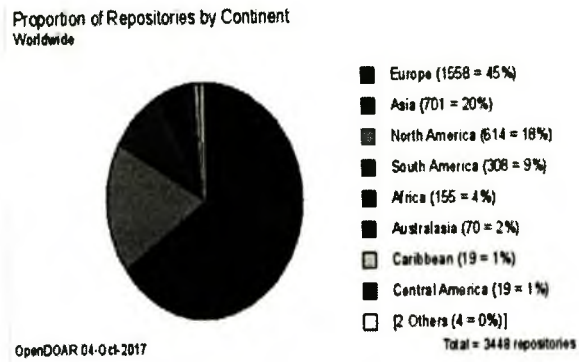
Figure 4.5: Types of IR software



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

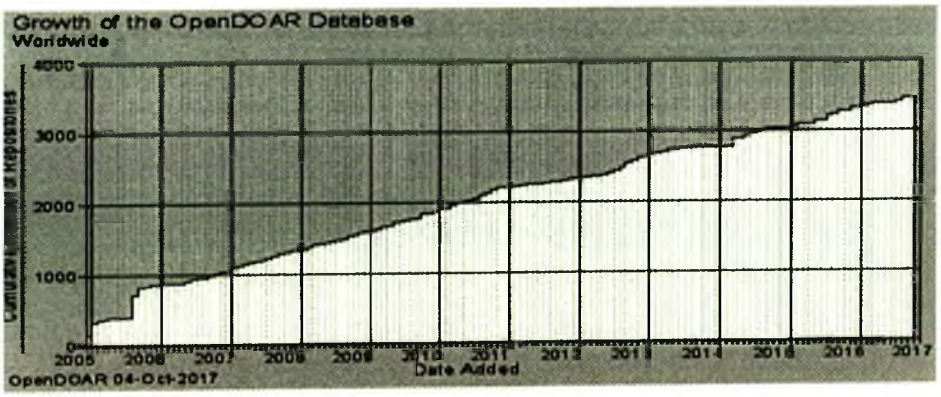
Institutional repository: global scenario: Up to 04 October 2017 there are 3448 institutions that are providing access to their repositories worldwide as given the data by OpenDOAR. By continent, Europe is the top continent having 1558 institutions and Asia is the second with 701 institutions. Figures 4.6 and 4.7 and clearly shows the growth and proportion of IRs in the global scenario.

Figure 4.6: Proportion of repositories by continent



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

Figure 4.7: Growth of OpenDOAR databases worldwide



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

Like developed countries, Bangladesh embraces the concept of establishing institutional repositories. Not-for profit organizations, such as higher learning institutions and research organizations might find IR useful for disseminating their intellectual outputs through Internet, for raising funds, and creating interest in the projects and activities of the respective organizations. icddr,b library, Sher-e-Bangla Agricultural University Library, Islamic University of Technology Library, Eastern University Library, Daffodil International University Library and BRAC University Library, are now working on IR using Dspace and GreenStone software. East West University (EWU) Library and Eastern University Library have moved with GreenStone and DSpace digital library software for building digital library system/IR. Independent University, Bangladesh (IUB) library is working to collect print copy materials from the faculty members and researchers. These materials are digitalized and used in developing IR. IUB are using DSpace software. Bangabandhu Sheikh Mujib Medical University (BSMMU) is also trying to set up an IR in their Library (M. H. H. Chowdhury, Uddin, Afroz, & Sameni, 2011). The below table clearly depicts the present IR status of Bangladesh as taken from OpenDOAR on 04 October, 2017.

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গ্রন্থাগার

Table 4.5: Development of IR by various libraries in Bangladesh

Repository name	Num. Recs.	Base URL	Software
BRAC University Institutional Repository	6398	http://dspace.bracu.ac.bd/xmlui/	DSpace
Daffodil International University Institutional Digital Repository	1362	http://dspace.daffodilvarsity.edu.bd:8080/	DSpace
Dhaka University Institutional Repository	730	http://repository.library.du.ac.bd/xmlui/	DSpace
E-Library on Disaster Management	1038	http://kmp.dmic.org.bd/	DSpace
Eastern University Digital Library	378	http://gsdl.easternuni.edu.bd/greenstone/cgi-bin/library.cgi?a=p&p=home&l=en&w=utf-8	Greenstone
Eastern University Institutional Repository	337	http://dspace.easternuni.edu.bd:8080/xmlui/	DSpace
EWU Digital Library	2269	http://gsdl.ewubd.edu/greenstone/cgi-bin/linux/library.cgi	Greenstone
EWU Institutional Repository	1905	http://dspace.ewubd.edu/	DSpace
Islamic University of Technology Digital Library	192	http://lib.iutoic-dhaka.edu/	Greenstone
IUB Library Digital Repository	195	http://dir.iub.edu.bd:8180/	DSpace
icddr,b Knowledge Repository	8381	http://dspace.icddrb.org/jspui/	DSpace
SAUL Archive	1588	http://archive.saulibrary.edu.bd/	DSpace

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

Similarities and Differences Between Digital Library (DL) and Institutional Repository (IL)

More modern libraries in the world have initialized and implemented institutional repositories Impacted by the digital revolution. Apparently, an IR and DL are two different entities. A digital library and an institutional repository can be designed and developed by the same DAM (Digital Access Management) software to deliver digitized materials. A digital library is a web-based application to present original library collections transformed by multiple digital formats. An institutional repository is a web-based application that consists of a collection of digitized brochures, conference proceedings, documents, dissertations and theses, newsletters, policies, presentations, regulations, research publications, and so forth, which are submitted by the institution's administrators, committees, executives, faculty, staff, and other related contributors. Obviously, the range and scope of the collected materials between a digital library and an institution repository is very different. A digital library focuses on its own digitized library assets while an institutional repository, though it is managed and operated by librarians and library staff, aims to serve the entire institution, instead of only the library itself (Yang & Li, 2016). 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).

BanglaJOL

Bangladesh Journals On Line (BanglaJOL) is a service to provide access to Bangladesh published research, and increase worldwide knowledge of indigenous scholarship. Some preservation initiatives have also been taken by BanglaJOL (www.banglajol.info) with the help of International Network for the Availability of Scientific Publications (INASP) and digitize all journal articles published in Bangladesh. Bangladesh Journals OnLine (BanglaJOL) was initiated in June 2007 and officially launched in September 2007. It is a project supported by INASP. In

2014, the management of BanglaJOL moved to the Bangladesh Academy of Sciences (BAS). It aims to promote the awareness and use of Bangladesh-published journals in all disciplines by providing access to tables of contents (TOCs), abstracts and full text on the Internet. The objective of BanglaJOL is to improve the visibility of the participating journals and the research findings they carry. All the materials available on BanglaJOL are free to search, view and browse. Till October 10, 2017, there are now 141 journals on BanglaJOL with 1630 Tables of Contents listing 21,087 articles. 20,206 of the articles are available in full text (PDF) (https://www.banglajol.info/) .

Challenges Facing the Digital Libraries: Bangladesh Scenario

The development of Digital Resource Management (DRM) as well as access to digital information can be seen as one of the major challenges for the library and information professions of any developing country especially for Bangladesh. The applications of DRM in library operations and services have become a key to satisfying ever-changing complex information demands and expectations of scientists and researchers. Establishment of DRM system and digital library system is challenging, expensive and long-term process. Particularly in the developing countries, like Bangladesh, the process comes across some serious challenges. Some of the major constraints hindering digital library development efforts in medical libraries of Bangladesh are outlined below:

Budget constraints: Digital library development requires sufficient budget for procuring of physical infrastructure, subscribing e-resources, implementation, licensing, training, costs for digital equipment and support for the technical infrastructure. The sustainability of digital library is difficult unless organizations have good budgetary support. Most of the digital libraries are facing problem of finances. Due to a lack of sufficient funds, notable ICT-based development projects are absent in libraries where the source of funding comes from the government and concerned organization authorities. Due to this shortage of sufficient funds for digitization, libraries are still unable to take necessary initiatives for digital library within the organization (N. Z. Shuva, 2012). 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 authorities and make them understand about the intangible value of library and recognize its contributions to value creation (Kostagiolas & Asonitis, 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 (A. J. Rahman et al., 2015).

Intellectual Property Rights: A major challenge for a DL is complying with copyright and other Intellectual Property Rights (IPR) issues. Issues of copyright, intellectual property and fair use concerns are posing unprecedented array of problems to the libraries and librarians who are struggling to cope with all these related issues in the new digital information environment. Librarians will have to discuss these issues with publishers and authors to create some mechanism that will be beneficial for library users, publishers and authors.

ICT & Infrastructure issues: Digital Libraries demand cutting edge IT and Communication infrastructure such as:

- High end and powerful Servers; Structured LAN with Broadband Intranet facilities (Optical fiber based Gigabit networks);
- Required number of Workstations capable of providing online information services, computing and multimedia applications;
- Internet connectivity with sufficient bandwidth, capable of meeting the informational and computational requirement of the user community;

There are many more related facilities / services which are highly essential in an ideal digital library environment. It is observed that the ICT infrastructure in most of the institutions/organizations, barring exceptions, are not up to the desired level so as to run advanced digital library services, to the optimum level. These barriers include poor quality communication media services (such as bad telephone lines, unreliable power supplies, stringent customs and other legal restrictions), inability to join telecommunication networks, inadequate computerization of libraries and poor library collections.

Digital Rights Management (DRM): It is a collective name for technologies and techniques that prevent one from using copyrighted digital work beyond the degree to which the copyright owner (or a publisher who may not actual hold a copyright) wishes to allow one to use it. It uses information about rights and rights holders to manage copyright material and the terms and conditions on which it is made available to users. More formally DRM has been described as a way of addressing the description, identification, trading, protection, monitoring and tracking of all forms of rights usages over tangible and intangible assets, including management of rights holders' relationships. Digital Rights Management (DRM)

involves ways in which the digital library operators manage issues of IPR, those of ownership of material made available on the digital library, how one controls access to as well as dissemination of copyrighted material. Several methods of managing digital rights do exist nowadays from which one could choose to adopt the more convenient one for their purposes (Sood & Chandrasekharan, 2004).Some rights management functions could include are usage tracking, identifying and authenticating users, providing the copyright status of each digital object, and the restrictions on its use. (Cleveland, 1998).

Digitizing analog materials: Books, journals, laboratory records, sound recordings, manuscripts, photographs of a traditional library must be converted into digital form. Today, the technology for digital conversion is emergent and there are few established standards on which they have to ensure reproduction quality. Unfortunately, most of the information professionals are not well verged about the equipment and their applications let alone the standard of digitization. Cost of some essential equipment e.g. high speed scanner communication switch, storage servers are still beyond the library budget (Alam, 2012).

Absence of organizational policy: Organizational policy for DRM system is highly essential for successful implementation of the same. Parent organizations' policy documents should mention clearly and elaborately about its library digitization policy. The libraries need to suggest the parent organization for the development of library digitization policy. Libraries should develop their digitization policy for their own sake. Nonetheless, a well-planned project and feasibility study and SWOT (Strengths, Weaknesses, Opportunities, and Threats) 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 users, 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 (A. J. Rahman et al., 2015).

Technologicai change: Information technology skills and applications are changing and developing quickly. To survive, digital libraries need the latest technology. Thus, more and more investment is necessary for digital libraries to update their technology. Along with these changes come interoperability problems. Therefore, proper selection of devices and software that are adequately flexible to meet both the present and future needs is required.

Building digital collection: One of the biggest issues in creating digital libraries will be the building of digital collections. There are essentially three methods of building digital collections (Cleveland, 1998):

Digitization: converting paper and other media in existing collections to digital form.

Acquisition of original digital works: created by publishers and scholars. Example items would be electronic books, journals, and datasets.

Access to external materials: not held in-house by providing pointers to Websites, other library collections, or publishers' servers.

Preservation: Archiving and preservation are significant activities in digital libraries. One of the largest challenges is preservation. To provide continued digital information services, a digital library should have historical information resources in addition to current digital sources. Preserving these historical resources is a challenging task because of the huge amounts of money required. Often, due to lack of funds, preservation is not possible. Also, whenever online subscriptions to resources expire, the digital library may lack these resources in the future.

Bandwidth problem: Digital libraries are multimedia products incorporating structured text, sound, graphics, pictures, photographs, video clips, and other material that requires intensive use of bandwidth. The developing countries have restrictions of bandwidth available to them. Digital libraries are multimedia products incorporating structured text, sound, graphics, pictures, photographs, video clips, and other material that requires intensive use of bandwidth. The developing countries have restrictions of bandwidth available to them.

Lack of training: The knowledge of library staff should be updated to face the challenges of the electronic environment. Without upgrading their skills periodically, library professionals are not able to adopt new technology, such as digital technology, in libraries. Therefore, establishing a digital library without refreshing the skills of library professionals is difficult.

Skilled Manpower: Skilled manpower is one of the prerequisites for the successful implementation of digitization and digital information system. Digital library systems and services require advanced competencies and skills such as scanning, OCR (Optical Character Recognition), Online procurement and use of e-books and e-

journals, maintaining bibliographical and full text databases, searching and retrieval, web design and hosting, etc. the library and information science (LIS) professional are expected be firmly grounded in ICT-related competencies such as core hardware and software skills, web design, internet searching and evaluation of electronic information. Unfortunately working knowledge regarding ICT based library systems among the practicing librarians and supporting staff is not in a standard level apart from some leading libraries in Bangladesh. So, preparing digital librarians is one of the key challenges toward digitization in our country (M. S. Alam & M. S. Islam, 2011).

Absence or diversified standard: Most of the libraries leading digitization initiatives in Bangladesh don't follow specific standard in digitization and preservation process. The problem is that across multiple digitization initiatives there is a wide diversity of different data structures, search engines, interfaces, controlled vocabularies, document formats, and so on. Because of this diversity, federating all digital libraries nationally or internationally would an impossible effort (M. S. Alam & M. S. Islam, 2011).

Management Support: For the provision of world class information systems, resources and services, the libraries need the wholehearted support from the respective management. Institutional support in terms of proper funding, human resources and IT skills enrichment are prerequisites for the development and maintenance of state-of-art digital library systems and services.

Selection of appropriate software for digital library: Selection of appropriate digital library software is another issue for medical libraries. It is essential to have full-fledged digital library management software. The software selection based on set parameters is an uphill task, as the technology itself is still emerging only. In general, what is desirable is a system that is flexible enough to fit the current digital information system and to accommodate future migration. It should be robust in technical architecture as well as the content architecture. The system should also provide a powerful search engine and the interface should be easy to navigate and there should be provision for customization. Whatever approach the libraries choose for software selection, it should begin with a feasibility study including SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis followed by detail technical and operational plan.

Lack of digital library coursework in ISLM (Information Science & Library Management) curriculum of Bangladesh: Analyzing the curriculum of ISLM courses at different levels, it is clear that there are no specific courses on digital libraries as of December 2011. Though there are courses in the curriculum that focus on ICT in the library and information center, library automation, and Internet studies, there is no course specifically dedicated to building a sustainable, workable digital library system (N. Z. Shuva, 2012). It requires a dedicated expert team for the DRM system and sophisticated technologies to advance the program more success.

Software cost: In addition, costs of commercial software as well as installation and maintenance costs for FOSS (Free and Open Source Software) are another noticeable obstacle to the progress of digitization in Bangladesh.

It can be stated that number of digital library projects are initiated in Bangladesh since early 2000s the research contribution on the subject has been on some conceptual basis. The Digital Library made its entry in Bangladesh scenario when Hinari came to Bangladesh in April 2003; the WHO platform popularized the use of e-resources in many medical libraries of Bangladesh where paid digital subscriptions were not possible. Containing access to a significant amount of the world's online biomedical journal and book literature, Hinari is a vital resource for training students, informing clinicians, alerting scientists, making journal article publishing a reality for researchers, and encouraging policy-makers in the developing world (Md Nazim Uddin et al., 2017). The digital library initiatives conducted by various university libraries and special organizations in Bangladesh are not a mature effort though the initiatives are good. The major impediment of library digitization in Bangladeshi medical libraries has been the budgetary limitations from the parent organizations. The academic authority is not much aware about the digital library system and its role in an academic environment. Most of the medical libraries do not have minimum ICT facilities for the teachers and general students. In this situation, it will take some time to shift into a digital mode. Some leading modern libraries already have started digitization projects but the initiatives of full-fledged digital libraries in an academic environment have not yet been realized. However, in this day of digital environment, more initiatives for digital library system are needed for dissemination of digital contents where there will be no physical boundary, and round-the-clock availability of the digital resources and multifaceted objects.

CHAPTER 5: ANALYSIS AND INTERPRETATION OF DATA

SECTION – 1:

Digital Library Initiatives: Librarians' Perspective

SECTION – 2

Digital Library Initiatives: Users' Perspective

CHAPTER 5
ANALYSIS AND INTERPRETATION OF DATA

The data has to be processed and anlaysed after collection in accordance with the delineate laid down for the purpose at the time of developing the research plan. This is essential for a scientific study and for ensuring that the investigator has all relevant data for making contemplated comparisons and analysis. Processing implies editing, coding, classification and tabulation of collected data so that they are amenable to analysis. The term analysis refers to the computation of certain measures along with searching for patterns of relationship that exist among data groups. Interpretation is the process of explaining the findings on the basis of some theory.

The study examines the digital library initiatives taken by the surveyed six medical libraries in Bangladesh. This chapter presents the results of the data analysis and discusses the findings. The discussion particularly focuses on various attributes of digital library system. This chapter is organized into two major sections. The purpose of this study is to investigate the digital library initiatives in medical libraries of Bangladesh. The primary data was collected through questionnaire and informal interview. This chapter describes the collected data and presents an analysis of the data with reference to the research objectives. All the data collected has been analyzed and presented in the form of tables, figures and charts. Appropriate statistical measures like Frequency, Percentage, Mean, Standard deviation, Sum etc. have been adopted in the presentation of data. All the statistical procedures were done through SPSS (version 20.0) and MS Excel programs. The data from the responses were numerically coded and then entered on to a spreadsheet which was then imported into and analysed using Statistical Packages for the Social Science (SPSS) software program version 20.0 for Windows. Programs were run to obtain frequencies, descriptive statistics, percentage, mean and standard deviation. Then the findings were synthesised and presented in figures, tables and narrative form. The data were also analysed using cross tabulation tables to identify basic demographic information and patterns as addressed in the questionnaires. Descriptive analysis was used on the quantitative data collected to examine the relationships and differences among the variables identified in the survey and to address the research questions. Hence, this chapter is divided into two major sections:

SECTION – 1

Digital Library Initiatives: Librarians' Perspective

For the present study the term "Digital Library Initiatives" include focused digital collections, institutional repositories and web based resources using Internet, digital library and IR software packages. A total of 6 medical libraries in Dhaka namely International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) Library, Bangladesh Institute of Research and Rehabilitation for Diabetes Endocrine and Metabolic Disorders (BIRDEM) Library, Bangladesh College of Physicians and Surgeons (BCPS) Library, Bangabandhu Sheikh Mujib Medical University (BSMMU) Library, Dhaka Medical College (DMC) Library and National Health Library and Documentation Centre (NHLDC) were identified for the study. Analysis of these responses is highlighted in this chapter in the order of progress of the questionnaire (Appendix-1), served to the target group. For convenience, the findings are presented under fourteen facets of questionnaire, which are as follows:

5.1 General Profile of the Institutions;

5.2 Library Users;

5.3 Staff Strength;

5.4 Library Resources;

5.5 ICT (Information and Communication Technologies) and Automation Facilities;

5.6 Internet Facilities and Library Website;

5.7 Digitization Activities;

5.8 Institutional Repository (IR);

5.9 Accessible Digital and Electronic Collections;

5.10 Digital/Web Based Library Services;

5.11 Library Consortium/Co-Operation

5.12 Budget for Digital Initiatives;

5.13 Training of ICT and Digital Library

5.14 Challenges Involved in Digital Library Development

General Profile of the Institutions

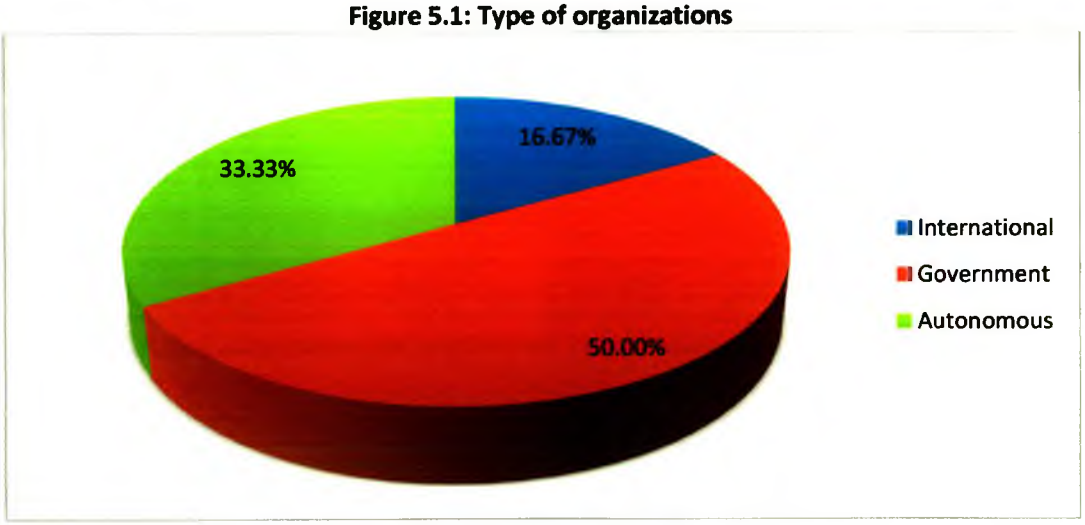
Type of the Parent Organizations

The Table 5.1 and Figure 5.1 present that, out of the 6 institutions under the study, the general institute profile shows 50% (3) Institutes fall under Government type and 33.3% (2) organizations are exclusive Autonomous organizations followed by only 1(16.7%) is treated as International organization i.e. icddr,b.

Table: 5.1 Type of the parent organizations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	International	1	16.7	16.7	16.7
	Government	3	50.0	50.0	66.7
	Autonomous	2	33.3	33.3	100.0
	Total	6	100.0	100.0	

Figure 5.1: Type of organizations



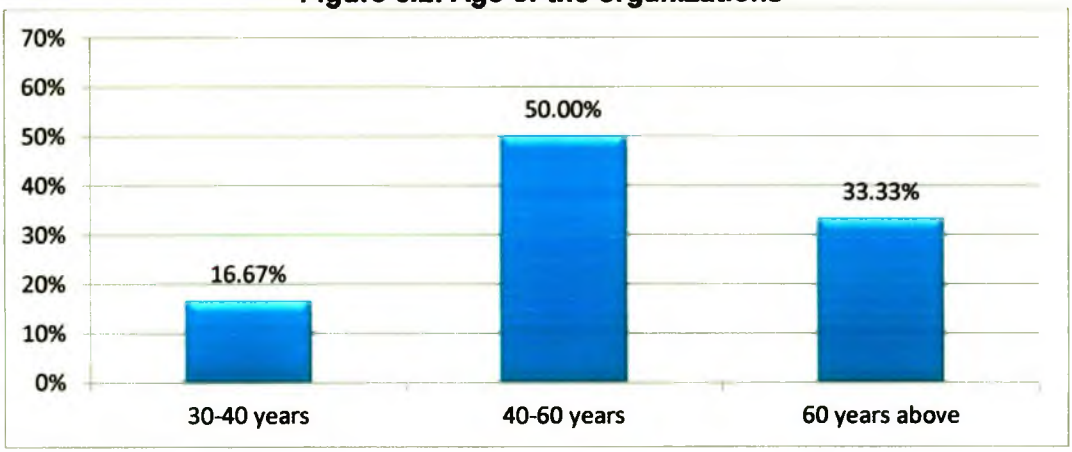
Age of Organizations

The age of the institute and the attitude towards change are observed to have a relationship. Keeping this in mind, an attempt has been made in this study to obtain data from institutes with various age brackets ranging from 30 years to 60 years plus. The Table 5.2 and Figure 5.2 demonstrate that, 50% (3) covered in the study are established during the last 40-60 years while 33.3% institutes are aged above 60 years. Some 16.7% percent institutes are established between 30-40 years. The findings reveal that a majority of institutes are relatively old and have the capabilities of adapting to the digital age library requirements faster as presented in Table 5.2.

Table 5.2: Age of the organizations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30-40 years	1	16.7	16.7	16.7
	40-60 years	3	50.0	50.0	66.7
	60 years above	2	33.3	33.3	100.0
	Total	6	100.0	100.0	

Figure 5.2: Age of the organizations



Independent Library Building

A question pertaining to the existence of independent library building revealed that, 16.7% (1) i.e. NHLDC covered in the study has independent library buildings while the remaining 83.3% percent of the institutes are reportedly having library facility in the same block with a specific floor or floors given for libraries as shown in Table 5.3.

Table 5.3: Existence of Independent Library Building

Name of Library	Existence of Independent Library Building			
	Yes		No	
	Count	Table Total N %	Count	Table Total N %
BCPS Library	0	0.0%	1	16.7%
BIRDEM Library	0	0.0%	1	16.7%
BSMMU Library	0	0.0%	1	16.7%
DMC Library	0	0.0%	1	16.7%
icddr,b Library	0	0.0%	1	16.7%
NHLDC	1	16.7%	0	0.0%

Library Users

Category of users (multiple answers)

The table 5.4 illustrates the various categories of users in surveyed libraries belongs to 17.6% each fall in the category of Student, Researcher and Doctor.

Table 5.4: Category of library users

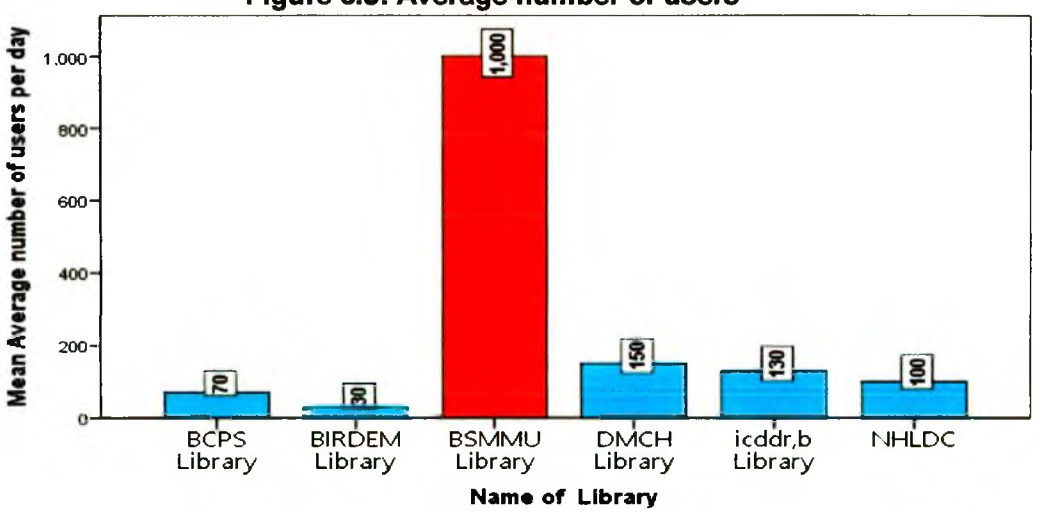
		Responses		Percent of Cases
		N	Percent	
Category of users[a]	Teacher	5	14.7%	83.3%
	Student	6	17.6%	100.0%
	Doctor	6	17.6%	100.0%
	Scientist	4	11.8%	66.7%
	Researcher	6	17.6%	100.0%
	Staff	5	14.7%	83.3%
	Others	2	5.9%	33.3%
Total		34	100.0%	566.7%

a. Dichotomy group tabulated at value 1. [Multiple Responses allowed]

Average number of users per day

Average number of users of selected libraries is shown in Figure 5.3 where BSMMU library has highest number of users belongs to 1000 per day whereas BIRDEM library has the lowest users i.e. 30 per day.

Figure 5.3: Average number of users



Total number of library members

The total number of library members of selected libraries is shown in table 5.5 where BCPS library has highest number of users belongs to 3400 whereas DMC library has the lowest users i.e. 1000.

Table 5.5: Total library members

		Total number of library members	
		Mean	Column Sum %
Name of Library	BCPS Library	3400	27.4%
	BIRDEM Library	3000	24.2%
	BSMMU Library	2000	16.1%
	DMC Library	1000	8.1%
	icddr,b Library	1750	14.1%
	NHLDC	1250	10.1%

Staff Strength

Total staff with IT background

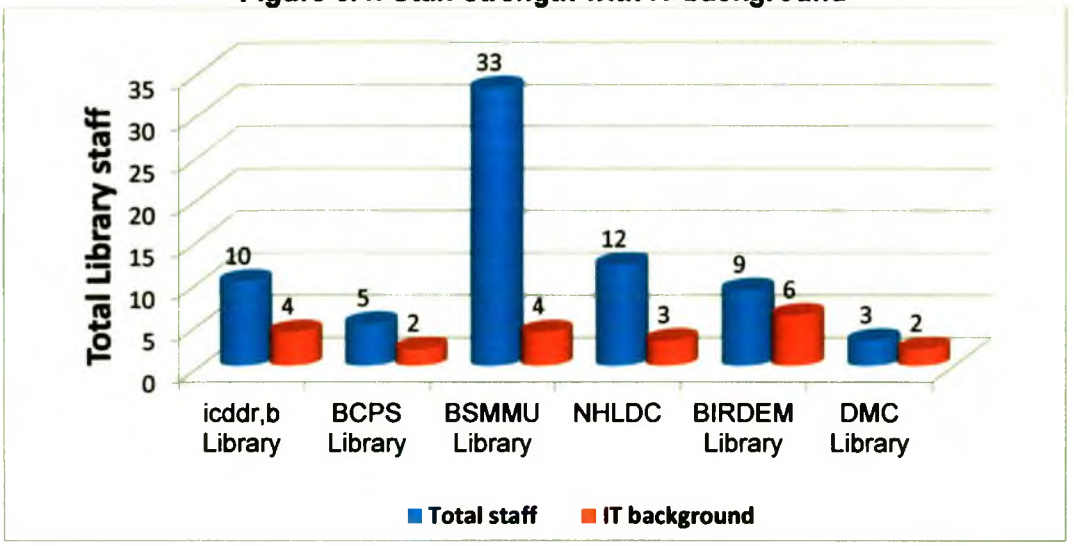
Staff is the most important asset of the medical libraries for developing digital library initiatives. Table 5.6 and Figure 5.4 indicates the HR strength with IT background of the selected libraries. It shows that the comparatively older university libraries have more library personnel than the newer ones. In this case, BSMMU library has the biggest number of personnel i.e. 33 persons with 4 IT background where as DMC has the lowest number of personnel i.e. 3 persons in the library.

Table 5.6 Existing staff strength with IT background of the sample medical libraries

Designation	icddr,b Library	IT background	BCPS Library	IT background	BSMMU	IT background	NHLDC	IT background	BIRDEM Library	IT background	DMC Library	IT background
Chief Librarian/Principal Librarian	-	-	1	✓	-	-	-	-	1	✓	-	-
Librarian/Head of Library/ Senior	1	✓	-	-	1	-	1	✓	1	✓	-	-
Additional Librarian	-	-	-	-	1	✓	-	-	-	-	-	-
Deputy/Associate/Joint Librarian	1	✓	-	-	1	✓	-	-	-	-	-	-
Senior Assistant Librarian/ Sr. Information Officer	3	✓	-	-	2	✓	-	-	-	-	-	-
Assistant Librarian	1	-	-	-	-	-	1	✓	-	1	-	-
Jr. Assistant librarian/ Library Officer	1	-	1	✓	4	-	-	-	1	✓	-	-
Library Assistant	-	-	-	-	4	-	1	✓	-	-	2	✓
Library Attendant	-	-	3	-	4	-	-	-	2	-	-	-
Section Officer	-	-	-	-	4	-	-	-	1	-	-	-
IT Specialist/ system administrator	-	-	-	-	-	-	-	-	-	-	-	-
Others	3	-	-	-	12	-	9	-	3	✓	1	-
Total	**10**	**4**	**5**	**2**	**33**	**4**	**12**	**3**	**9**	**6**	**3**	**2**

✓ **Yes** — **No**

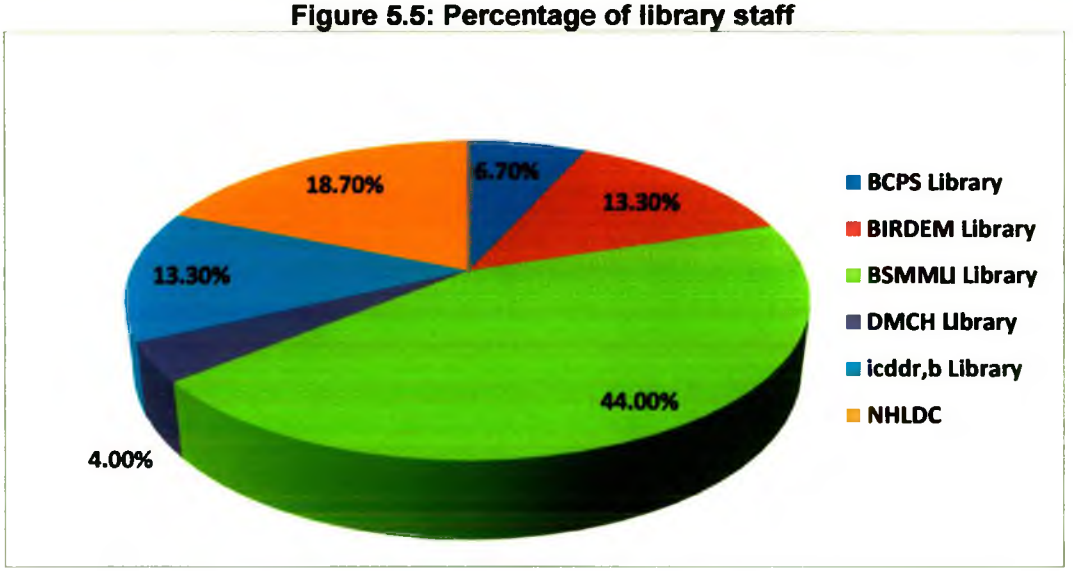
Figure 5.4: Staff strength with IT background



Percentage of total staff in selected libraries

The figure 5.5 clearly shows that BSMMU library has the highest percentage of library personnel i.e. 44%.

Figure 5.5: Percentage of library staff



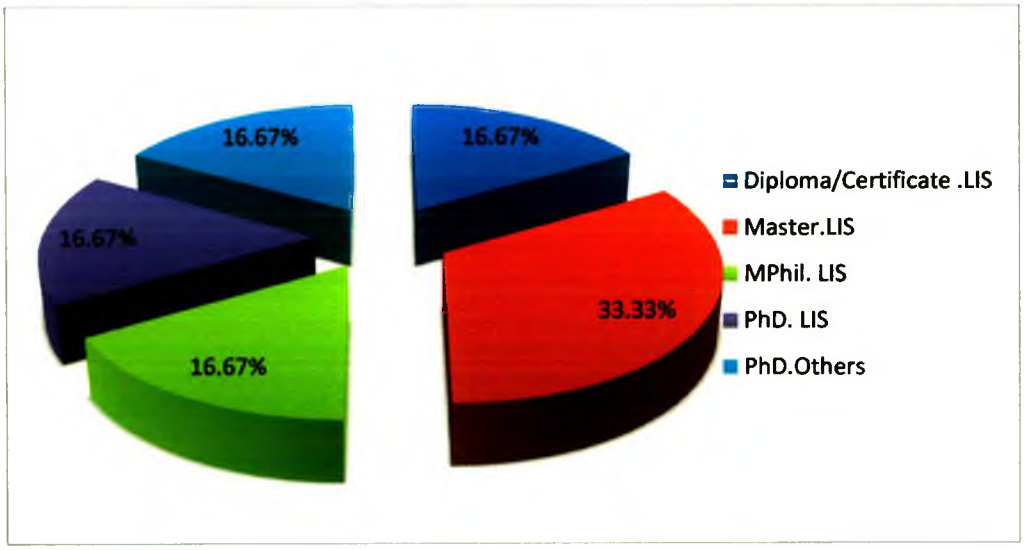
Academic Qualification

The professional qualification of the librarian would be leveraging factor in the development of the library. The study has revealed that a majority of the librarians 33.3% have Master degree in library science. One librarian holds MPhil in LIS followed by 1 librarian PhD degree in LIS. Similarly, there are 16.36 percent of the respondent with Diploma Degree in library science discipline that is explored in Table 5.7.

Table 5.7: Educational qualification of library head

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PhD/Equivalent	2	33.3	33.3	33.3
	M Phil	1	16.7	16.7	50.0
	Master Degree	2	33.3	33.3	83.3
	Certificate	1	16.7	16.7	100.0
	Total	6	100.0	100.0	

Figure 5.6: Academic qualification of librarians



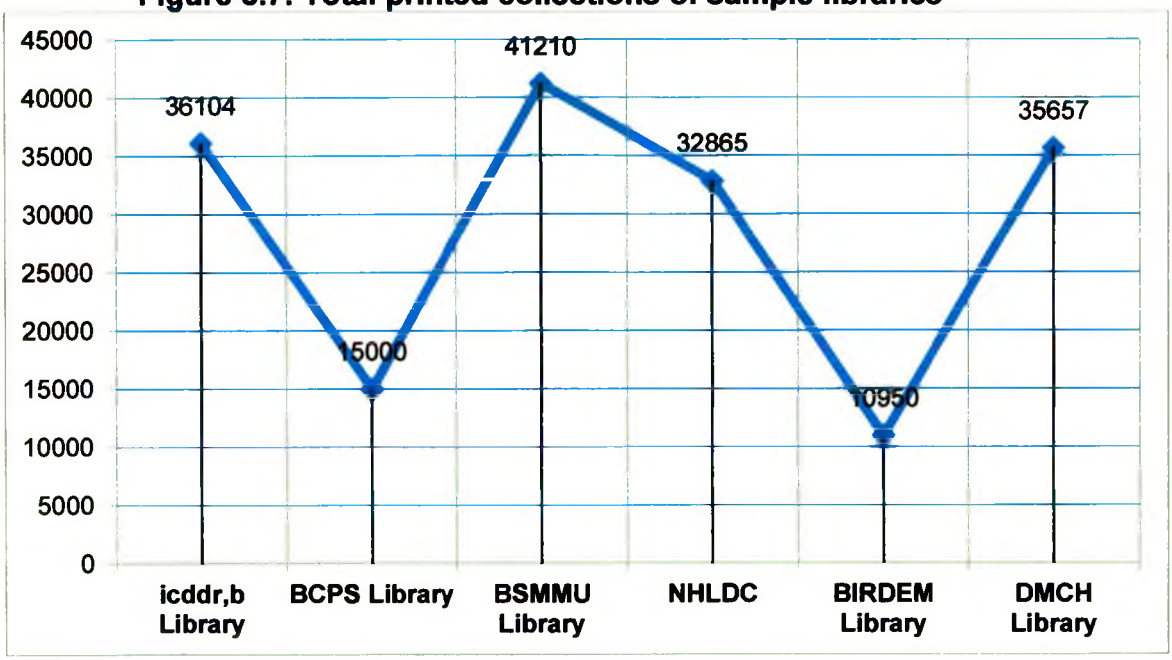
Library Print resources

Table 5.8 and Figure 5.7 illustrates that the library print resources of the sample Medical libraries (MLs). Resources include Books, journals/magazines, audio-visual materials, manuscripts and old documents and news clippings. The Table indicates that BSMMU library has the total largest print collection i.e. 41210 (Figure 5.7) than other libraries.

Table 5.8: Library print resources of sample libraries

	Name of Library											
	BCPS Library		BIRDEM Library		BSMMU Library		DMC Library		icddr,b Library		NHLDC	
	Mean	Row Sum %	Mean	Row Sum %	Mean	Row Sum %	Mean	Row Sum %	Mean	Row Sum %	Mean	Row Sum %
Books	5000	4.7%	7759	7.3%	26867	25.4%	33557	31.7%	14500	13.7%	18300	17.3%
Theses/Dissertations	5500	48.7%	305	2.7%	3537	31.3%	1600	14.2%	350	3.1%	0	0.0%
Reports	0	0.0%	0	0.0%	2333	55.0%	0	0.0%	1905	45.0%	0	0.0%
Loose Journals	0	0.0%	21	0.6%	2353	69.3%	500	14.7%	463	13.6%	60	1.8%
Magazines	0	0.0%	0	0.0%	0	0.0%	0	0.0%	7	58.3%	5	41.7%
Bound Journals	2500	5.8%	2865	6.7%	4630	10.8%	0	0.0%	18436	42.9%	14500	33.8%
Audio-Visual materials	2000	61.5%	0	0.0%	800	24.6%	0	0.0%	450	13.8%	0	0.0%
News Clippings	0	0.0%	0	0.0%	690	100.0%	0	0.0%	0	0.0%	0	0.0%
Total Collections	15000	8.7%	10950	6.4%	41210	24.0%	35657	20.8%	36104	21.0%	32865	19.1%

Figure 5.7: Total printed collections of sample libraries



ICT (Information and Communication Technologies) and Automation Facilities

ICT and Automation inception year

Table 5.9 shows the inception year of ICT in the respective library, it is observed that icddr,b library first started ICT and automation in 1897 but DMC library has not started ICT and automation facilities so far.

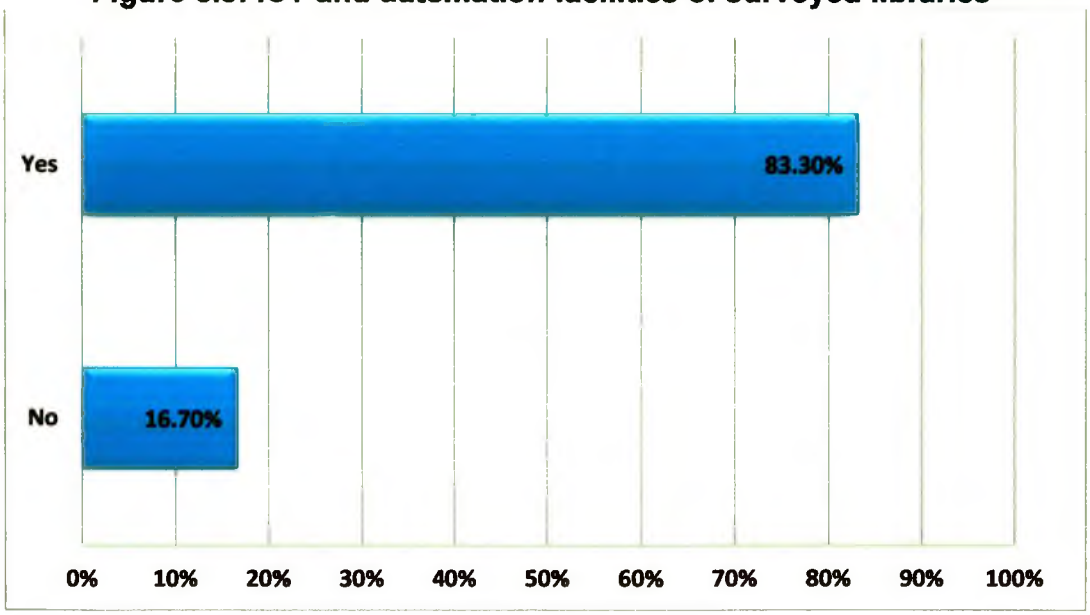
Table 5.9: ICT and automation inception year

	Year of ICT inception				
	1987	1991	2003	2004	2010
Name of Library	icddr,b Library	BIRDEM Library	NHLDC	BCPS Library	BSMMU Library

Percentage of automation facilities

The percentage of automation facilities is shown in Figure 5.8 it is noted that all the surveyed libraries have automation facilities apart from DMC library.

Figure 5.8: ICT and automation facilities of surveyed libraries



Status of Automation

The status of automation is presented in Table 5.10 which explores that DMC library has no automation yet where as icddr,b library is fully automated.

Table 5.10: Status of automation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Fully	1	16.7	16.7	16.7
	Partially	4	66.7	66.7	83.3
	Not automated	1	16.7	16.7	100.0
	Total	6	100.0	100.0	

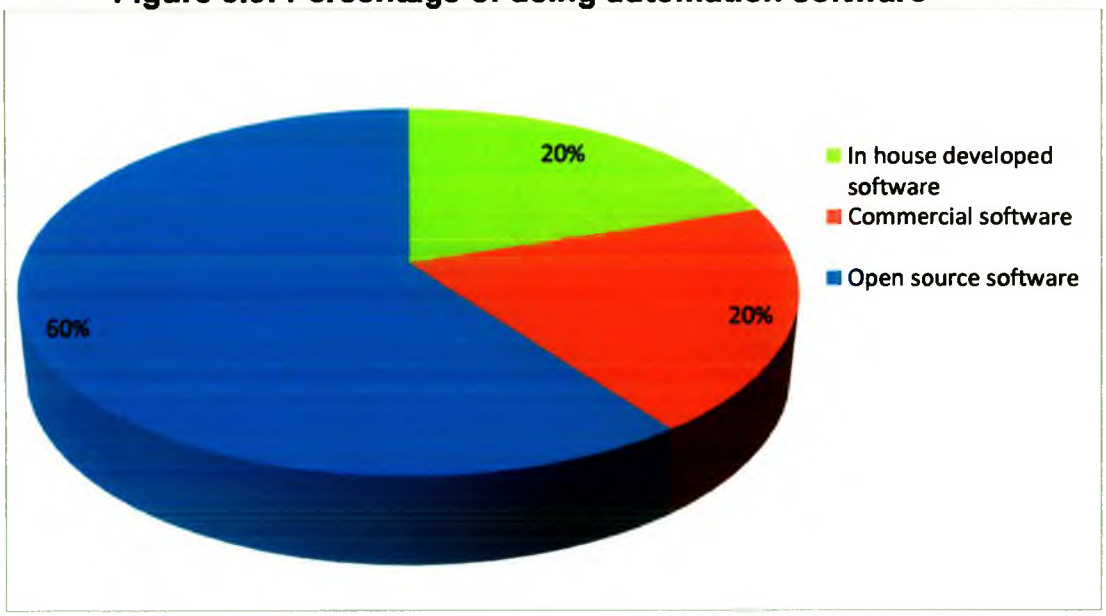
Extent of using automation software

The Table 5.11 explores that only icddr,b library is using commercial software followed by BSMMU, BIRDEM and NHLDC are using Open source software for automation purpose.

Table 5.11: Type of automation software used in the sample libraries

Name of Library	Type of automation software		
	In house developed software	Commercial software	Open source software
BCPS Library	✓	—	—
BIRDEM Library	—	—	✓
BSMMU Library	—	—	✓
icddr,b Library	—	✓	—
NHLDC	—	—	✓
DMC Library	—	—	—

Figure 5.9: Percentage of using automation software



Software Usage Status

Various types of software usage status of surveyed libraries is reflected in 5.12 that points out icddr,b library is using Liberty, on the other hand only BSMMU is using KOHA software for ILS purpose.

Table 5.12: ILS software usage status of the surveyed libraries

		Software name for Integrated Library System						
		ABCD	Evergreen	KOHA	Liberty	OpenBiblo	Others	SLiMs
Name of Library	BCPS Library	0	0	0	0	0	1	0
	BIRDEM Library	0	0	0	0	0	1	0
	BSMMU Library	0	0	1	0	0	0	0
	icddr,b Library	0	0	0	1	0	0	0
	NHLDC	0	0	0	0	0	1	0

Internet Facilities and Library Website

Basic information of Internet facilities

It is observed from Table 5.13 that icddr,b library is the pioneer for adoption of Internet in 1995 on the contrary DMC library has no record for the said purpose. BSMMU has the largest numbers of Internet connected computers i.e. 80. All the surveyed charge for using Internet apart from icddr,b library.

Table 5.13: Basic information of Internet facilities of the surveyed libraries

Name of Library	Inception of Internet	Internet connected computers	Charge for surfing Internet
icddr,b Library	1995	27	No
BCPS Library	2001	10	Yes
BSMMU Library	2006	80	Yes
NHLDC	2000	35	Yes
BIRDEM Library	2001	5	Yes
DMC Library	NA*	1	No

*Data not found

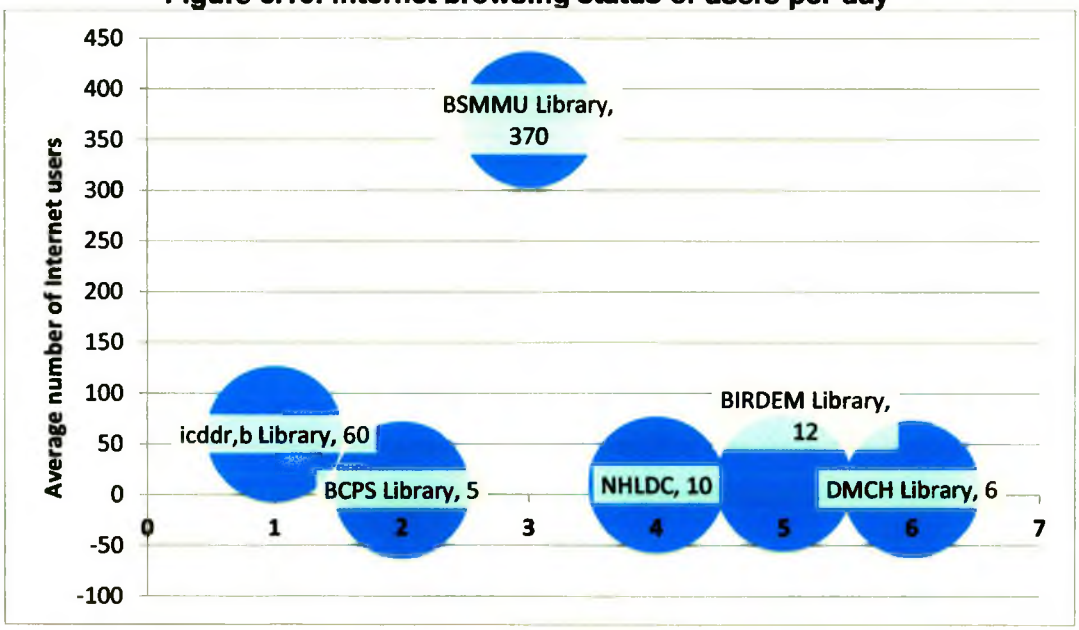
Internet Users

The Table 5.14 and Figure 5.10 expressed that BSMMU library has the highest number Internet users per day followed by icddr,b library belongs to 60.

Table 5.14: Internet users per day in the surveyed libraries

		Internet users per day	
		Mean	Column Sum %
Name of Library	BCPS Library	5	1.1%
	BIRDEM Library	12	2.6%
	BSMMU Library	370	79.9%
	DMC Library	6	1.3%
	icddr,b Library	60	13.0%
	NHLDC	10	2.2%

Figure 5.10: Internet browsing status of users per day



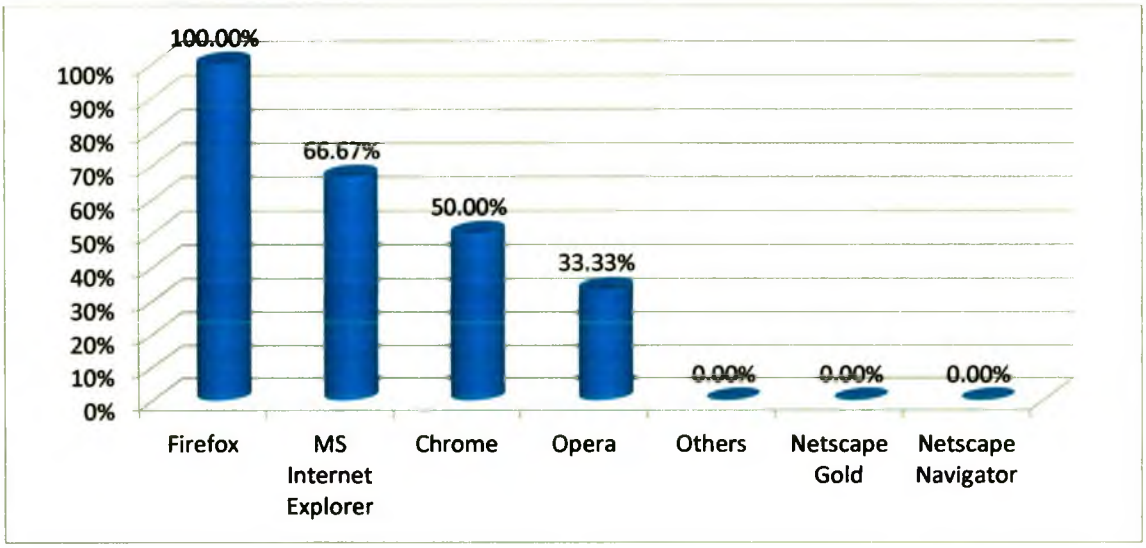
Preference of browser software

The Table 5.15 and Figure 5.11 illustrate that all library heads under survey (6, 100%) chosen that Mozilla Firefox ranked 1st position is the most essential browser for retrieving web based information for users followed by Internet Explorer and Google chrome accounting 66.67% and 50% respectively.

Table 5.15: Preference of browser software of library heads (multipie responses)

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Firefox	6	1	1	6	1.00	.000
MS Internet Explorer	6	0	1	4	.67	.516
Chrome	6	0	1	3	.50	.548
Opera	6	0	1	2	.33	.516
Others	6	0	0	0	.00	.000
Netscape Gold	6	0	0	0	.00	.000
Netscape Navigator	6	0	0	0	.00	.000
Valid N (listwise)	6					

Figure 5.11: Percentage of browser software usage



Preference of Search Engine

The Table 5.16 shows that all library heads under survey (6, 100%) chosen that Google ranked 1st position is the most essential search engine for retrieving web based information for users followed by Yahoo and MSN chrome accounting 2nd and 3rd respectively.

Table 5.16: Extent of using search engine of the library heads

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Google	6	1	1	6	1.00	.000
Yahoo	6	0	1	5	.83	.408
MSN	6	0	1	2	.33	.516
AltaVista	6	0	1	2	.33	.516
Lycos	6	0	1	1	.17	.408
Others	6	0	0	0	.00	.000
Valid N (listwise)	6					

Library Webpage and Intranet

Library Webpage and Intranet are two important factors for developing digital library systems, Table 5.17 below explores the details library webpage and library intranet of surveyed libraries. All the surveyed libraries apart from NHLDC and DMC library have library webpage. In the regard of Intranet, only icddr,b library belongs this credit for accessing e-resources.

Table 5.17: Distribution of the libraries by the availability of library webpage and Intranet

Name of Library	Library Webpage	Library Intranet	URL of library webpage
icddr,b Library	Yes	Yes	http://www.icddrb.org/quick-links/library
BCPS Library	Yes	No	https://www.bcpsbd.org/library.htm
BSMMU Library	Yes	No	http://www.bsmmu.edu.bd/?page=menu&content=139020395538
NHLDC	NO	No	NA
BIRDEM Library	Yes	No	http://birdem-bd.org/index.php/other-services/birdem-library/
DMC Library	No	No	NA

Contents of library website

Table 5.18 clearly shows the blueprint of library website contents of surveyed libraries. It is observed that only BSMMU library webpage holds the link for accessing to e-books and e-journals. DMC library and NHLDC is in most deplorable state for the connection of library webpage.

Table 5.18: Distribution of the libraries by the availability of library Website contents

Website Contents	icddr,b Library	BCPS Library	BSMMU Library	NHLDC	BIRDEM Library	DMC Library
General information on the library, staff, contact numbers, opening hours, services, collections, rules and regulation	✓	✓	✓	✓	✓	—
Web OPAC	—	—	—	—	—	—
Access to e- books & e-journals	—	—	✓	—	—	—
Access to commercial online databases	—	—		—	—	—
Access to open Access database	—	—	✓	—	—	—
Link to Institutional Repository	—	—	✓	—	—	—
New book list	—	✓	—	—	—	—
FAQ	—	—	—	—	—	—
Suggestion page	—	—	—	—	—	—
Feedback & comments	—	—	—	—	—	—
Other information	✓	—	—	—	—	—

✓ **Available** — **Not available**

Contents of library Intranet site

Table 5.19 clearly shows the blueprint of library Intranet site contents of surveyed libraries. It is observed that only icddr,b library intranet site holds the link for accessing to e-books and e-journals as well as other important links.

Table 5.19: Distribution of the libraries by the availability of library Intranet contents

Contents	icddr,b Library	BCPS Library	BSMMU Library	NHLDC	BIRDEM Library	DMC Library
General information on the library, staff, contact numbers, opening hours, services, collections, rules and regulation	✓	–	–	–	–	–
Web OPAC	✓	–	–	–	–	–
Access to e- books & e-journals	✓	–	–	–	–	–
Access to commercial online databases	✓	–	–	–	–	–
Access to open Access database	✓	–	–	–	–	–
Link to Institutional Repository	✓	–	–	–	–	–
New book list	✓	–	–	–	–	–
FAQ	–	–	–	–	–	–
Suggestion page	–	–	–	–	–	–
Feedback & comments	–	–	–	–	–	–
Other information	✓	–	–	–	–	–

✓ **Available** – **Not available**

Electronic Security System

A very poor trend has been observed on the availability of electronic security system in which DMC and BIRDEM library reported that they have not any sort of such system whereas BCPS library has electronic access door, icddr,b library has RFID and CC camera and only BSMMU library has Electronic Surveillance System to provide digital library services as shown in Table 5.20.

Table 5.20: Types of electronic security system in the surveyed libraries

Name of Library	Types of electronic security system					
	Electronic Surveillance System	RFID	Electronic access door	CC camera	Others	Not available
	Count	Count	Count	Count	Count	Count
BCPS Library	0	0	1	0	0	0
BIRDEM Library	0	0	0	0	0	1
BSMMU Library	1	0	0	0	0	0
DMC Library	0	0	0	0	0	1
icddr,b Library	0	1	0	1	0	0
NHLDC	0	0	0	1	0	0

Digital Library Infrastructure

Digital Library Initiatives

The study revealed that close to 84 percent of the libraries covered in the study have taken initiatives for set up libraries where as DMC library is far away from developing digital library system. Higher levels of digital initiatives facilitate better digital library services. As shown in Table 5.21.

Table 5.21: Status of Digital Library Initiatives

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1	16.7	16.7	16.7
	Yes	5	83.3	83.3	100.0
	Total	6	100.0	100.0	

ICT Equipment

The effectiveness of digital library services depends on the digital library infrastructure which comprises providing latest ICT equipment. In medical institutes the libraries are observed to be moderately-equipped with required number of computers and other devices apart from DMC library. A total of 72.81 percent of computers is available for digital library facility in surveyed libraries. Server has a proportion of only 0.88% in terms of total I CT devices followed by Scanners, Photocopiers and Routers belong to 4.82%, 4.82%, and 3.51% accordingly. Nearly 17 percent of the respondents have equipped their digital libraries with more than 5

Laptops. The findings reveal that there is a need to augment more ICT equipment specially for DMC library in the long run to reap the benefits of information and digital communication technologies. All the libraries covered in the Survey have reported to have internet connectivity. Although this a positive sign in the growth of digital libraries. It is equally important to ensure right kind of back- up storage support and ensure that library users have access to the facility without any difficulty. (Table 5.22 & Table 5.23)

Table 5.22: Total ICT resources of surveyed libraries

ICT resources	Total	Percentage
Servers	2	0.88%
Computers	166	72.81%
Scanners	11	4.82%
Digital Cameras	5	2.19%
Digital Photocopiers	11	4.82%
Printers	20	8.77%
Router	8	3.51%
Laptop	5	2.19%
Total	228	100.00%

Table 5.23: Library wise ICT resources

	Name of Library											
	NHLDC		icddr,b Library		DMC Library		BSMMU Library		BIRDEM Library		BCPS Library	
	Mean	Row Sum %	Mean	Row Sum %	Mean	Row Sum %	Mean	Row Sum %	Mean	Row Sum %	Mean	Row Sum %
Servers	0	0.0%	1	50.0%	0	0.0%	0	0.0%	0	0.0%	1	50.0%
Computers	40	24.1%	27	16.3%	1	0.6%	80	48.2%	8	4.8%	10	6.0%
Scanners	5	45.5%	2	18.2%	0	0.0%	2	18.2%	1	9.1%	1	9.1%
Digital Cameras	3	60.0%	0	0.0%	0	0.0%	1	20.0%	1	20.0%	0	0.0%
Digital Photocopiers	3	27.3%	3	27.3%	1	9.1%	2	18.2%	1	9.1%	1	9.1%
Printers	5	25.0%	5	25.0%	1	5.0%	4	20.0%	3	15.0%	2	10.0%
Router	2	25.0%	4	50.0%	0	0.0%	0	0.0%	1	12.5%	1	12.5%
Laptop	0	0.0%	5	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Type of digital materials

Two types of digital resources are available in surveyed libraries apart from DMC library. Only icddr,b library has both types om materials as shown in Table 5.24.

Table 5.24: Distribution of the libraries by creation of digital resources

Name of Library	Born digital	Digitally created
icddr,b Library	Yes	Yes
BCPS Library	Yes	No
BSMMU Library	Yes	Yes
NHLDC	No	Yes
BIRDEM Library	No	Yes
DMC Library	No	No

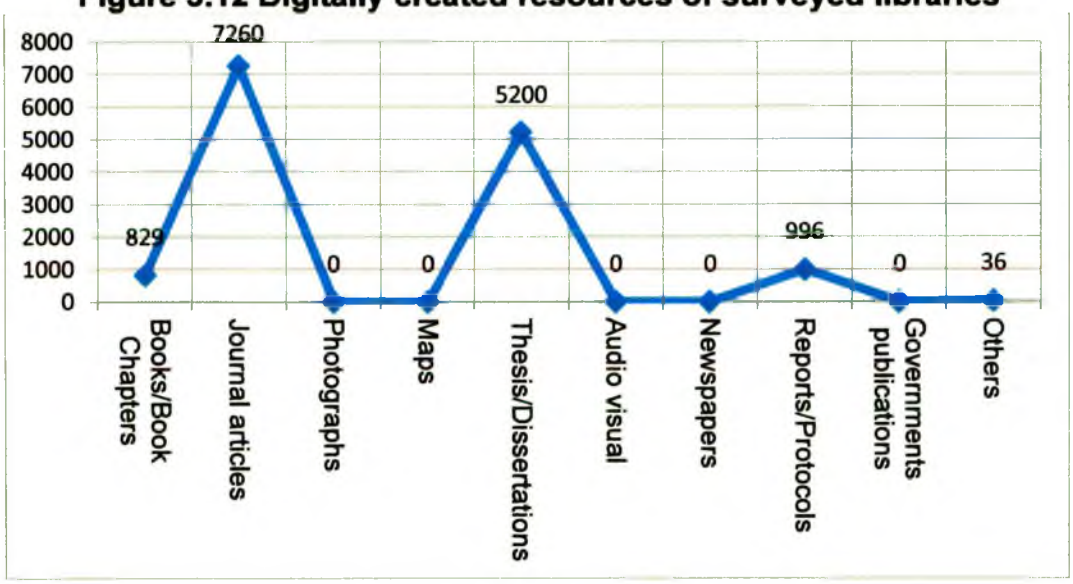
Library wise digitized collections

A very poor trend has been observed on the availability of digitally created resources in which icddr,b library holds some book chapters i.e. 824 followed by BCPS and NHLDC have digitized theses of 5000 and 200 respectively as explores in Table 5.25 and Figure 5.12.

Table 5.25: Library wise digitized collections

Sample libraries	Books/Book Chapters	Journal articles	Photo graphs	Maps	Thesis/ Dissertations	Audio visual	Newspapers	Reports/Protocols	Government publications	Others	Total
icddr,b Library	824	6955	0	0	0	0	0	926	0	36	8741
BCPS Library	0	0	0	0	5000	0	0	0	0	0	5000
BSMMU Library	0	0	0	0	0	0	0	0	0	0	0
NHLDC	0	30	0	0	200	0	0	0	0	0	230
BIRDEM Library	5	275	0	0	0	0	0	70	0	0	350
DMC Library	0	0	0	0	0	0	0	0	0	0	0
Total	829	7260	0	0	5200	0	0	996	0	36	14321

Figure 5.12 Digitally created resources of surveyed libraries



Digital material acquire process

The Table 5.26 shows the digital materials acquire process of surveyed libraries. It is worth mentioning that all 100% libraries acquire digital materials through Harvested from web.

Table 5.26: Acquire process of digital materials (multiple responses)

		Responses		Percent of Cases
		N	Percent	
Acquire process of digital materials[a]	Outright Purchase	1	5.9%	16.7%
	Licensed from a vendor	2	11.8%	33.3%
	Created in-house	5	29.4%	83.3%
	Compliment	3	17.6%	50.0%
	Harvested from web	6	35.3%	100.0%
Total		17	100.0%	283.3%

a. Dichotomy group tabulated at value 1. [Multiple responses allowed]

Digital Materials Converting Process

Scanning is a common process for creating digital resources. DMC library is not following any process for creating digital resources as illustrated in Table 5.27.

Table 5.27: Distribution of the libraries by digital materials converting process

Methods	icddr,b Library	BCPS Library	BSMMU Library	NHLDC	BIRDEM Library	DMC Library
Registering	–	–	–	–	–	–
Scanning	√	√	√	√	√	–
Optical Character Recognition	–	–	–	–	–	–
Proofreading	–	–	–	–	–	–
Reformatting	–	–	–	–	–	–
Producing the Final Version	√	–	–	–	–	–

✓ Available – Not available

Format for Preserving Digital Resources

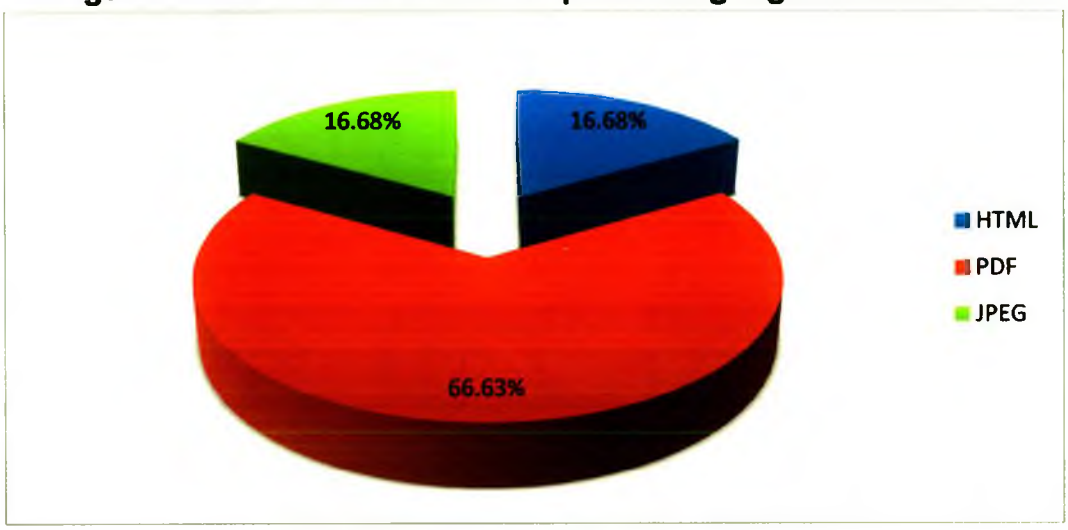
It is observed from Table 5.28 and Figure 5.13 that PDF is the most preferred format for preserving digital resources.

Table 5.28: Preferred format for preserving digital resources

		Responses		Percent of Cases
		N	Percent	
Preferred format for digital resources[a]	HTML	1	16.7%	25.0%
	PDF	4	66.7%	100.0%
	JPEG	1	16.7%	25.0%
Total		6	100.0%	150.0%

a. Dichotomy group tabulated at value 1. . [Multiple responses allowed]

Figure 5.13: Preferred format for preserving digital resources



Digitization Policy

All the surveyed libraries have no digitization policy for preserving digital resources that is not a good sign for digital library development as explored in Table 5.29.

Table 5.29: Extent of written digitization policy

		Written digitization policy	
		No	Yes
Name of Library	BCPS Library	1	0
	BIRDEM Library	1	0
	BSMMU Library	1	0
	DMC Library	1	0
	icddr,b Library	1	0
	NHLDC	1	0

Priorities for Digitization

The priorities for digitizing library resources shown in Table 5.30 and Table 5.31 provides the mean value and the Standard Deviation (SD) and importance level assessed by a Five point Likert scale for eleven attributes. 'Theses and dissertations' has the highest mean value of 4.33 and SD is .816, 'Journals and other serials' has the second highest mean value of 4.17 and SD is .408.

Table 5.30: Priorities for digitization of library resources

Attributes	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Theses and dissertations	6	3	5	26	4.33	.816
Journals and other serials	6	4	5	25	4.17	.408
Rare books	6	3	4	22	3.67	.516
Reports/ Government documents	6	2	5	22	3.67	1.033
Manuscripts	6	1	5	20	3.33	1.366
Historical documents/archives	6	1	5	19	3.17	1.472
Audio Visual	6	1	4	16	2.67	1.033
Photographs	6	1	5	15	2.50	1.517
Maps	6	1	5	13	2.17	1.472
Old Newspapers	6	1	4	13	2.17	1.169
Valid N (listwise)	6					

Table 5.31: Importance level for digitization of library resources

Document types	Not Important		Less valuable		Valuable		Most valuable		Worthwhile	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Reports/ Government documents	0	0.0%	1	16.7%	1	16.7%	3	50.0%	1	16.7%
Historical documents/archives	1	16.7%	1	16.7%	1	16.7%	2	33.3%	1	16.7%
Journals and other serials	0	0.0%	0	0.0%	0	0.0%	5	83.3%	1	16.7%
Manuscripts	1	16.7%	0	0.0%	2	33.3%	2	33.3%	1	16.7%
Maps	2	33.3%	3	50.0%	0	0.0%	0	0.0%	1	16.7%
Old Newspapers	2	33.3%	2	33.3%	1	16.7%	1	16.7%	0	0.0%
Photographs	2	33.3%	1	16.7%	2	33.3%	0	0.0%	1	16.7%
Rare books	0	0.0%	0	0.0%	2	33.3%	4	66.7%	0	0.0%
Theses and dissertations	0	0.0%	0	0.0%	1	16.7%	2	33.3%	3	50.0%
Audio Visual	1	16.7%	1	16.7%	3	50.0%	1	16.7%	0	0.0%

Scale: 5 = Worthwhile; 4 = Most valuable; 3 = Valuable; 2 = Less valuable; 1 = Not important

Extent of metadata standard

The data depicted in Table 5.32 summarizes that out of total 6 respondents, controlled vocabulary is used in icddr,b and NHLDC.

Table 5.32: Types of vocabulary used

Types	icddr,b Library	BCPS Library	BSMMU Library	NHLDC	BIRDEM Library	DMC Library
Controlled vocabulary	✓	–	–	✓	–	–
Natural language	–	–	✓	–	–	–

✓ Available – Not available

Digital Library Software

Open source digital library software is used in almost all libraries namely icddr,b; BSMMU; and NHLDC as shown in Table 5.33.

Table 5.33: Extent of using digital library software

Name of Library	Type of software		
	In house developed software	Commercial software	Open source software
BCPS Library	–	–	–
BIRDEM Library	–	–	–
BSMMU Library	–	–	✓
icddr,b Library	–	–	✓
NHLDC	–	–	✓
DMC Library	–	–	–

✓ Available – Not available

Software for Managing Digitized Contents

A question pertaining to the digital library software available revealed that 5 (84%) respondents have D-Space software preference in their libraries while another DMC library has not chosen any kind of library software. It is pertinent to point that the librarians need to strive to ensure that the libraries have genuine and need-based software to enable them to provide digital library services more efficiently and effectively that is explored in Table 5.34.

Table 5.34: Digital Library Software preferences

Name of Library	Software preference									
	DSpace	GreenStone	DigiTool	E-Prints	CONTENTdm	ETD-db	Fedora	DIGIBIB	Others	Not decided
BCPS Library	1	0	0	0	0	0	0	0	0	0
BIRDEM Library	1	0	0	0	0	0	0	0	0	0
BSMMU Library	1	0	0	0	0	0	0	0	0	0
DMC Library	0	0	0	0	0	0	0	0	0	1
icddr,b Library	1	0	0	0	0	0	0	0	0	0
NHLDC	1	0	0	0	0	0	0	0	0	0

Storage Devices for Preserving Digitized Contents

The Table 5.35 illustrates the preferred storage devices for preserving digital resources.

Table 5.35: Preferred storage devices for preserving digitized contents

Storage Device	icddr,b Library	BCPS Library	BSMMU Library	NHLDC	BIRDEM Library	DMC Library
CD-ROM/ DVD	–	√	√	–	–	–
Dedicated computers	√	–	–	–	–	–
Library Server	√	–	–	√	–	–
Organizational Server	√	–	–	√	–	–
External Hard-disk	√	–	–	√	√	–

✓ **Available** – **Not available**

Institutional Repository (IR)

Status of Institutional Repository (IR)

At this moment, possible solution for the libraries of Bangladesh to increase their digital collections/digital information resources is to create "Institutional Repository". But the present scenario of developing IR in surveyed libraries is quite disappointing which is apparent in Table 5.36. Out of 6 respondents, only icddr,b library is well advanced for developing IR.

Table 5.36: Status of Institutional Repository (IR) of selected libraries

		Status of Institutional Repository (IR)	
		Yes	No
		Count	Count
Name of Library	BCPS Library	0	1
	BIRDEM Library	0	1
	BSMMU Library	0	1
	DMC Library	0	1
	icddr,b Library	1	0
	NHLDC	0	1

icddr,b Library IR

As stated earlier, only icddr,b library among the surveyed libraries has developed IR with a rich collection of documents. So the basic information of Institutional Repository (IR) of icddr,b library is presented in Table 5.37. It is worth mentioning here that icddr,b IR is enlisted through DOAR (Directory of Open Access Repositories).

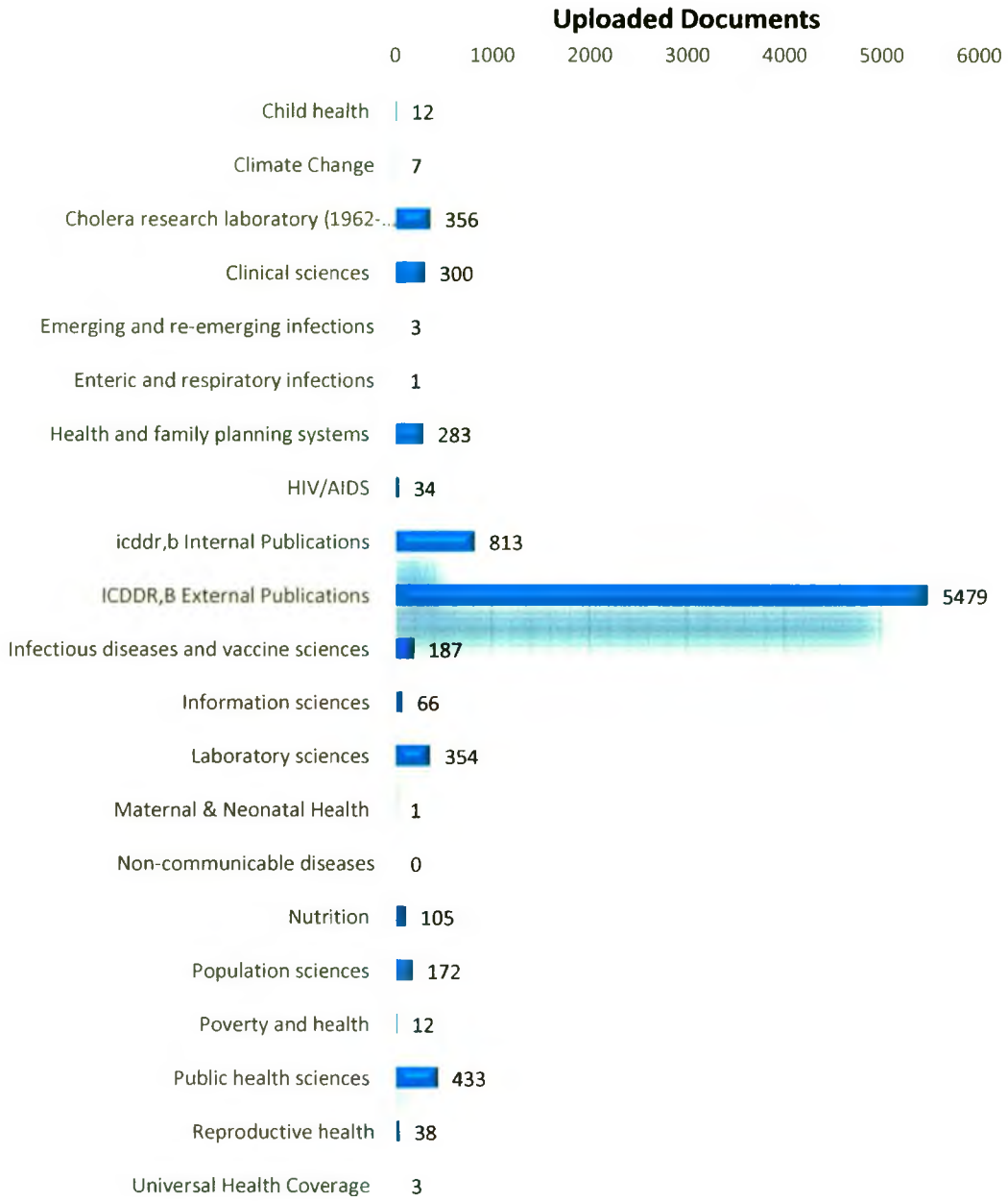
Table 5.37: Basic information of Institutional Repository (IR) of icddr,b library

Name of IR	Inception year	URL	Total uploaded items	Enlisted with DOAR	Objective
Knowledge Repository	2005	http://dspace.icddrb.org	8767	Yes	Capture and preserve research and related contents and to make it available online.

Uploaded Documents of icddr,b IR

The Figure 5.14 illustrates the total number oy documents as of 31 January, 2018, in which shows the maximum number of documents i.e. 5479 belongs to icddr,b External Publications.

Figure 5.14: Total uploaded documents of icddr,b IR



Source: http://dspace.icddrb.org/jspui/community-list (accessed 02 February 2018)

Usage status of icddr,b IR

The Figure 5.15 shows the monthly usage status of icddr,b IR for 2017.

Figure: 5.15: Usage status of icddr,b IR for 2017

Source: Google Scholar

Preference for uploaded IR items

The respondents were asked to write down about the preferences (multiple responses allowed) of the IR items of the existing/ planned IR system which will be developed in future. The result of the analysis is furnished in the Table 5.38. It is noted from the table that the respondents have given 100% priorities for the resources of 'Journal Articles' and 'News Clippings'.

Table 5.38: Preference for uploaded IR items

		Responses		Percent of Cases
		N	Percent	
Preferred items of IR[a]	Thesis	4	9.3%	66.7%
	Dissertation	4	9.3%	66.7%
	Conference proceeding	2	4.7%	33.3%
	Book	4	9.3%	66.7%
	Journal articles	6	14.0%	100.0%
	Scientific report	2	4.7%	33.3%
	Unpublished document	4	9.3%	66.7%
	Research paper	4	9.3%	66.7%
	Internship report	3	7.0%	50.0%
	Audio-visual/multimedia	2	4.7%	33.3%
	News clippings	6	14.0%	100.0%
	Others	2	4.7%	33.3%
Total		43	100.0%	716.7%

a. Dichotomy group tabulated at value 1. [Multiple responses allowed]

Subject coverage for IR

Preferred subject coverage for the development of IR remarked by library heads are presented in Table 5.39 that shows Nutrition and Maternal & Neonatal Health with a Mean score of 1.00 and .83 ranked 1st and 2nd position respectively.

Table 5.39: Descriptive Statistics of preferred subject coverage of IR

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Nutrition	6	1	1	6	1.00	.000
Maternal & Neonatal Health	6	0	1	5	.83	.408
Universal Health Coverage	6	0	1	4	.67	.516
Non-communicable diseases	6	0	1	4	.67	.516
Hospitals	6	0	1	4	.67	.516
HIV/AIDS	6	0	1	4	.67	.516
Health and Family Planning Systems	6	0	1	4	.67	.516
Medicine &Health	6	0	1	4	.67	.516
Reproductive Health	6	0	1	3	.50	.548
Public Health Sciences	6	0	1	3	.50	.548
Poverty and Health	6	0	1	3	.50	.548
Population Sciences	6	0	1	3	.50	.548
Laboratory Sciences	6	0	1	3	.50	.548
Infectious Diseases and Vaccine Sciences	6	0	1	3	.50	.548
Medical Education	6	0	1	3	.50	.548
Human anatomy, cytology and histology	6	0	1	3	.50	.548
Clinical Sciences	6	0	1	3	.50	.548
Climate Change	6	0	1	3	.50	.548
Child Health	6	0	1	3	.50	.548
Gynecology, obstetrics, pediatrics & geriatrics	6	0	1	2	.33	.516
Surgery and related medical specialties	6	0	1	2	.33	.516
Human physiology	6	0	1	2	.33	.516
Others	6	0	1	1	.17	.408
Valid N (listwise)	6					

IR software for building up digital collections

Digital libraries contain digital documents either as born digital or digitized. For a proper functioning of a digital library it is essential to have full-fledged IR software. It helps to collect, organize, store and retrieve the information in an effective manner. Selection of appropriate IR software is highly important. The present study intends to assess the various IR software adopted by the digital libraries covered under study. The Table 5.40 explored that only icddr,b library is now using DSpace software for developing IR whereas other surveyed libraries apart from DMC library have not decided yet for any IR software. BSMMU library has a plan to develop its IR through DSpace.

Table 5.40: IR software preferences

Name of Library	Name of software for building IR									
	DSpace	GreenStone	DigiTool	E-Prints	CONTENTdm	ETD-db	Fedora	DIGIBIB	Others	Not decided
	Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
BCPS Library	0	0	0	0	0	0	0	0	0	1
BIRDEM Library	0	0	0	0	0	0	0	0	0	1
BSMMU Library	1	0	0	0	0	0	0	0	0	0
DMC Library	0	0	0	0	0	0	0	0	0	1
icddr,b Library	1	0	0	0	0	0	0	0	0	0
NHLDC	0	0	0	0	0	0	0	0	0	1

Online accessible collections

Accessible Digital and Electronic Collections

E- Resources constitute several forms of resources made available to the users in digital forms. Common E-Resources include e-journals, e-books, e-theses &dissertations, course materials, subject gateways, reports, archives, e-newspapers, etc. In this study an attempt has been made to find out the availability of accessible digital and electronic collections in the libraries covered in the survey. All the surveyed libraries apart from DMC library informed that they are subscribing/registering to various e-resources and online databases and they are building up e-book collections in their digital resource bases through Research4Life platform (Hinari, AGORA, OARE, ARDI). The Table 5.41 and Table 5.42 furnish library wise digital collections and total number of digital collections accordingly. The Figure 5.16 also illustrates the picture of accessible digital collections of surveyed libraries. It is observed that, DMC library is in a poor state since it does not belong to any sort of digital collections.

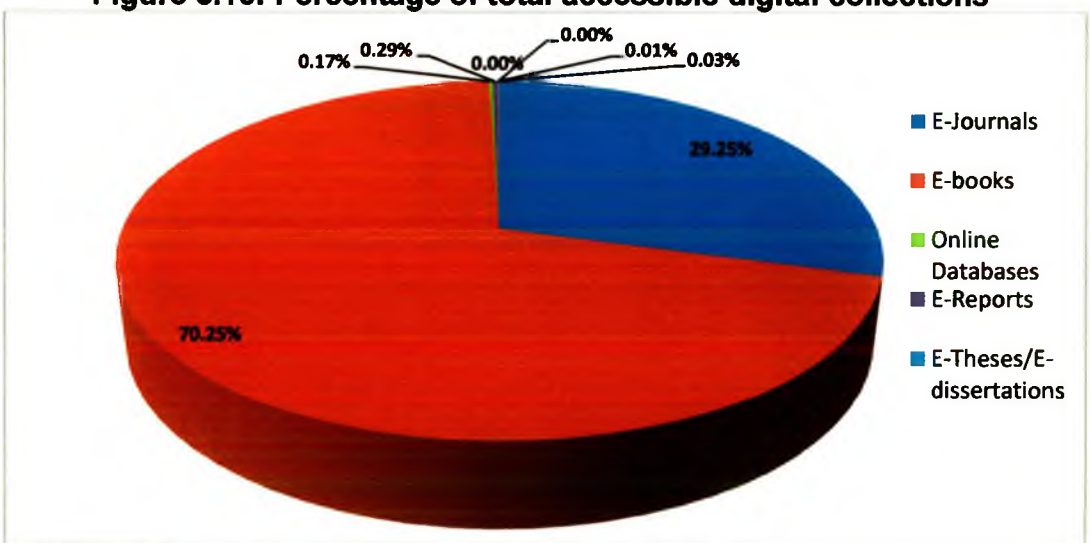
Table 5.41: Library wise accessible digital collections

	Name of Library											
	icddr,b Library		NHLDC		BIRDEM Library		BCPS Library		BSMMU Library		DMC Library	
	Total	Row Sum %	Total	Row Sum %	Total	Row Sum %	Total	Row Sum %	Total	Row Sum %	Total	Row Sum %
E-Journals	48158	29.3%	30945	18.8%	36170	22.0%	36170	22.0%	13000	7.9%	0	0.0%
E-books	103365	26.2%	78527	19.9%	78527	19.9%	78527	19.9%	56000	14.2%	0	0.0%
Online Databases (Subscribed, free and registered)	271	28.6%	192	20.3%	192	20.3%	192	20.3%	101	10.7%	0	0.0%
E-Reports (Open access)	1650	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
E-Theses/E-dissertations	0	.	0	.	0	.	0	.	0	.	0	.
E-Encyclopedias (Open access)	6	21.4%	6	21.4%	5	17.9%	4	14.3%	7	25.0%	0	0.0%
E-Dictionaries (Open access)	12	30.0%	6	15.0%	7	17.5%	9	22.5%	6	15.0%	0	0.0%
E-Newspapers (Open access)	45	27.3%	34	20.6%	23	13.9%	40	24.2%	23	13.9%	0	0.0%

Table 5.42: Total accessible digital collections of surveyed libraries

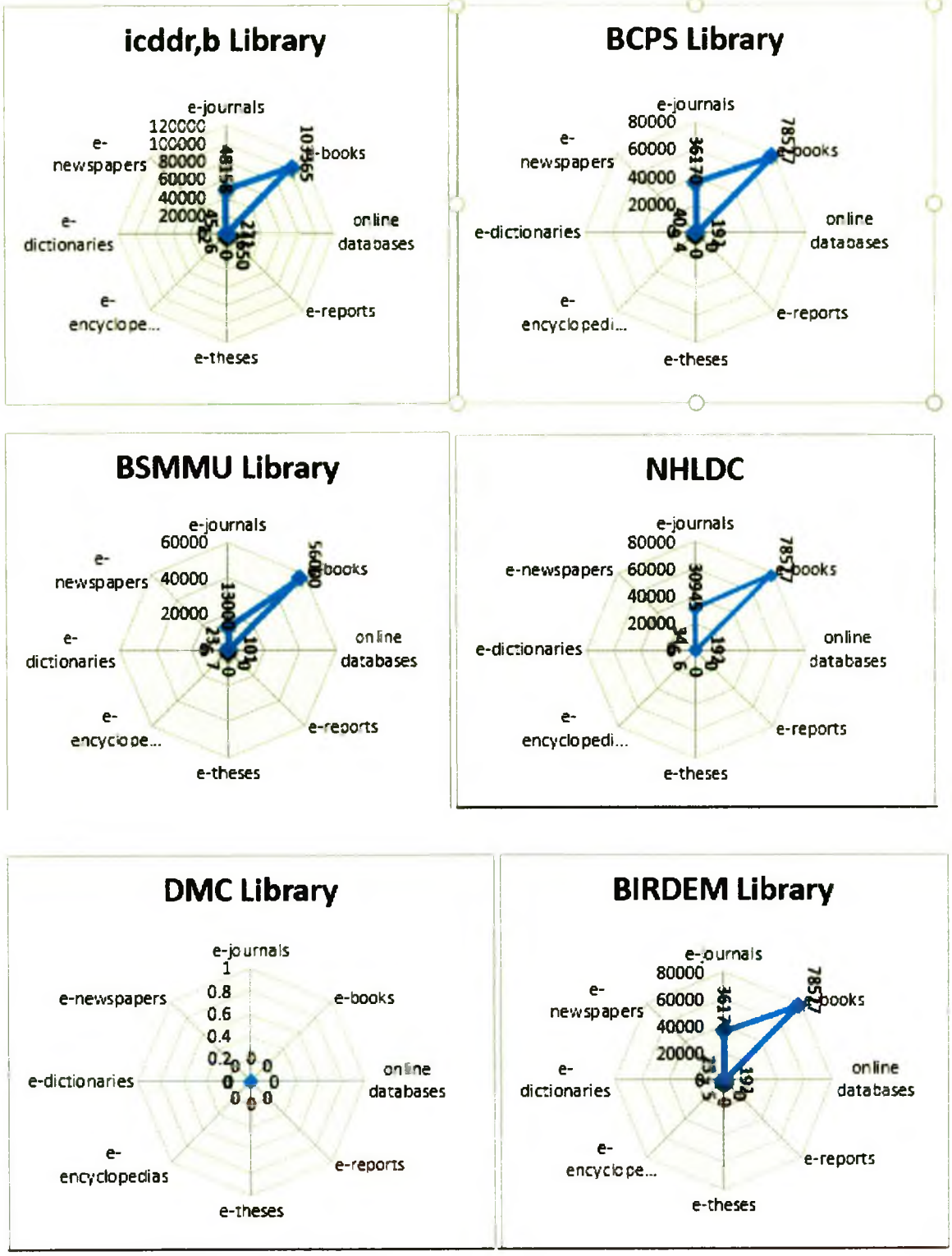
Types of digital resources	Total	Percentage
E-Journals	164443	29.25%
E-books	394946	70.25%
Online Databases	948	0.17%
E-Reports	1650	0.29%
E-Theses/E-dissertations	0	0.00%
E-Encyclopedias	28	0.00%
E-Dictionaries	40	0.01%
E-Newspapers	165	0.03%
Total	562220	100.00%

Figure 5.16: Percentage of total accessible digital collections



The investigator tries to take a blueprint in one frame of library wise digital collections as shown in Figure 5.17.

Figure 5.17: Library wise accessible digital collections



Online databases

Online databases are broadly two types of e-data bases- (i) Full Text databases- This form of databases contains the whole content of an article such as citation, text, illustrations, diagrams and tables and (ii) bibliographic databases which contain only certain brief information about the article like title, author details, publication date, page numbers and details of publisher or seller of the journal or book. The findings of Table 5.43 indicate that Scopus and Hinari are dominating on line databases in all surveyed libraries apart from DMC library.

Table 5.43: Status of subscribed/registered online databases/electronic platform

	Name of Library											
	BCPS Library		BIRDEM Library		BSMMU Library		DMC Library		icddr,b Library		NHLDC	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
JSTOR	0	1	0	1	0	1	0	1	1	0	0	1
Emerald	0	1	0	1	0	1	0	1	0	1	0	1
Oxford University Press	0	1	1	0	0	1	0	1	1	0	0	1
ASM Journals	0	1	0	1	0	1	0	1	1	0	0	1
SpringerLink	1	0	1	0	0	1	0	1	1	0	0	1
Indian Journals	0	1	0	1	0	1	0	1	1	0	0	1
Cochrane Library	0	1	1	0	0	1	0	1	1	0	0	1
Hinari	1	0	1	0	1	0	0	1	1	0	1	0
AGORA	1	0	1	0	0	1	0	1	1	0	1	0
OARE	1	0	1	0	0	1	0	1	1	0	1	0
Science Direct	1	0	0	1	0	1	0	1	1	0	0	1
ProQuest	0	1	0	1	0	1	0	1	1	0	0	1
EBSCOHost	0	1	1	0	0	1	0	1	1	0	0	1
ARDI	0	1	0	1	0	1	0	1	1	0	0	1
TRAVAX	0	1	0	1	0	1	0	1	0	1	0	1
ISI Web of Science	0	1	0	1	0	1	0	1	1	0	0	1
Scopus	1	0	1	0	1	0	0	1	1	0	1	0
Ulrichsweb	0	1	0	1	0	1	0	1	1	0	0	1
UptoDate	0	1	1	0	0	1	0	1	1	0	0	1
Others	0	1	0	1	0	1	0	1	1	0	0	1

Access Control Measures of the Digital Library

One of the primary objectives of a digital library is to build a mechanism to facilitate the creation as well as the use of digital information resources online by anyone from anywhere. Therefore, the issue of security of information becomes a major concern

as well as challenge. Digital library managers need to decide which user should have access to what digital material and how the access can be made smooth as well as secured. This section of the study gives an idea about the different types of access control measures adopted by the digital library initiatives under study. Table 5.44 shows that User name and Password access method is the most popular of surveyed libraries belongs to 60%.

Table 5.44: Digital resources access methods

		Name of Library											
		BCPS Library		BIRDEM Library		BSMMU Library		DMC Library		icddr,b Library		NHLDC	
		No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
IP enabled (On campus access)	Count	0	1	1	0	1	0	1	0	0	1	1	0
User name and password	Count	1	0	0	1	0	1	1	0	1	0	0	1
MyAthens	Count	1	0	1	0	1	0	1	0	0	1	1	0

Digital/Web Based Library Services

A question pertaining to the opinion (multiple responses allowed) about digital/web-based information services revealed that all the respondents provide Internet services i.e. 100% followed by WiFi services numbering 83.3% as shown in Table 5.45.

Table 5.45: Status of digital/web based library services

		Responses		Percent of Cases
		N	Percent	
Digital library services[a]	OPAC	2	6.5%	33.3%
	Web OPAC	1	3.2%	16.7%
	Online renewal service	1	3.2%	16.7%
	Institutional Repository (IR)/Digital Repository (DR) service	1	3.2%	16.7%
	Online SDI service	1	3.2%	16.7%
	Online reservation	1	3.2%	16.7%
	Online reference query	2	6.5%	33.3%
	Web 2.0	1	3.2%	16.7%
	Electronic document delivery	3	9.7%	50.0%
	Mobile based services	1	3.2%	16.7%
	Remote access service	1	3.2%	16.7%
	RFID based services	2	6.5%	33.3%
	Wifi service	5	16.1%	83.3%
	Virtual reference service	1	3.2%	16.7%
	Distance learning service	1	3.2%	16.7%
	Internet service	6	19.4%	100.0%
	E-indexing and abstracting service	1	3.2%	16.7%
Total		31	100.0%	516.7%

a. Dichotomy group tabulated at value 1. [Multiple responses allowed]

Library consortium/co-operation

Status of e-resource consortium

The advent of library consortium as an accepted part of the library and information infrastructure has had a very significant impact on the way in whichdigital collections are perceived. The popular library networks include Bangladesh INASP-PERI Consortium (BIPC). Keeping this view in mind an attempt has been made to find out as to how many institutes are a part of various library networks. The study revealed that 50 percent of the responding institutes are participating in library network which is moderately satisfactory number as explored in Table 5.46.

Table 5.46: Status of e-resource consortium

		Member of e-resource consortium	
		Yes	No
		Count	Count
Name of Library	BCPS Library	1	0
	BIRDEM Library	1	0
	BSMMU Library	0	1
	DMC Library	0	1
	icddr,b Library	1	0
	NHLDC	0	1

Membership status of library consortium

The table 5.47 shows that Bangladesh INASP-PERI Consortium is dominating among surveyed libraries.

Table 5.47: Membership Status of e-resource consortium

Name of consortium	Name of Library											
	BCPS Library		BIRDEM Library		BSMMU Library		DMC Library		icddr,b Library		NHLDC	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Bangladesh INASP-PERI Consortium	0	1	0	1	1	0	1	0	0	1	1	0
UGC Digital Library	1	0	1	0	1	0	1	0	0	1	1	0
Bangladesh Research and Education Network	1	0	1	0	1	0	1	0	0	1	1	0

Digital Resources Budget Share

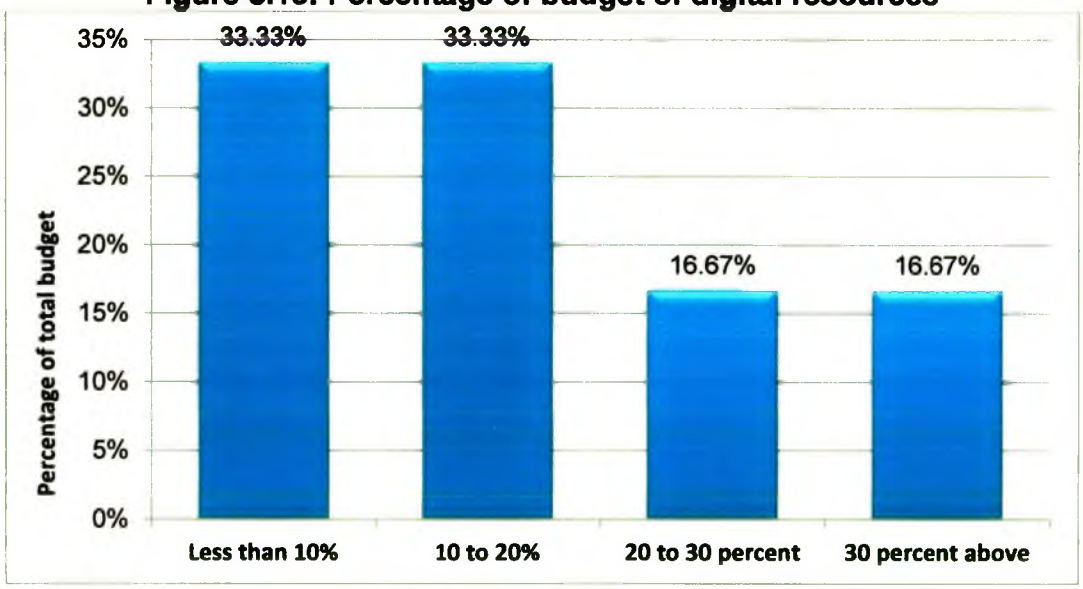
Most of the initiatives in the direction of creating digital library facilities demand considerably high investments in hardware and software. Keeping this in mind an attempt has been made in this study to find out the budget allocations for digital libraries. Since the data is sensitive, in place of the actual monetary allocation details

respondents have been asked to provide information in terms of percentage of allocation to digital resources as a share in the total library budget. Each 33.3 percent of the respondents indicated that Less than 10% and 10 to 20% are allocated for digital resources. Another 16.7 percent of the respondent informed that 20-30 percent of its library budget is normally allocated for digital resources. The same respondent (16.7%) answered that it allocates 30 percent above for digital resources. The Table 5.48 and Figure 5.18 show the details of digital resources budget share.

Table 5.48: Digital resources budget share

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 10%	2	33.3	33.3	33.3
	10 to 20%	2	33.3	33.3	66.7
	20 to 30 percent	1	16.7	16.7	83.3
	30 percent above	1	16.7	16.7	100.0
	Total	6	100.0	100.0	

Figure 5.18: Percentage of budget of digital resources



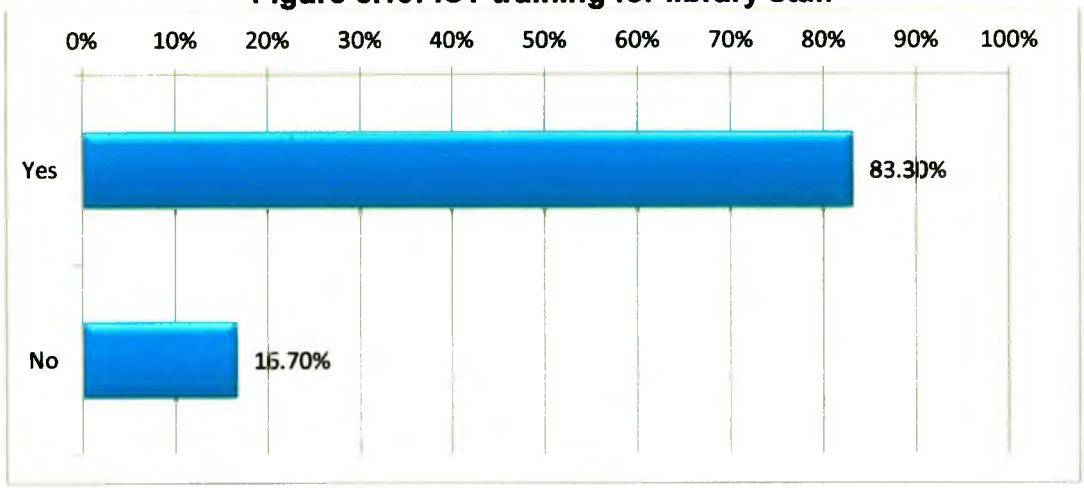
Training of ICT and Digital Library

Participation of staff for ICT training

Computers and internet are the primary tools with the help of which digital libraries are built. Hence a basic understanding of these technologies is essential for any information professional working in a digital library environment. To build an effective

digital library, the staff need to undergo training on ICT technologies. The Figure 5.19 shows the number of surveyed libraries who had sent their staff for various ICT courses. 83.3% (5) libraries, library staff got chance to attend various ICT training courses, whereas 16.7% (1) library claimed that its staff did not get chance to attend any ICT training.

Figure 5.19: ICT training for library staff



Training Opportunities

In the present study the investigator tries to identify the major training programmes attended by the digital library team and results are shown in the Table 5.49 that indicates 'Application software' and 'Introduction to computers' with a Mean score .67 both ranked 1st position.

Table 5.49: ICT training status of library staff

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Application software [e.g. power point, excel, access, word]	6	0	1	4	.67	.516
Introduction to computers	6	0	1	4	.67	.516
Internet and World Wide Web	6	0	1	3	.50	.548
Others	6	0	1	2	.33	.516
Online searching skills	6	0	1	2	.33	.516
Digital library services	6	0	1	1	.17	.408
Web design and home page Development	6	0	1	1	.17	.408
Access and User Interfaces to Digital Libraries	6	0	0	0	.00	.000
Digital Archiving and Preservation	6	0	0	0	.00	.000
Architecture and Systems of Digital Libraries	6	0	0	0	.00	.000
Metadata and Foundations of Digital Libraries	6	0	0	0	.00	.000
Introduction and Overview of Digital Libraries	6	0	0	0	.00	.000
Valid N (listwise)	6					

Challenges Involved In Digital Library Development

The respondents were asked about the challenges they face in setting up a successful digital library. Seventeen potentially challenging factors were identified from the literature and they were listed and the respondents were asked to rate those factors on five point Likert type of scale of 1 to 5 (not a problem to extremely problematic). Thus for each challenge the scores were obtained, Mean and SD and importance level were computed. The scores are presented in Table 5.50 and Table 5.51 in where 'Lack of IT staff' has the highest mean value of 4.67 and the Standard Deviation belongs to .516 comprising Rank 1 followed by 'Low speed of internet connections' and 'Lack of budget' with mean value of 4.33 and 4.33 and their Standard Deviation is .861 and 1.033 belong to rank 2 jointly.

Table 5.50: Challenges involved in digital library development

Challenges	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Lack of IT staff	6	4	5	28	4.67	.516
Low speed of internet connections	6	3	5	26	4.33	.816
Lack of budget	6	3	5	26	4.33	1.033
Concern about cost of preservation and management of digital content	6	2	5	25	4.17	1.329
Lack of digital library initiatives of the authorities	6	3	5	24	4.00	1.095
Lack of training to make staff efficient	6	3	5	24	4.00	.894
Lack of ICT infrastructural facilities	6	2	5	23	3.83	1.329
Lack of Integrated library software	6	2	5	23	3.83	1.329
Lack of government concentration	6	1	5	22	3.67	2.066
Lack of national digitization policy	6	1	5	22	3.67	1.633
Administrative bureaucracy complexity	6	1	5	21	3.50	1.761
Lack of professional staff	6	1	5	21	3.50	1.517
Copyright issues/Digital Rights Management	6	1	5	20	3.33	1.633
Lack of equipment to digitize library resources	6	1	5	18	3.00	1.789
Lack of knowledge of digital preservation	6	1	5	18	3.00	1.549
Inadequate salaries for library personnel	6	1	5	17	2.83	1.835
Others	6	1	3	10	1.67	.816
Valid N (listwise)	6					

(Importance level: 5 = Extremely important; 4 = Very important; 3 = Important; 2 = Somewhat important; 1= Not important)

Table 5.51: Importance level of DL development problems

	Extremely important		Very important		Important		Somewhat important		Not important	
	Count	Row Total N %	Count	Row Total N %	Count	Row Total N %	Count	Row Total N %	Count	Row Total N %
Lack of budget	4	66.7%	0	0.0%	2	33.3%	0	0.0%	0	0.0%
Lack of IT staff	4	66.7%	2	33.3%	0	0.0%	0	0.0%	0	0.0%
Lack of professional staff	2	33.3%	1	16.7%	2	33.3%	0	0.0%	1	16.7%
Lack of training to make staff efficient	2	33.3%	2	33.3%	2	33.3%	0	0.0%	0	0.0%
Lack of Integrated library software	3	50.0%	0	0.0%	2	33.3%	1	16.7%	0	0.0%
Lack of digital library initiatives of the authorities	3	50.0%	0	0.0%	3	50.0%	0	0.0%	0	0.0%
Concern about cost of preservation and management of digital content	4	66.7%	0	0.0%	1	16.7%	1	16.7%	0	0.0%
Lack of ICT infrastructural facilities	3	50.0%	0	0.0%	2	33.3%	1	16.7%	0	0.0%
Low speed of internet connections	3	50.0%	2	33.3%	1	16.7%	0	0.0%	0	0.0%
Lack of knowledge of digital preservation	1	16.7%	2	33.3%	0	0.0%	2	33.3%	1	16.7%
Copyright Issues/Digital Rights Management	2	33.3%	1	16.7%	1	16.7%	1	16.7%	1	16.7%
Lack of equipment to digitize library resources	2	33.3%	0	0.0%	2	33.3%	0	0.0%	2	33.3%
Lack of national digitization policy	3	50.0%	0	0.0%	2	33.3%	0	0.0%	1	16.7%
Administrative bureaucracy complexity	3	50.0%	0	0.0%	1	16.7%	1	16.7%	1	16.7%
Inadequate salaries for library personnel	2	33.3%	0	0.0%	1	16.7%	1	16.7%	2	33.3%
Lack of government concentration	4	66.7%	0	0.0%	0	0.0%	0	0.0%	2	33.3%
Others	0	0.0%	0	0.0%	1	16.7%	2	33.3%	3	50.0%

(Importance level: 5 = Extremely important; 4 = Very important; 3 = Important; 2 = Somewhat important; 1= Not important)

SECTION – 2

Digital Library Initiatives: Users' Perspective

This section deals with the analysis and interpretation of all the responses received from the users about *Digital Library Initiatives in Medical Libraries of Bangladesh*. The data is analyzed using Mean, Standard Deviation (SD), Sum, Percentage, Pie chart, Column chart, Bar chart, Area Chart, Table etc. A total of six medical libraries were selected for this study which include International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) Library, Bangladesh Institute of Research and Rehabilitation for Diabetes Endocrine and Metabolic Disorders (BIRDEM) Library, Bangladesh College of Physicians and Surgeons (BCPS) Library, Bangabandhu Sheikh Mujib Medical University (BSMMU) Library, Dhaka Medical College (DMC) Library and National Health Library and Documentation Centre (NHLDC). A total 380 Questionnaires were circulated to the users (Post Graduate, M. Phil/PhD Students, scientists and faculty members) of selected medical libraries. The study is made using survey method. Analysis has been made on the basis of the response of the users.

The response received from different categories of users have been analysed and presented in details per the questionnaire under the following heads:

i. Demographic Information;
ii. Use of e-resources;
iii. Role of electronic resources;
iv. Digital library activities
v. Problems of accessing digital resources

DEMOGRAPHIC INFORMATION

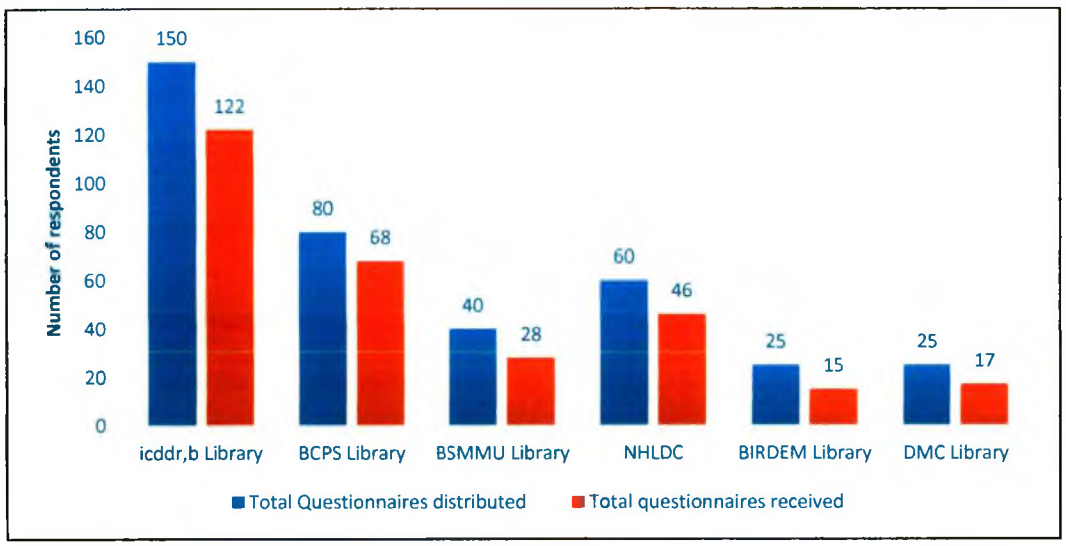
The Response Rate

The investigator distributed a total of 380 questionnaires amongst the scientists, doctors, students, researchers and staff members of six medical libraries selected for the study. Out of 380 questionnaires distributed a total of 296 filled questionnaires were received with a response rate of 77.89%. which are found to be usable are selected for the study. The details of the distribution analysis are described in Table 5.52 below. Out of 6 libraries examined, BCPS library has the largest response rate 68 (85%) followed by icddr,b Library and NHLDC with 122 (81.33%) and 46 (76.67%). 28 (70%) of the total respondents are from BSMMU library followed by DMC and BIRDEM library with 17 (68%) and 15 (60%) respectively.

Table 5.52: Total questionnaires distribution and received status

Surveyed Libraries	Total Questionnaires distributed	Percentage of distributed questionnaires	Total questionnaires received	Percentage of received questionnaires
icddr,b Library	150	39.47%	122	81.33%
BCPS Library	80	21.05%	68	85.00%
BSMMU Library	40	10.53%	28	70.00%
NHLDC	60	15.79%	46	76.67%
BIRDEM Library	25	6.58%	15	60.00%
DMC Library	25	6.58%	17	68.00%
Total	380	100.00%	296	77.89%

Figure 5.20: Institution wise questionnaires distribution and received status



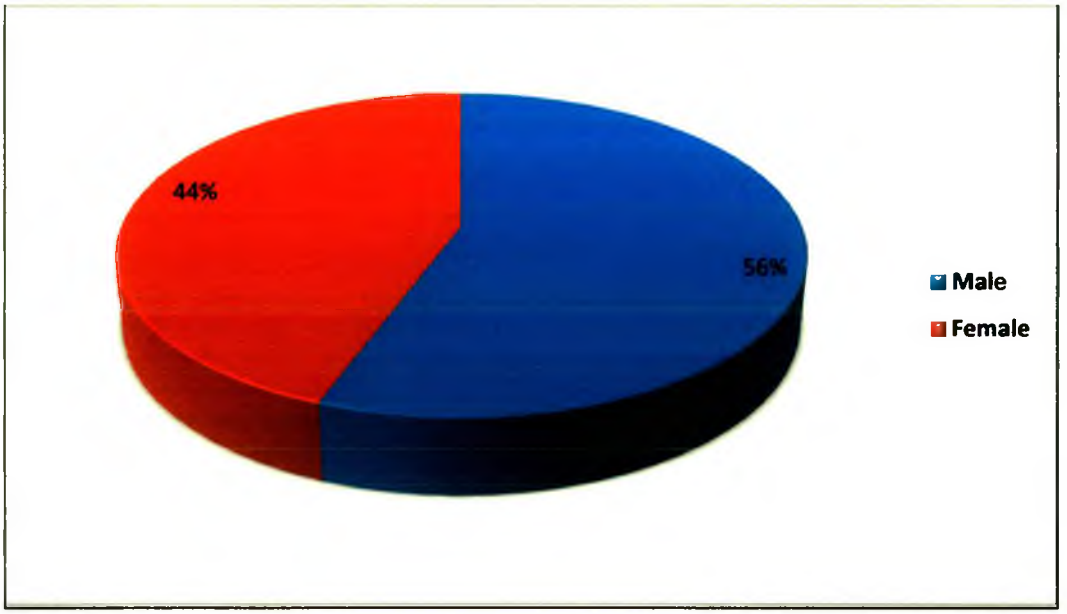
Sex

The data collected is presented in Table 5.53 and Figure 5.21 shows that in terms of sex, 165 (55.7%) of the respondents are male and 131 (44.3%) are female.

Table 5.53: Frequency of sex of the respondents (n=296)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	165	55.7	55.7	55.7
	Female	131	44.3	44.3	100.0
	Total	296	100.0	100.0	

Figure 5.21: Percentage of sex of the respondents (n=296)



User Types

The type of the respondents is taken as one of the variables for studying digital library initiatives in medical libraries in the study. The category wise breakup of responses is shown in Table 5.54. It observed from the table that majority of the respondents numbering 114 (38.5%) are Doctor, whereas 89 respondents representing 30.1 percent are Researcher and Student represent 27 (9.1%) followed by Teacher, Scientist, Staff and Others accounting 6.1%, 5.7%, 7.1%, 3.4% respectively.

Table 5.54: Frequency of category of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Teacher	18	6.1	6.1	6.1
	Doctor	114	38.5	38.5	44.6
	Researcher	89	30.1	30.1	74.7
	Student	27	9.1	9.1	83.8
	Scientist	17	5.7	5.7	89.5
	Staff	21	7.1	7.1	96.6
	Others	10	3.4	3.4	100.0
	Total	296	100.0	100.0	

Age

Age has an important influence on the use of information in general and Medical E-Resources in particular. The Age wise distribution of respondents is shown in Table 5.55 and 5.56. The age of the surveyed libraries' respondents is arranged in different age groups. It is clear from the table that majority of the respondents numbering 165 (55.7 %) are in the age group of 26 – 35 years. The respondents between the age group of 56 – 65 years numbering 49 (16.6%) are the second largest. About 47 (15.9%) respondents fall in the age group of 36 – 45 years. A few respondents accounting 26 (8.8%) are in the age group of 46-55 years. The table clearly shows that users in the age group between 26 and 35 are the highest.

Table 5.55: Frequency of age group of the respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
26-35	165	55.7	55.7	58.8
36-45	47	15.9	15.9	74.7
46-55	26	8.8	8.8	83.4
56-65	49	16.6	16.6	100.0
Total	296	100.0	100.0	

Respondent types by age group

Table 5.56: Cross tabulation of the respondent types by age group

Category of user		Age group					Total
		21-25	26-35	36-45	46-55	56-65	
Teacher	Count	0	5	1	2	10	18
	% within	0.0%	3.0%	2.1%	7.7%	20.4%	6.1%
	% of Total	0.0%	1.7%	0.3%	0.7%	3.4%	6.1%
Doctor	Count	1	88	19	1	5	114
	% within	11.1%	53.3%	40.4%	3.8%	10.2%	38.5%
	% of Total	0.3%	29.7%	6.4%	0.3%	1.7%	38.5%
Researcher	Count	0	40	13	18	18	89
	% within	0.0%	24.2%	27.7%	69.2%	36.7%	30.1%
	% of Total	0.0%	13.5%	4.4%	6.1%	6.1%	30.1%
Student	Count	8	18	0	1	0	27
	% within	88.9%	10.9%	0.0%	3.8%	0.0%	9.1%
	% of Total	2.7%	6.1%	0.0%	0.3%	0.0%	9.1%
Scientist	Count	0	0	7	1	9	17
	% within	0.0%	0.0%	14.9%	3.8%	18.4%	5.7%
	% of Total	0.0%	0.0%	2.4%	0.3%	3.0%	5.7%
Staff	Count	0	11	2	3	5	21
	% within	0.0%	6.7%	4.3%	11.5%	10.2%	7.1%
	% of Total	0.0%	3.7%	0.7%	1.0%	1.7%	7.1%
Others	Count	0	3	5	0	2	10
	% within	0.0%	1.8%	10.6%	0.0%	4.1%	3.4%
	% of Total	0.0%	1.0%	1.7%	0.0%	0.7%	3.4%
Total	Count	9	165	47	26	49	296
	% within	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	3.0%	55.7%	15.9%	8.8%	16.6%	100.0%

The Cross tabulation of the respondent types by age group is presented in Table 5.56. Teacher within the age group 56-65 comprising 20.4% whereas the Researcher with in the same group are 36.7%. The table gives a clear picture of the respondents' percentage based on their categories.

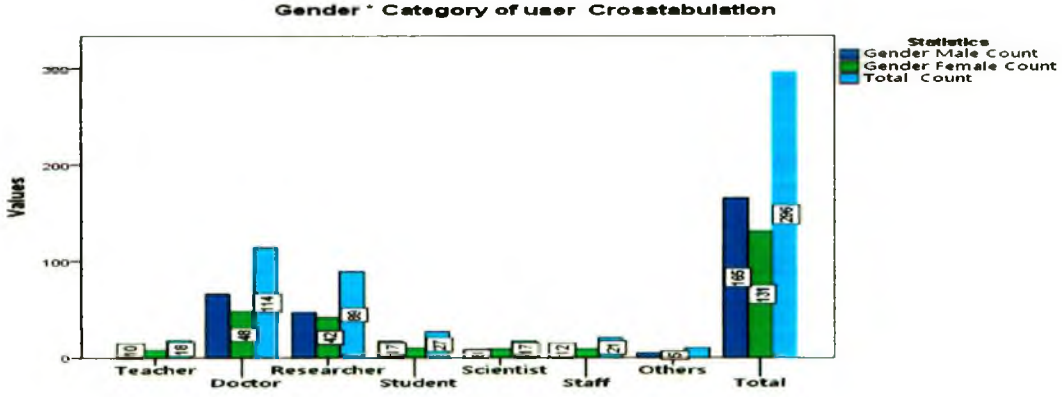
Respondent types by sex

The Cross tabulation of the respondent types by sex is explored in Table: 5.57 and Figure 5.22. The doctors fall in the group male account 66 (57.9%) whereas female doctors number 48 (42.1%). The table gives a clear picture of the respondents' percentage based on their sex.

Table 5.57: Cross tabulation of the respondent types by sex

			Category of user							Total
			Teacher	Doctor	Researcher	Student	Scientist	Staff	Others	
Gender	Male	Count	10	66	47	17	8	12	5	165
		% within Category of user	55.6%	57.9%	52.8%	63.0%	47.1%	57.1%	50.0%	55.7%
		% of Total	3.4%	22.3%	15.9%	5.7%	2.7%	4.1%	1.7%	55.7%
	Female	Count	8	48	42	10	9	9	5	131
		% within Category of user	44.4%	42.1%	47.2%	37.0%	52.9%	42.9%	50.0%	44.3%
		% of Total	2.7%	16.2%	14.2%	3.4%	3.0%	3.0%	1.7%	44.3%
Total		Count	18	114	89	27	17	21	10	296
		% within Category of user	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	6.1%	38.5%	30.1%	9.1%	5.7%	7.1%	3.4%	100.0%

Figure 5.22: Cross tabulation of gender by their categories (n=296)



Educational Qualifications

The qualification wise distribution shown in Table 5.58 provides the details of the educational qualifications of the respondents. The academic qualifications of the respondents were analyzed by forming nine groups viz; (i) MBBS, (ii) M.Phil, (iii) PhD, (iv) Diploma/MCPS, (v) MD, (vi) MS, (vii) FCPS, (viii) MRCP, (ix) PhD. It is found that more respondents are from group (i) MBBS 100 (33.80%) than group (vi) MS 46 (15.50%).

Table 5.58: Frequency of the respondents by educational qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	MBBS	100	33.8	33.8	33.8
	M Phil	2	.7	.7	34.5
	Diploma/MCPS	6	2.0	2.0	36.5
	MD	29	9.8	9.8	46.3
	MS	46	15.5	15.5	61.8
	FCPS	32	10.8	10.8	72.6
	MRCP	27	9.1	9.1	81.8
	PhD	36	12.2	12.2	93.9
	Others	18	6.1	6.1	100.0
	Total	296	100.0	100.0	

Purpose of Library Visit

The purpose of library visit of the respondents is shown in Table 5.59. It may be seen from the table that majority of the respondents visiting library 193 (30.2%) for Reference work followed by 83 (13%) of the respondents for Internet use and remaining 60 (9.4%), 78 (12.2%), 56 (8.8%) for Group study, Preparing assignment and Borrowing books respectively were Multiple Responses allowed.

Table 5.59: Frequency of purpose of library visit by the respondents

Purpose of library visit[a]	Responses		Percent of Cases
	N	Percent	
Group study	60	9.4%	20.8%
Reference work	193	30.2%	67.0%
Internet use	83	13.0%	28.8%
Preparing assignment	78	12.2%	27.1%
Borrowing books	56	8.8%	19.4%
Total	639	100.0%	221.9%

a. Dichotomy group tabulated at value 1. [Multiple Responses allowed]

Purpose of Library visit by user types

The respondent's category by library visiting purpose distribution shown in table 5.60 provides the details of the purpose of library of the respondents.

Table 5.60: Cross tabulation of respondent's category by library visiting purpose

Category of user		Purpose of library visit[a]						Total
		Individual study	Group study	Reference work	Internet use	Preparing assignment	Borrowing books	
Teacher	Count	0	0	0	7	11	8	18
	% of Total	0.0%	0.0%	0.0%	2.4%	3.8%	2.8%	6.2%
Doctor	Count	72	25	80	32	40	23	113
	% of Total	25.0%	8.7%	27.8%	11.1%	13.9%	8.0%	39.2%
Researcher	Count	53	22	63	17	19	13	85
	% of Total	18.4%	7.6%	21.9%	5.9%	6.6%	4.5%	29.5%
Student	Count	15	7	16	8	2	4	26
	% of Total	5.2%	2.4%	5.6%	2.8%	0.7%	1.4%	9.0%
Scientist	Count	7	0	12	5	4	0	17
	% of Total	2.4%	0.0%	4.2%	1.7%	1.4%	0.0%	5.9%
Staff	Count	16	5	20	8	2	3	21
	% of Total	5.6%	1.7%	6.9%	2.8%	0.7%	1.0%	7.3%
Others	Count	6	1	2	6	0	5	8
	% of Total	2.1%	0.3%	0.7%	2.1%	0.0%	1.7%	2.8%
Total	Count	169	60	193	83	78	56	288
	% of Total	58.7%	20.8%	67.0%	28.8%	27.1%	19.4%	100.0%

Percentages and totals are based on respondents.
a. Dichotomy group tabulated at value 1. [Multiple Responses allowed]

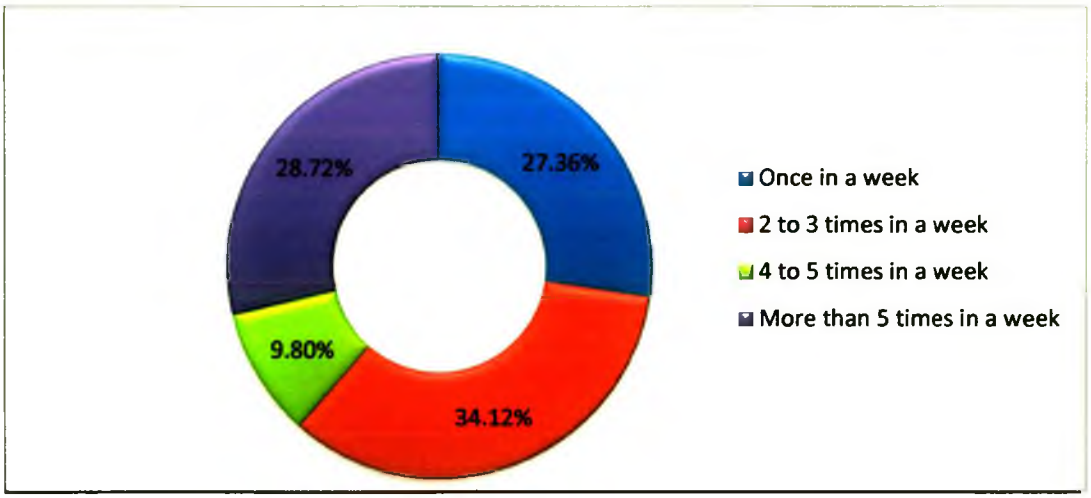
Medical Library visit

Respondents were asked to know about visits to university library. A question was asked to know about the frequencies of library visits of respondents. The data collected is presented in Table 5.61 and Figure 5.23 that explore that a majority of users 34.1% visit library for 2 to 3 times in a week.

Table 5.61: Frequency of library visit by the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Once in a week	81	27.4	27.4	27.4
	2 to 3 times in a week	101	34.1	34.1	61.5
	4 to 5 times in a week	29	9.8	9.8	71.3
	More than 5 times in a week	85	28.7	28.7	100.0
	Total	296	100.0	100.0	

Figure 5.23: Percentage of respondents for library visit



Use of e-resources

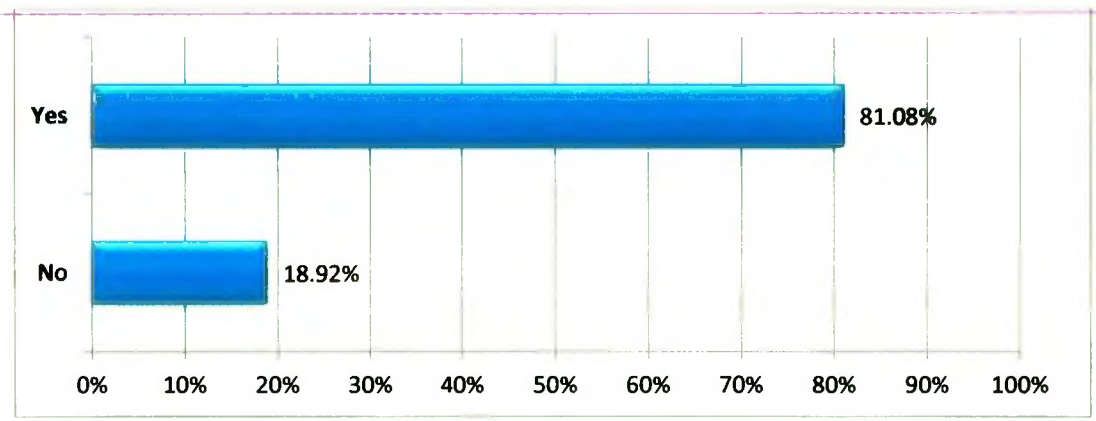
Usage status of e-resources

The data collected is presented in Table 5.62. and Figure 5.24 shows that in terms of usage of e-resources, 240 (81.1%) of the respondents are using e-resources and 56 (18.9%) are not using.

Table 5.62: Extent of usage status of e-resources

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	56	18.9	18.9	18.9
	Yes	240	81.1	81.1	100.0
	Total	296	100.0	100.0	

Figure 5.24: Percentage of use e-resources of respondents



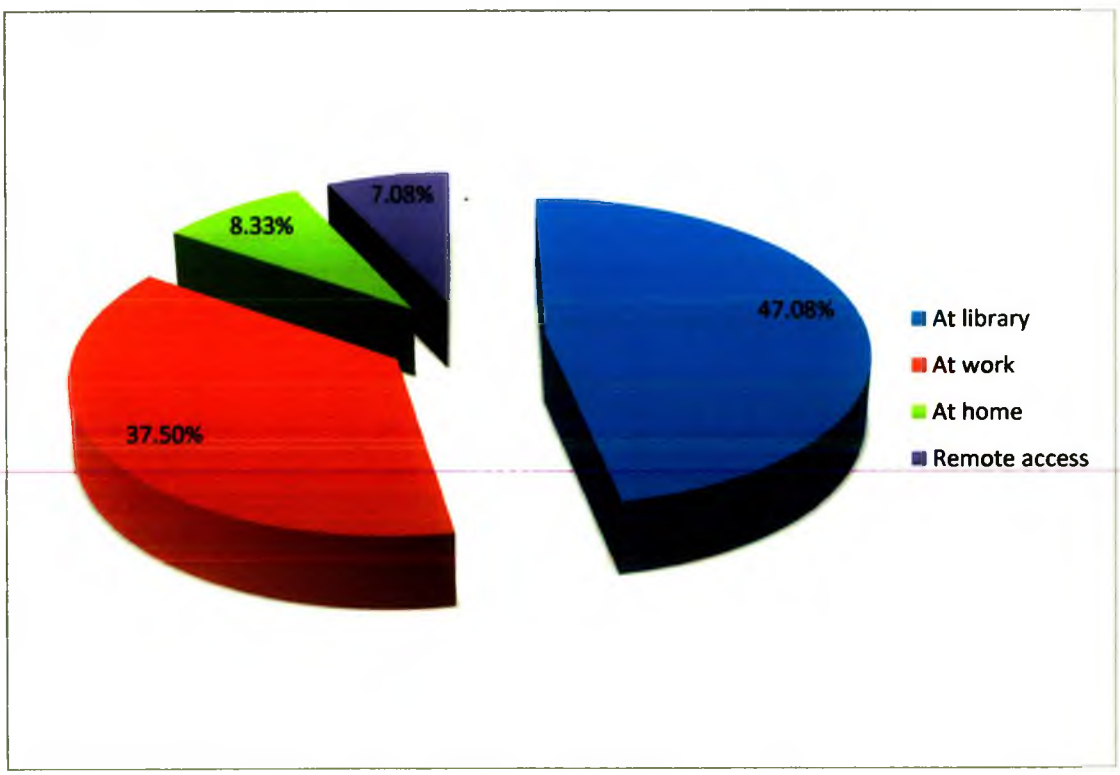
Place of Access and Use INDEST E-Resources

The place of access and use E-Resource by the respondents of surveyed libraries is shown in table 5.63 and Figure 5.25. It may be seen from the table that majority of the respondents accessing E-Resources 113 (38.2%) from Library followed by 90 (30.4%) of the respondents access E-Resources at work and remaining 20 (6.8%) and 17 (5.7%) of the respondents access E-Resources from Home and Remote access accordingly.

Table 5.63: Frequency of access point of e-resources

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	At library	113	38.2	47.1	47.1
	At work	90	30.4	37.5	84.6
	At home	20	6.8	8.3	92.9
	Remote access	17	5.7	7.1	100.0
	Total	240	81.1	100.0	
Missing	System	56	18.9		
Total		296	100.0		

Figure 5.25: Percentage of access point of e-resources



Types of e-resources

It was found that respondents use various types of e-resources. A question was asked to know the types of e-resources and their frequency of usage as shown in Table 5.64. It has been observed that majority of respondents use e-journals (14.5%), e-newspapers (13.1%), OPAC (7.9%), Institutional Repository (6.6%), and E-thesis (8.4%). A majority of respondents always use e-books (11.5%) and Internet/Web (9.5%) followed by JIF (6.6%) and E-maps (4.7%) where Multiple Responses allowed.

Table 5.64: Preference of e-resources by the respondents

E-resources types	Responses		Percent of Cases
	N	Percent	
Journal Citation Reports (JCR)	106	7.6%	44.2%
Journal Impact Factors (JIF)	91	6.6%	37.9%
E-books	159	11.5%	66.2%
E-journals	201	14.5%	83.8%
E-newspapers	182	13.1%	75.8%
E-maps	65	4.7%	27.1%
E-thesis	116	8.4%	48.3%
E-research reports	134	9.7%	55.8%
Internet/web resources	131	9.5%	54.6%
Online Public Access Catalogue (OPAC)	109	7.9%	45.4%
Institutional Repository (IR)	92	6.6%	38.3%
Total	1386	100.0%	577.5%

a. Dichotomy group tabulated at value 1. [Multiple Responses allowed]

Usage e-resources

Respondents were asked to know about frequency of accessing digital resources. A question was asked to know about the frequencies of library visits of respondents. The data collected is presented in Table 5.65 represents that a majority of the respondents 154 (64.2%) accessing difital resources Daily followed by 13.8% Weekly.

Table 5.65: Frequency of accessing digital resources (n=296)

	Frequency	Percent	Valid Percent	Cumulative Percent
Daily	154	52.0	64.2	64.2
Weekly	33	11.1	13.8	77.9
Monthly	16	5.4	6.7	84.6
Once or twice only	8	2.7	3.3	87.9
Fortnightly	29	9.8	12.1	100.0
Total	240	81.1	100.0	
Missing System	56	18.9		
Total	296	100.0		

Sources of e-resources

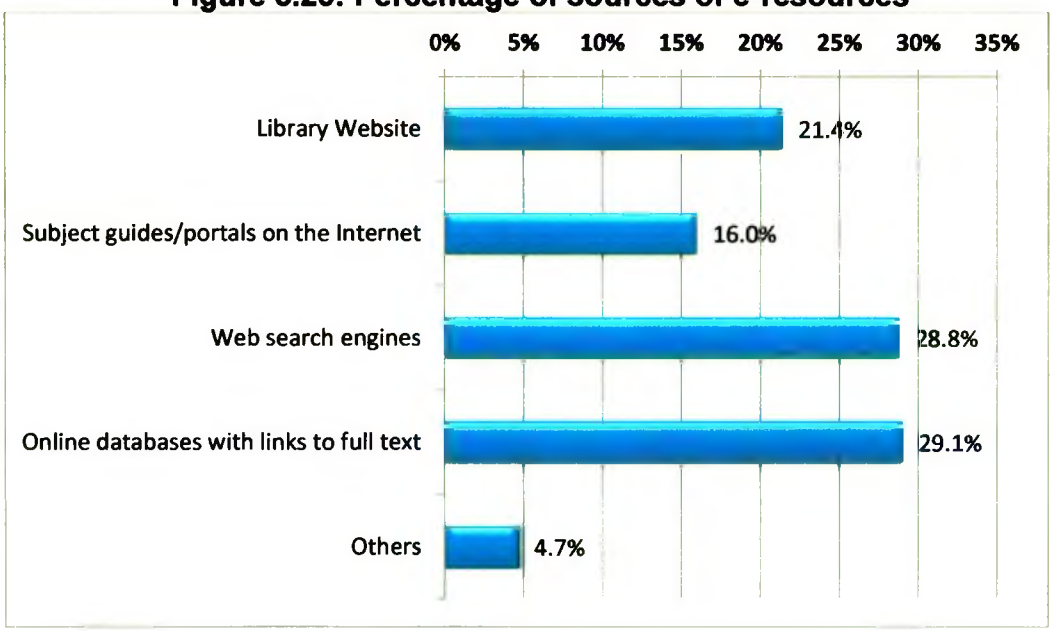
The source of access and use digital resources by the respondents of surveyed libraries is shown in table 5.66 and Figure 5.26. It may be seen from the table that majority of the respondents accessing E-Resources through Online databases (29.1%) followed by Web search engines comprising 28.8%.

Table 5.66: Sources of e-resources for finding information

		Responses		Percent of Cases
		N	Percent	
Sources of e-resources[a]	Library Website	87	21.4%	39.4%
	Subject guides/portals on the Internet	65	16.0%	29.4%
	Web search engines	117	28.8%	52.9%
	Online databases with links to full text	118	29.1%	53.4%
	Others	19	4.7%	8.6%
Total		406	100.0%	183.7%

a. Dichotomy group tabulated at value 1. [Multiple Responses allowed]

Figure 5.26: Percentage of sources of e-resources



Purpose of accessing e-resources

The library visiting purpose for using e-resources distribution shown in Table 5.67 provides the details of the purpose of library of the respondents where 31.6% respondents access e-resources for Research purpose.

Table 5.67: Purpose of accessing e-resources

		Responses		Percent of Cases
		N	Percent	
Purpose of accessing e-resources[a]	Research	219	31.6%	91.2%
	Learning	186	26.9%	77.5%
	Teaching	39	5.6%	16.2%
	Current information	157	22.7%	65.4%
	Flexibility of use	77	11.1%	32.1%
	Others	14	2.0%	5.8%
Total		692	100.0%	288.3%

a. Dichotomy group tabulated at value 1. [Multiple Responses allowed]

Features e-resources

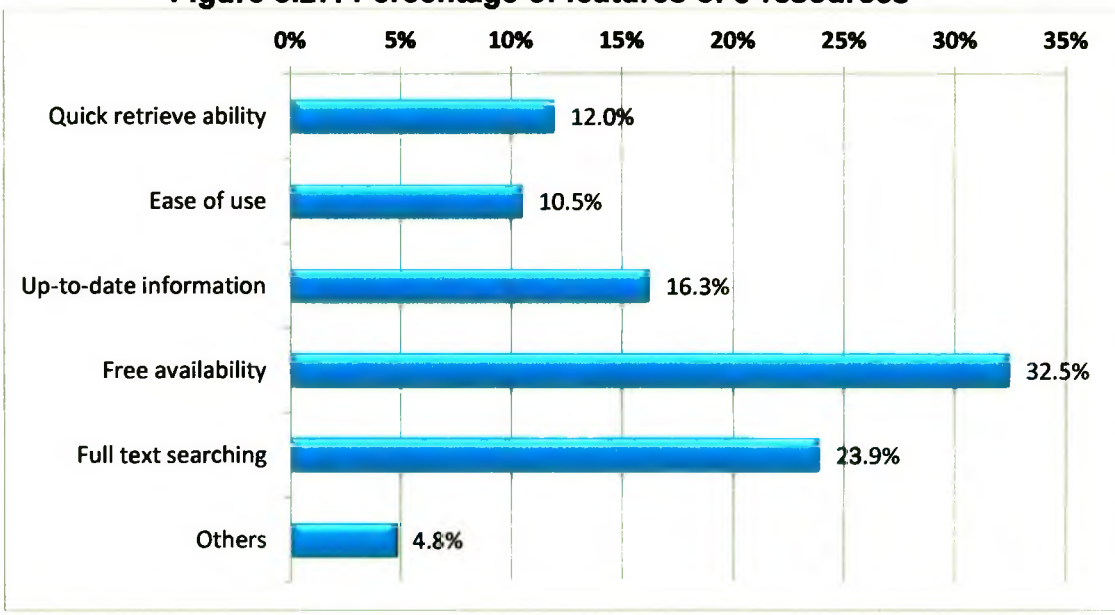
The features of e-resources distribution shown in Table 5.68 and Figure 5.27 provides the details of the features of e-resources rated by respondents where 32.5% respondents select Free Availability as no.1 feature.

Table 5.68: Features of e-resources rated by the respondents

		Responses		Percent of Cases
		N	Percent	
Feature of e-resources[a]	Quick retrieve ability	67	12.0%	28.4%
	Ease of use	59	10.5%	25.0%
	Up-to-date information	91	16.2%	38.6%
	Free availability	182	32.5%	77.1%
	Full text searching	134	23.9%	56.8%
	Others	27	4.8%	11.4%
Total		560	100.0%	237.3%

a. Dichotomy group tabulated at value 1. [Multiple Responses allowed]

Figure 5.27: Percentage of features of e-resources



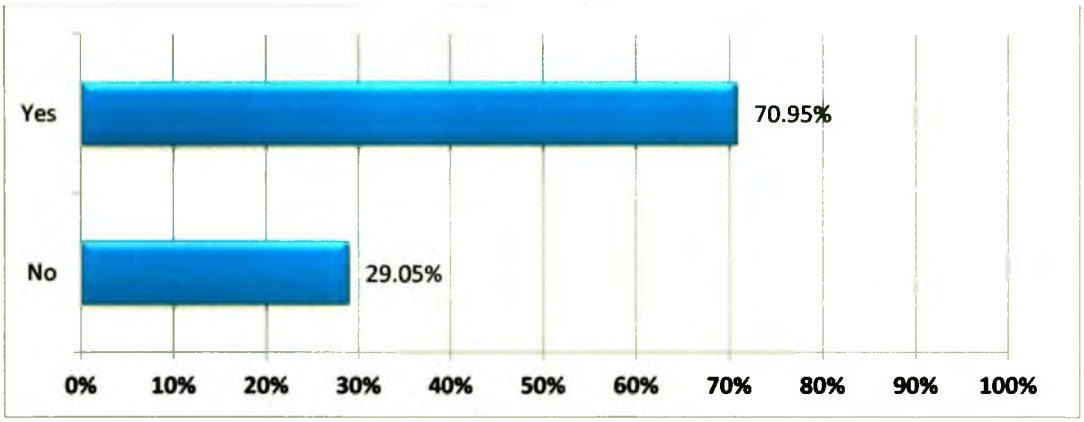
Training for accessing e-resources

It was found that all university libraries had been subscribing various electronic databases in the library. A question was asked to know the training status for using e-resources. The data collected is presented in Table 5.69 and Figure 5.28.

Table 5.69: Extent of training for using e-resources

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	86	29.1	29.1	29.1
	Yes	210	70.9	70.9	100.0
	Total	296	100.0	100.0	

Figure 5.28: Extent of training for using e-resources



Name of e-resources used by respondents

The Name and descriptive statistics of e-resources used by respondents distribution shown in Table 5.70 and Table: 5.71 provide the details the names of elctronic databases where 10.4% respondents use Google scholar folloed by Hinari 9.2% for Research purpose.

Table 5.70: Frequency of various e-resources/Databases used (multiple responses)

Types of databases	Responses		Percent of Cases
	N	Percent	
	87	3.4%	29.4%
JSTOR	138	5.5%	46.6%
ResearchGate	66	2.6%	22.3%
BanglaJOL	113	4.5%	38.2%
DOAJ	51	2.0%	17.2%
Cochrane Library	28	1.1%	9.5%
Scopus	49	1.9%	16.6%
ARDI	56	2.2%	18.9%
UpToDate	83	3.3%	28.0%
PLoS Journals	246	9.7%	83.1%
PubMed	128	5.1%	43.2%
PubMed Central	99	3.9%	33.4%
BioMed Central	31	1.2%	10.5%
AGROA	37	1.5%	12.5%
OARE	26	1.0%	8.8%
Indian Journals	91	3.6%	30.7%
Wilely Online Library	115	4.5%	38.9%
Institutional Repository	58	2.3%	19.6%
Cambridge University Press	43	1.7%	14.5%
POPLINE	264	10.4%	89.2%
Google scholar	233	9.2%	78.7%
Hinari	106	4.2%	35.8%
ScienceDirect	114	4.5%	38.5%
ISI Web of Science	61	2.4%	20.6%
Ebscohost	39	1.5%	13.2%
ProQuest	108	4.3%	36.5%
Springer Link	60	2.4%	20.3%
Oxford University Press	2530	100.0%	854.7%
Total			

a. Dichotomy group tabulated at value 1. . [Multiple Responses allowed]

Table 5.71 : Descriptive statistics of various e-resources/Databases used (multiple responses)

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Google scholar	296	0	1	264	.89	.311
PubMed	296	0	1	246	.83	.375
Hinari	296	0	1	233	.79	.410
ResearchGate	296	0	1	138	.47	.500
PubMed Central	296	0	1	128	.43	.496
Institutional Repository	296	0	1	115	.39	.488
ISI Web of Science	296	0	1	114	.39	.487
DOAJ	296	0	1	113	.38	.487
Springer Link	296	0	1	108	.36	.482
ScienceDirect	296	0	1	106	.36	.480
BioMed Central	296	0	1	99	.33	.473
Wilely Online Library	296	0	1	91	.31	.462
JSTOR	296	0	1	87	.29	.456
PLoS Journals	296	0	1	83	.28	.450
BanglaJOL	296	0	1	66	.22	.417
Ebscohost	296	0	1	61	.21	.405
Oxford University Press	296	0	1	60	.20	.403
Cambridge University	296	0	1	58	.20	.398
UpToDate	296	0	1	56	.19	.392
Cochrane Library	296	0	1	51	.17	.378
ARDI	296	0	1	49	.17	.372
POPLINE	296	0	1	43	.15	.353
ProQuest	296	0	1	39	.13	.339
OARE	296	0	1	37	.13	.331
AGROA	296	0	1	31	.10	.307
Scopus	296	0	1	28	.09	.293
Indian Journals	296	0	1	26	.09	.284
Travex	296	0	0	0	.00	.000
Valid N (listwise)	296					

Role of e-resources

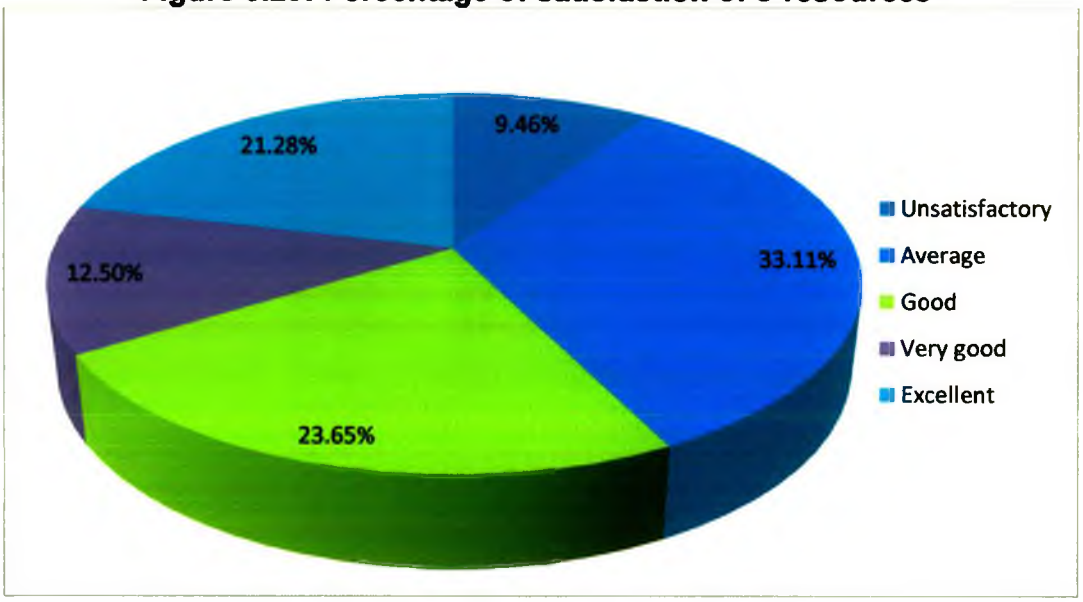
Usefulness of e-resources

The respondents were asked to point out the extent of usefulness showed in Table 5.72 and Figure 5.29 of e-resources as the sources of academic improvement. They had been given five options, out of which the largest portion of respondents (98, 33.1%) reckoned that they are not much satisfied whereas only 28 respondents (9.5%) expressed that they are unsatisfied.

Table 5.72: Level of satisfaction with the usefulness of e-resources

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Unsatisfactory	28	9.5	9.5	9.5
	Average	98	33.1	33.1	42.6
	Good	70	23.6	23.6	66.2
	Very good	37	12.5	12.5	78.7
	Excellent	63	21.3	21.3	100.0
	Total	296	100.0	100.0	

Figure 5.29: Percentage of satisfaction of e-resources



Satisfaction of paid e-resources

The respondents were asked to indicate their satisfaction with the paid e-resources in 5-point ranking scale from 'Excellent' to 'Poor'. Table and Table shows the extent of satisfaction and Descriptive statistics of paid e-resources of their respective institution library. As has been observed from the Table 5.73 and Table 5.74, 'The

level of e-resources available' with highest Mean value (2.99) was ranked as the 1st satisfactory source with the regard of paid-e-resources.

Table 5.73: Level of Satisfaction with the Subscribed number of E-Journals and databases

	Excellent		Very good		Satisfactory		Barely satisfactory		Poor	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
The level of e-resources available	8	2.7%	84	28.4%	125	42.2%	54	18.2%	25	8.4%
The coverage of my subject/work	30	10.1%	53	17.9%	122	41.2%	63	21.3%	28	9.5%
Ease of access	13	4.4%	81	27.4%	49	16.6%	123	41.6%	30	10.1%
Ease of use	27	9.1%	66	22.3%	42	14.2%	132	44.6%	29	9.8%
Availability of computer facilities in the library	14	4.7%	96	32.4%	27	9.1%	128	43.2%	31	10.5%
Adequate bandwidth to access the resources	19	6.4%	45	15.2%	49	16.6%	133	44.9%	50	16.9%
Easy navigation to resources from library	6	2.0%	78	26.4%	54	18.2%	122	41.2%	36	12.2%
Overall user satisfaction	8	2.7%	86	29.1%	56	18.9%	108	36.5%	38	12.8%

Scale: [5 = Excellent; 4 = Very good; 3 = Satisfactory; 2 = Barely satisfactory; 1= Poor]

Table 5.74: Descriptive statistics for the subscribed number of E-Journals and databases

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
The level of e-resources available	296	1	5	884	2.99	.957
The coverage of my subject/work	296	1	5	882	2.98	1.086
Availability of computer facilities in the library	296	1	5	822	2.78	1.149
Ease of use	296	1	5	818	2.76	1.172
Ease of access	296	1	5	812	2.74	1.099
Overall user satisfaction	296	1	5	806	2.72	1.097
Easy navigation to resources from library	296	1	5	784	2.65	1.060
Adequate bandwidth to access the resources	296	1	5	738	2.49	1.132
Valid N (listwise)	296					

Scale: [5 = Excellent; 4 = Very good; 3 = Satisfactory; 2 = Barely satisfactory; 1= Poor]

Digital Library Activities

Digital Library Mode

Table 5.75 expresses that the majority of respondents (143, 48.3%) given preference for 'Digital Library' mode whereas a good number of respondents (99, 33.4%) still choose 'Traditional Library'.

Table 5.75: Users' preferences on types of library mode

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Traditional library	99	33.4	33.4	33.4
	Digital library	143	48.3	48.3	81.8
	Hybrid library	54	18.2	18.2	100.0
	Total	296	100.0	100.0	

Digital Library Search Technique

Various search techniques are used to collect information through e-resources by the users. A question was asked to know the frequencies of various search techniques used by the respondents. The data collected is presented in Table 5 76. It has been observed that majority of respondents search by Date of publication (31.8%), Keyword Search (18.9%) and Subject Search (18.6%).

Table 5.76: Users' preferences on search technique to access digital collections

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Key word	56	18.9	18.9	18.9
	Subject	55	18.6	18.6	37.5
	Author	23	7.8	7.8	45.3
	Date of publication	94	31.8	31.8	77.0
	Journal title	39	13.2	13.2	90.2
	Title of the article	29	9.8	9.8	100.0
	Total	296	100.0	100.0	

Digitai Library Knowledge

Table 5.77 expresses that the majority of respondents (131, 48.3%) have no knowledge about 'Digital Library' whereas a good number of respondents (122, 45%) found themselves 'A Little' knowledge on digital library.

Table 5.77: Respondents' knowledge on digital library

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	A lot	18	6.1	6.6	6.6
	A little	122	41.2	45.0	51.7
	Nothing	131	44.3	48.3	100.0
	Total	271	91.6	100.0	
Missing	System	25	8.4		
Total		296	100.0		

Digital Resource Usage Preference

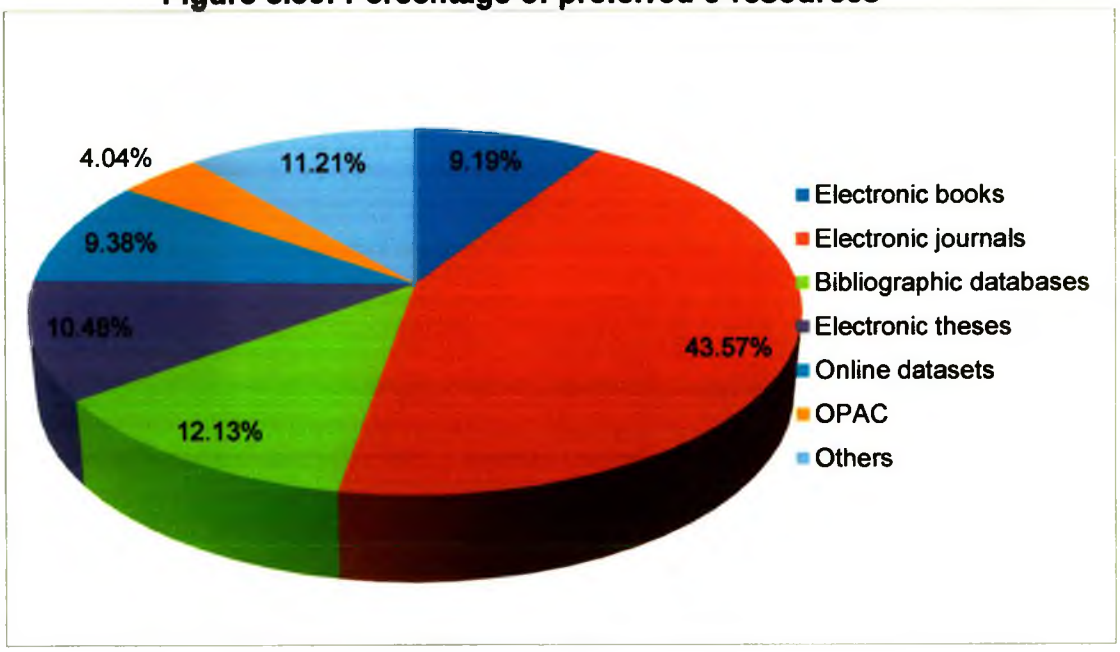
The Table 5.78 and Figure 5.30 reveal that the maximum numbers of users under survey (237, 43.6%) think that Electronic journals are the most essential type for strengthening research activities followed by Electronic books and Bibliographic databases accounting 9.2% and 12.1% respectively.

Table 5.78: Users' perception regarding preferred e-resources types

		Responses		Percent of Cases
		N	Percent	
Preferred types of e-resources[a]	Electronic books	50	9.2%	18.0%
	Electronic journals	237	43.6%	85.3%
	Bibliographic databases	66	12.1%	23.7%
	Electronic theses	57	10.5%	20.5%
	Online datasets	51	9.4%	18.3%
	OPAC	22	4.0%	7.9%
	Others	61	11.2%	21.9%
Total		544	100.0%	195.7%

a. Dichotomy group tabulated at value 1. [Multiple Responses allowed]

Figure 5.30: Percentage of preferred e-resources



Preference of Format Retrieved Digital Information

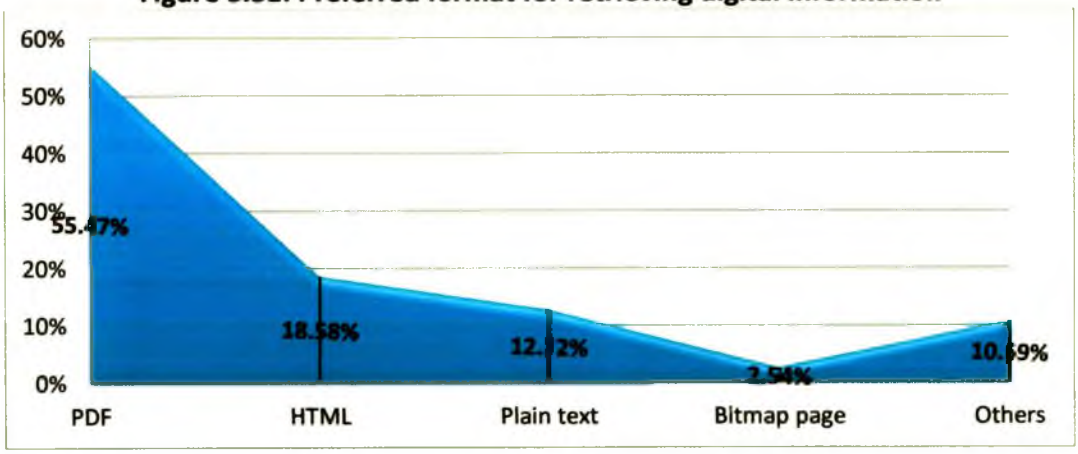
Table 5.79 and Figure 5.31 exhibit the response for preference of format to read retrieved Digital Information. On the whole we find that 55.5% of the respondents preferred 'PDF', 18.6% of them indicates 'HTML'.

Table 5.79: Preferred file format for downloading E-Journals and Databases (multiple responses)

		Responses		Percent of Cases
		N	Percent	
Preferred file format[a]	PDF	218	55.5%	81.0%
	HTML	73	18.6%	27.1%
	Plain text	50	12.7%	18.6%
	Bitmap page	10	2.5%	3.7%
	Others	42	10.7%	15.6%
Total		393	100.0%	146.1%

a. Dichotomy group tabulated at value 1. [Multiple Responses allowed]

Figure 5.31: Preferred format for retrieving digital information



Preference of Search Engine Retrieved Digital Information

Table 5.80 shows that out of total response all respondents counting 100% prefer Google to a great extent. 70.6% and 15.5% respondents states as 'Yahoo' and 'Bing' respectively where multiple responses allowed in which the researcher counts "Percent of cases" as base value.

Table 5.80: Preferred search engine for searching Internet (multiple responses)

		Responses		Percent of Cases
		N	Percent	
Preferred search engine[a]	Google	296	38.4%	100.0%
	Yahoo	209	27.1%	70.6%
	Bing	46	6.0%	15.5%
	Baidu	2	0.3%	0.7%
	AOL	57	7.4%	19.3%
	Ask.com	52	6.7%	17.6%
	Excite	81	10.5%	27.4%
	Lycos	7	0.9%	2.4%
	Others	21	2.7%	7.1%
Total		771	100.0%	260.5%

a. Dichotomy group tabulated at value 1. [Multiple Responses allowed]

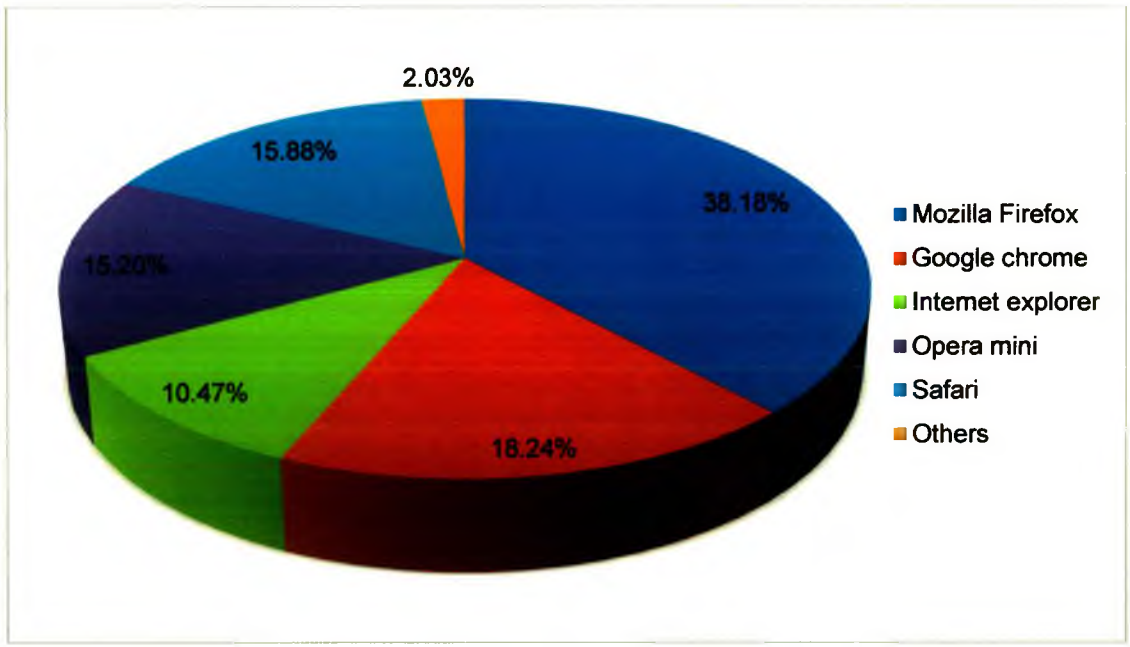
Preferred browser software

The Table 5.81 and Figure 5.32 reveal that the maximum numbers of users under survey (113, 38.2%) chosen that Mozilla Firefox is the most essential browser for retrieving web based information followed by Google chrome and Safari accounting 18.2% and 15.9% respectively.

Table 5.81: Preferred browser software for accessing digital collection

Browser	Frequency	Percent	Valid Percent	Cumulative Percent
Mozilla Firefox	113	38.2	38.2	38.2
Google chrome	54	18.2	18.2	56.4
Internet explorer	31	10.5	10.5	66.9
Opera mini	45	15.2	15.2	82.1
Safari	47	15.9	15.9	98.0
Others	6	2.0	2.0	100.0
Total	296	100.0	100.0	

Figure 5.32: Preferred browser software for accessing digital collections



Level of Satisfaction of DL Activities

The respondents were asked to point out the extent of satisfaction showed in Table 5.82. They had been given five options, out of which the largest portion of respondents (168, 56.8%) reckoned that they are satisfied whereas a medium number of respondents (17.2%) expressed that they are dissatisfied.

Table 5.82: Rating to Satisfaction level for digital library activities

	Frequency	Percent	Valid Percent	Cumulative Percent
Poor	51	17.2	17.2	17.2
Dissatisfied	51	17.2	17.2	34.5
Neither satisfied nor dissatisfied	11	3.7	3.7	38.2
Satisfied	168	56.8	56.8	94.9
Highly satisfied	15	5.1	5.1	100.0
Total	296	100.0	100.0	

Basic advantages of DL Features

An attempt was made here to find out the basic advantages in using DL features by the respondents. Table 5.83 and Table 5.84 provide the details of the Mean value and Standard deviation along with importance level ranking from 'Strongly disagree' to 'Strongly agree' for the five attributes of basic advantages. The mean value for the 'Save time' is 4.38 and the Standard Deviation is 0.722 placed 1st position followed by 'Timely access to information', 'Multiple access to information', 'Updated and Hyperlinked information' and 'Improved use of information' with mean value of 4.28, 4.27, 4.11 and 3.51 and their respective Standard Deviation is 0.694, 0.708, 0.768 and 1.235.

Table 5.83: Descriptive statistics of DL features ranked by respondents

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Save time	296	2	5	1297	4.38	.722
Timely access to information	296	2	5	1268	4.28	.694
Multiple access to information	296	2	5	1263	4.27	.708
Updated and Hyperlinked information	296	2	5	1218	4.11	.768
Improved use of information	296	2	5	1039	3.51	1.235
Valid N (listwise)	296					

(Importance level: 5 = Strongly Agree; 4 = Agree; 3 = Fairly Agree; 2 = Disagree; 1 = Strongly Disagree)]

Table 5.84: Ranking of respondents of DL features

Features	Strongly Agree		Agree		Fairly Agree		Disagree		Strongly Disagree	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Save time	144	48.6%	132	44.6%	9	3.0%	11	3.7%	0	0.0%
Multiple access to information	116	39.2%	151	51.0%	21	7.1%	8	2.7%	0	0.0%
Timely access to information	116	39.2%	157	53.0%	14	4.7%	9	3.0%	0	0.0%
Improved use of information	98	33.1%	45	15.2%	63	21.3%	90	30.4%	0	0.0%
Updated and Hyperlinked information	90	30.4%	166	56.1%	24	8.1%	16	5.4%	0	0.0%

(Importance level: 5 = Strongly Agree; 4 = Agree; 3 = Fairly Agree; 2 = Disagree; 1 = Strongly Disagree)

Constraints for accessing digital resources

The below Table 5.85 and Table 5.86 provide the details of the mean value and Standard Deviation as well as importance level for the nine attributes of constraints for accessing digital resources measured by 5 point Likert scale. 'Slow connection speed' has the highest mean value of 3.99 and the Standard Deviation belongs to 1.112 comprising Rank 1 followed by 'Slow information download' and 'High cost of access' with mean value of 3.73 and 3.61 and their Standard Deviation is .861 and 1.049 belong to rank 2 and 3 respectively. 'Low bandwidth' has a mean value of 3.57 and the Standard Deviation is 1.205.

Table 5.85: Descriptive statistics of problems encountered while using e-resources

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Slow connection speed	296	1	5	1181	3.99	1.112
Slow information download	296	1	5	1103	3.73	.861
High cost of access	296	1	5	1069	3.61	1.049
Login problems	296	2	5	1058	3.57	1.205
Low bandwidth	296	1	5	1048	3.54	1.198
Accessibility of websites	296	1	5	1045	3.53	1.123
No training of use of e-resources	296	1	5	1032	3.49	.879
No Internet access	296	1	5	1003	3.39	1.022
Inadequate searching skills	296	1	5	947	3.20	1.160
Valid N (listwise)	296					

(Importance level: 5 = Extremely important; 4 = Very important; 3 = Important; 2 = Somewhat important; 1 = Not important)

Table 5.86: Ranking of problems encountered while using e-resources

	Extremely important		Very important		Important		Somewhat important		Not important	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Slow connection speed	134	45.3%	66	22.3%	61	20.6%	29	9.8%	6	2.0%
Login problems	85	28.7%	93	31.4%	25	8.4%	93	31.4%	0	0.0%
Low bandwidth	79	26.7%	71	24.0%	104	35.1%	15	5.1%	27	9.1%
Slow information download	69	23.3%	87	29.4%	131	44.3%	8	2.7%	1	0.3%
High cost of access	82	27.7%	48	16.2%	149	50.3%	3	1.0%	14	4.7%
Accessibility of websites	85	28.7%	36	12.2%	141	47.6%	19	6.4%	15	5.1%
No Internet access	68	23.0%	28	9.5%	153	51.7%	45	15.2%	2	0.7%
Inadequate searching skills	48	16.2%	60	20.3%	121	40.9%	37	12.5%	30	10.1%
No training of use of e-resources	37	12.5%	103	34.8%	130	43.9%	19	6.4%	7	2.4%

CHAPTER 6: FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

- Summary of the Findings (Institutional)
- Summary of the Findings (Users)
- Recommendations
- Conclusions

CHAPTER 6
FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

Majority of surveyed libraries had already perceived themselves to be hybrid in nature, which actually was a good indicator from digital library perspective. The researcher realized that the topic on digital library development in Bangladesh was still new that libraries were still experimenting at the idea and was doing small scale digitization works mainly pertaining to information surrogates of internal organizational publications and subscribing/registering to e-resources, particularly e-journals and e-books and developing their websites/homepages as well as developing IR and to become a member of library consortium. Planning digital library initiatives was time consuming as it involved many technical and non-technical aspects such as the acquisition of digital technology, the setting up of a proper telecommunication system, scanning, selection procedures, materials cleaning prior to digitization works, and the creation of related digital library infrastructure. Besides the provision of normal library services, the same staff would have to plan for digital library projects at the same time.

The present research attempts to assess the real picture of the present condition of the medical libraries of Bangladesh by setting a set of standards and making recommendations for logical change which could fit with our socio-economic condition. As it is evident from the foregoing chapters, medical libraries of Bangladesh have been suffering from lack of proper and systematic initiatives from the supreme management of respective organization. Major findings from the Surveyed Libraries done under this study have been furnished in Chapter 5. This chapter (Chapter 6) aims to furnish the important findings of the questionnaire survey.

In this chapter the summary of the findings presented in the following styles:

(A) Summary of the Findings (Institutional)

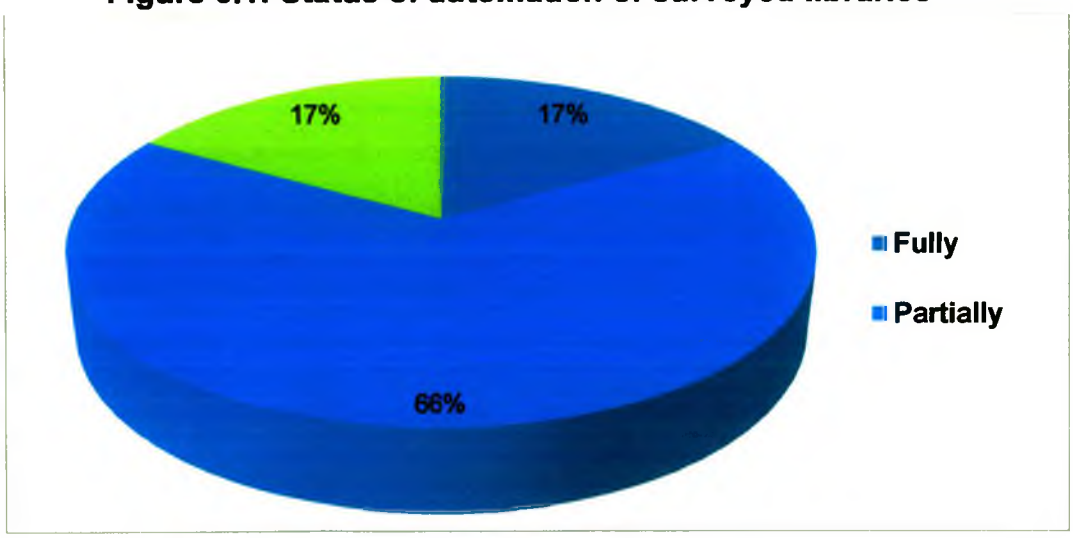
(B) Summary of the Findings (Users)

(A) Summary of the Findings (Institutional)

The major findings of the study are furnished below based on librarians' perspective:

1. 50% (3) Institutes fall under Government type and 33.3% (2) organizations are exclusive autonomous organizations followed by only 1(16.7%) is treated as International organization i.e. icddr,b.
2. 16.7% (1) i.e. NHLDC covered in the study has independent library buildings.
3. 'Doctor' is the most common category of users found in all 6 (100%) surveyed libraries.
4. BSMMU library has highest number of users belongs to 1000 per day.
5. BSMMU library has the biggest number of personnel i.e. 33 persons with 4 IT background where as DMC has the lowest number of personnel i.e. 3 persons in the library.
6. A majority of the librarians 33.3% have Master degree in library science as well as the same percentage have PhD degree.
7. BSMMU library has the total largest print collection i.e. 41210 (Figure 5.7) than other libraries.
8. icddr,b library first started ICT and automation in 1897 but DMC library has not started ICT and automation facilities so far.
9. The use of commercially available integrated library management systems is absent in surveyed libraries apart from icddrb library. NHLDC and BIRDEM library are using the free CDS/ISIS bibliographic database management software but it is not internet friendly and due to lack of technical hands, once the uses of this software has been stopped. DMC library has no automation yet whereas icddr,b library is fully automated as shown in Figure 6.1

Figure 6.1: Status of automation of surveyed libraries



10. BSMMU, BIRDEM and NHLDC are using Open source software for automation purpose.

11. icddr,b library is using commercial software i.e. Liberty, on the other hand only BSMMU is using KOHA software for ILS purpose. BIRDEM library still relies on very old software CDS/ISIS for library automation. It is a very frustrated fact that DMC library till now does not have any sort of automation facility. BCPS library and NHLDC have little bit options for automation activities.

12. BSMMU library has the largest numbers of Internet connected computers i.e. 80. A total of 166 computers are available in surveyed libraries.

13. Mozilla Firefox ranked 1st position is the most essential browser for retrieving web based information for users followed by Internet Explorer and Google chrome accounting 66.67% and 50% respectively.

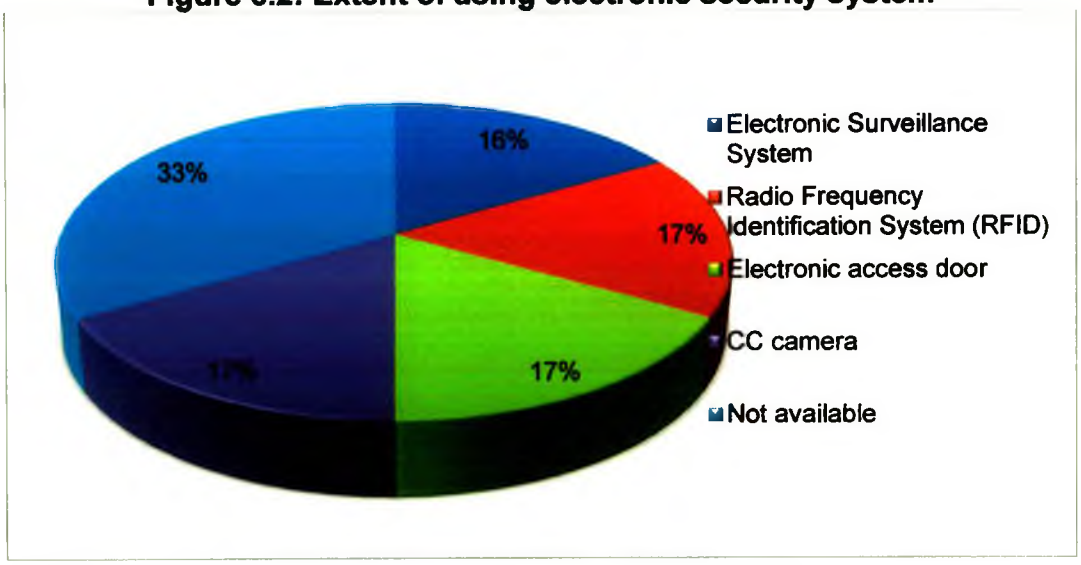
14. All the surveyed libraries apart from NHLDC and DMC library have library webpage. In the regard of Intranet, only icddr,b library belongs this credit for accessing e-resource.

15. DMC library and NHLDC is in most deplorable state for the connection of library webpage.

16. Only icddr,b library intranet site holds the link for accessing to e-books and e-journals as well as other important links.

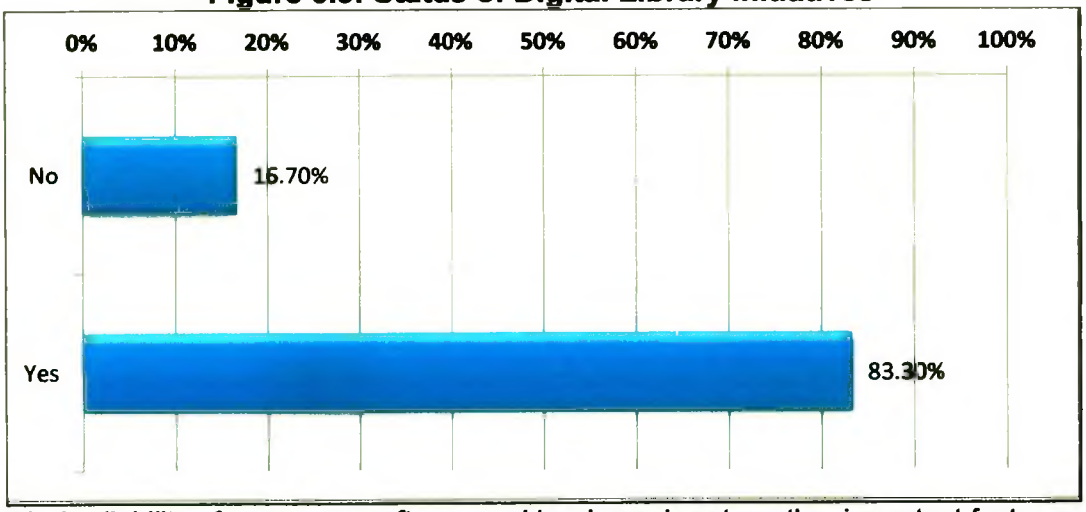
17. DMC and BIRDEM library reported that they have not any sort of Electronic Security System as shown in Figure 6.2. RFIS system is available in icddr,b library.

Figure 6.2: Extent of using electronic security system



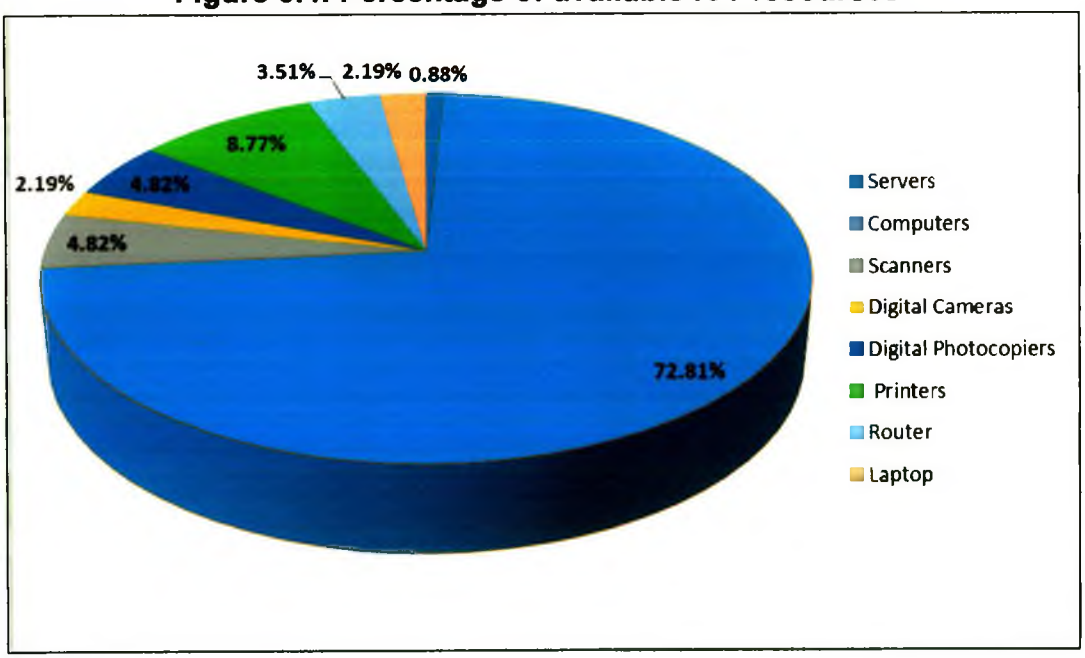
18. 83.3 percent (5 libraries) of the libraries covered in the study have taken initiatives for set up libraries where as DMC library is far away from developing digital library system as shown in Figure 6.3.

Figure 6.3: Status of Digital Library Initiatives



19. Availability of necessary software and hardware is yet another important factor on which the quality of digital library services depends. A very poor trend has been observed on the availability of software and hardware in which close to 16 percent of the respondent reported that it has necessary software and hardware to provide basic digital library services. A total of 72.81 percent of computers is available for digital library facility in surveyed libraries. Server has a proportion of only 0.88% in terms of total ICT devices followed by Scanners, Photocopiers and Routers belong to 4.82%, 4.82%, and 3.51% accordingly as illustrated in Figure 6.4.

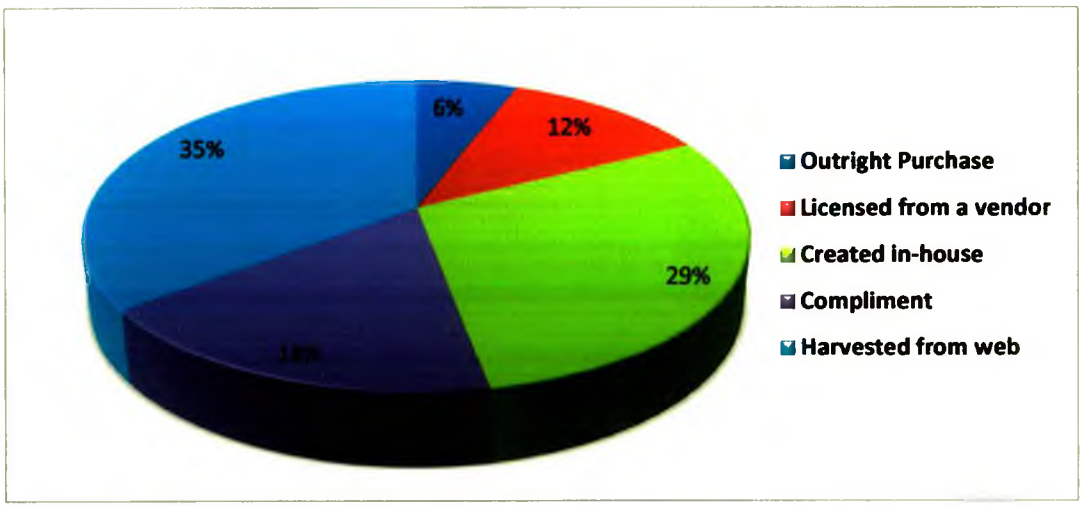
Figure 6.4: Percentage of available ICT resources



20. icddr,b library has the largest digitized collections counting 8741. Largest resources digitized by icddr,b library and the least resources digitized by BIRDEM and DMC library.

21. Digital libraries consist of wide variety of born digital publication types which include e-books, e-journals, databases, doctoral theses, conference paper, post print articles, course materials, and newspaper clippings, lecture PPTs, book chapters, and digitized collection. The study finds that e-journals is the most preferred publication type in the digital libraries. Outright purchase is the most favorable choice for acquiring digital materials as shown in Figure 6.5.

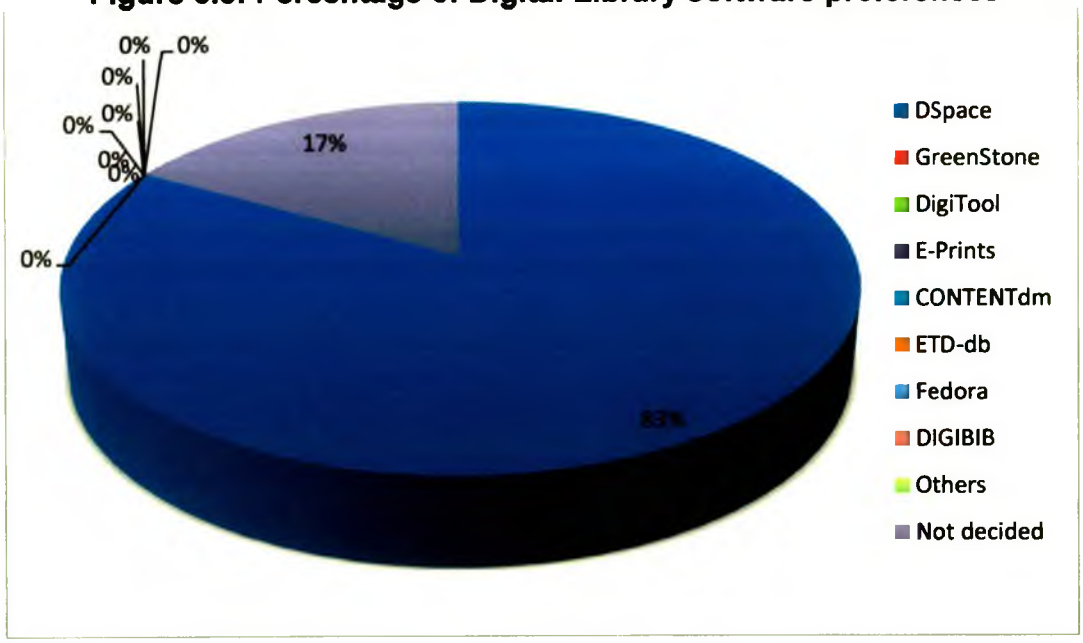
Figure 6.5: Digital material acquire process of surveyed libraries



22. All the surveyed libraries (100%) have no digitization policy for preserving digital resources.

23. 5 (84%) respondents have D-Space software preference in their libraries while another DMC library has not chosen any kind of library software as explored in Figure 6.6. Among the Open Source Software (OSS), software DSpace is predominantly used.

Figure 6.6: Percentage of Digital Library software preferences

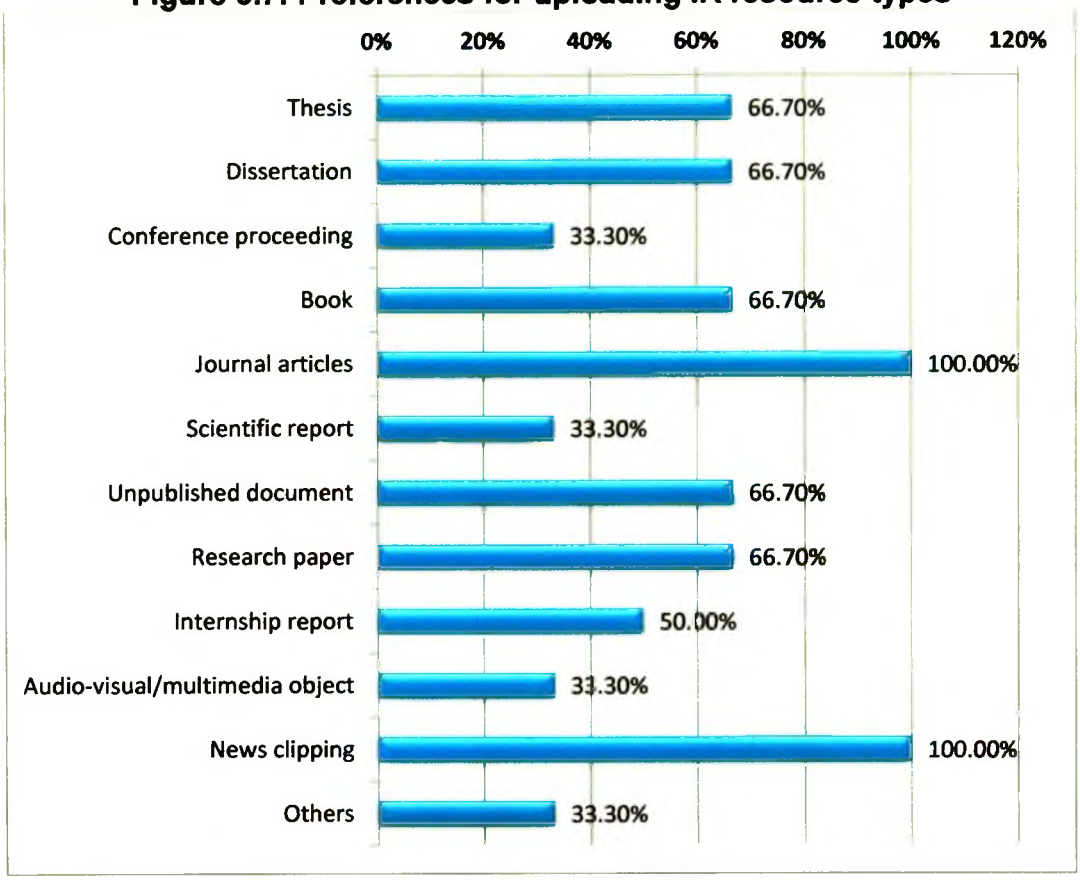


24. Out of 6 respondents, only icddr,b library is well advanced for developing IR. Scanning is the most common method used by medical libraries in Bangladesh for digitization.

25. In regard of the status of internet connectivity in the surveyed libraries, the study reveals that, all the medical libraries have internet connectivity. It is found that, all the 6 (100%) libraries are having broadband connectivity. Thus, the broadband is found to be the most preferred mode of connectivity of internet among the sample libraries compared to other modes, perhaps owing to its faster access in least cost. WiFi facility is also available in library premises of all the 5 (84%) libraries apart from DMC library.

26. Digital library contains a variety of digital information resources ranging from text to image, audio, video etc. Collection of digital libraries under the study comprises only text format for developing IR. It is noted the respondents have given 100% priorities for the resources of 'Journal Articles' and 'News Clippings' for uploading IR documents as shown in 6.7.

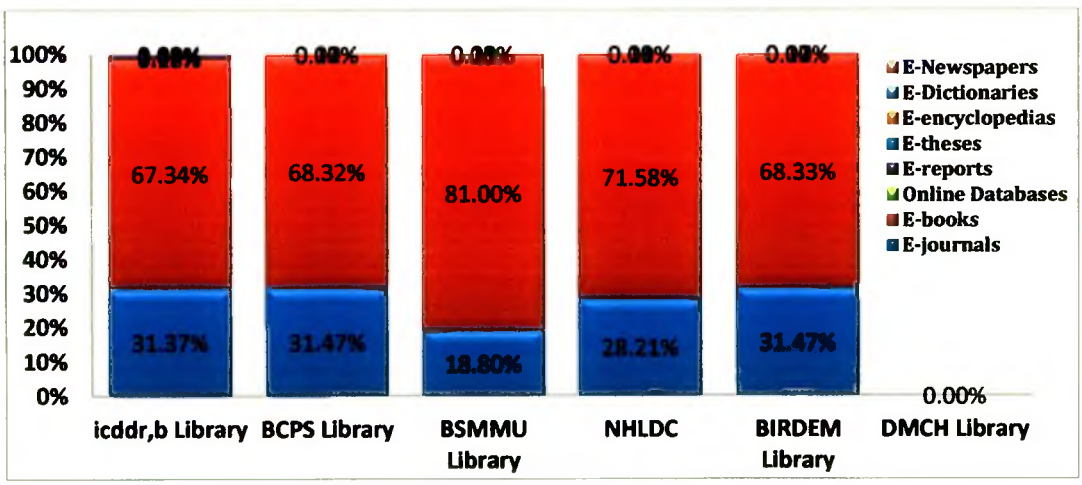
Figure 6.7: Preferences for uploading IR resource types



27. Only icddr,b library is now using DSpace software for developing IR whereas other surveyed libraries apart from DMC library have not decided yet for any IR software. BSMMU library has a plan to develop its IR through DSpace.

28. In the regard of accessible digital collections, e-books and e-journals are two important e-resource types in surveyed libraries that comprising a proportion of 29.25% and 70.25% respectively as shown in Figure 6.8.

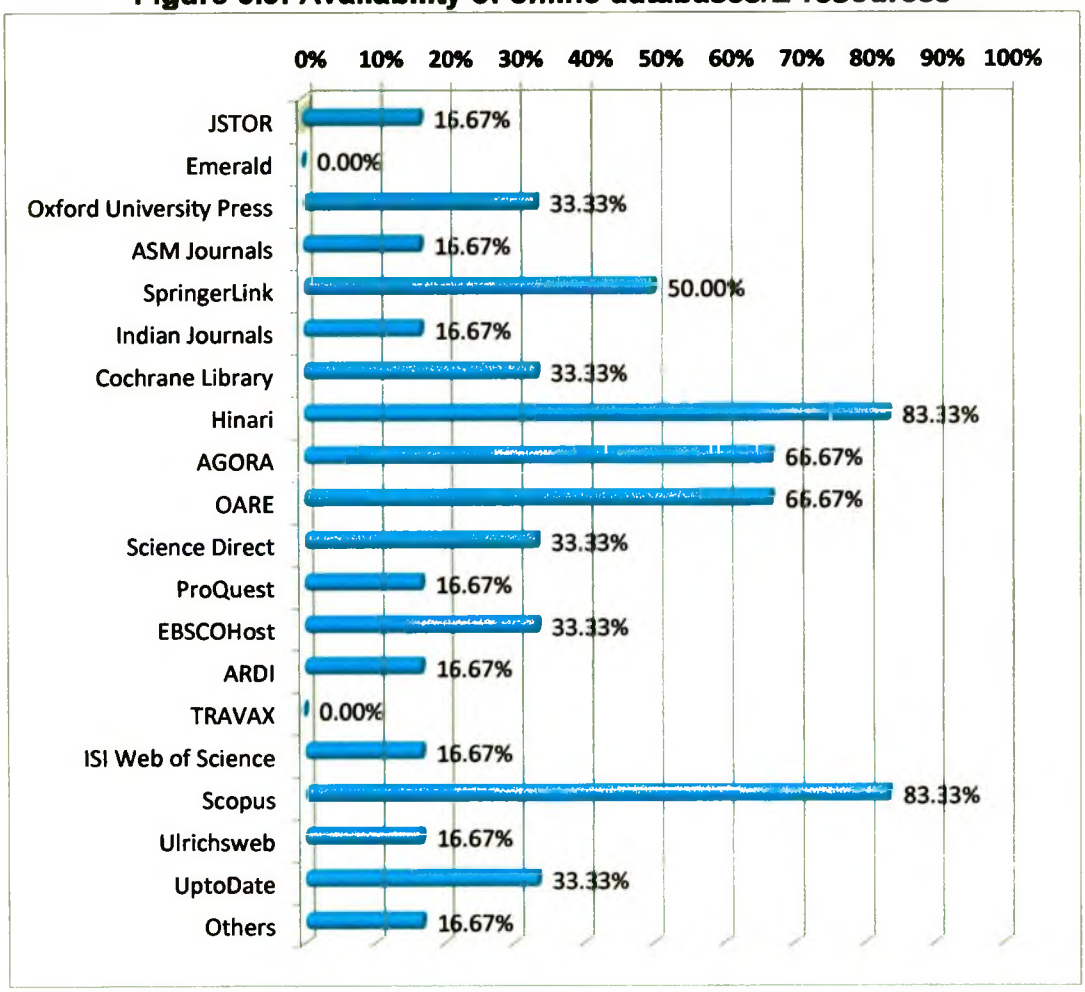
Figure 6.8: Accessible digital and electronic collections in surveyed libraries



29. The key to the efficiency/efficacy of a digital library is the quality of its metadata, which ensures maximum recall as well as precision, while information retrieval. The study reveals that Dublin Core Metadata Initiative (DCMI) is the popular metadata standard adopted by icddr,b library for developing its IR.

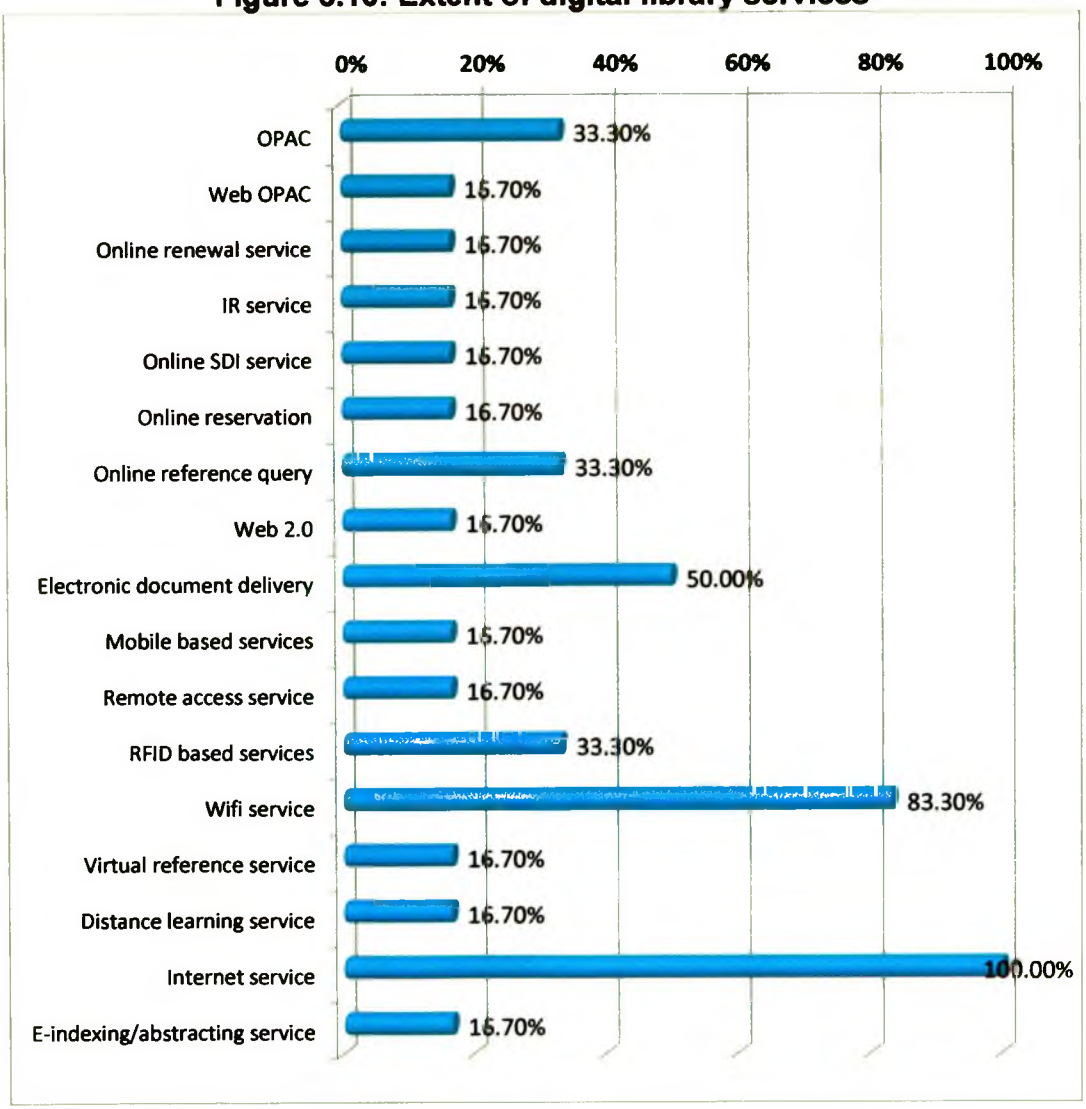
30. Access to online databases and e-journals are extremely indispensible, both for the researchers and R & D personnel, as they not only save time but also remove geographical constraints in locating the learning resources, besides providing a wider access to hyperlinked digital contents covered in a wide spectrum of subjects in varied forms. In this regard, an attempt has been made in this study to find out the availability of various e- resources. The present study, however, revealed that a little over 83 percent of the respondents informed that they are subscribing and registering to various e-journals and they are also building up e-book collections in their digital resource bases through Research4Life platform. Scopus and Hinari are dominating online databases in all surveyed libraries apart from DMC library as illustrated in Figure 6.9.

Figure 6.9: Availability of online databases/E-resources



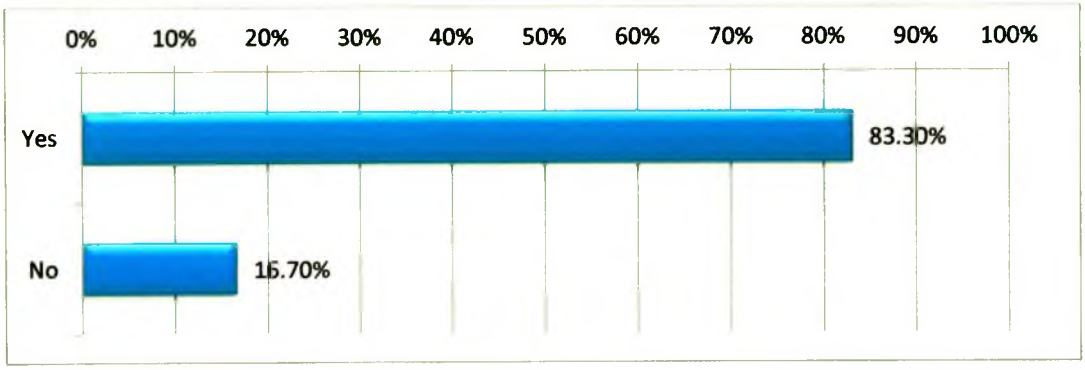
31. Digital library services play a crucial role not only in information transfer and retrieval but also saves valuable time and cost of the researchers to a great deal. Even though, the utility of digital library services are considered more crucial, surprisingly the study revealed that, a very insignificant portion of digital library facilities available to the surveyed libraries, while the DMC library is in a very disappointing state to provide modern library services. In this regard, icddr,b library is well advanced for providing web based library services which is quite a positive sign for the advancement of digital library system. Internet has become one of the most popular services in the contemporary modern libraries. All the respondents provide Internet services i.e. 100% followed by WiFi services numbering 83.3% as shown in Figure 6.10. Only 1(16%) out of 6 medical libraries are providing full-free internet services, and, the remaining 5 (84%) surveyed libraries are providing discounted/fee-based internet services.

Figure 6.10: Extent of digital library services



32. The popular library consortium in Bangladesh includes BIPC and UDL. The study revealed that 50% (3) percent of the responding institutes are participating in any library consortium which is quite satisfactory number. It is also positive sign that, 83.3% libraries have a plan to join Library consortium in future as shown in Figure 6.11.

Figure 6.11: Plan to be a member of consortium



33. The study observed that majority of the digital library initiatives in Bangladesh comprise of library automation, institutional repositories, followed by focused online databases, e-books and e-journals accessed through library consortium, subscription, registration and open access gateway.

34. It is observed that digital libraries collect, acquire or create a vast variety of digital materials with different categories of formats. It is observed that PDF is the most preferred format.

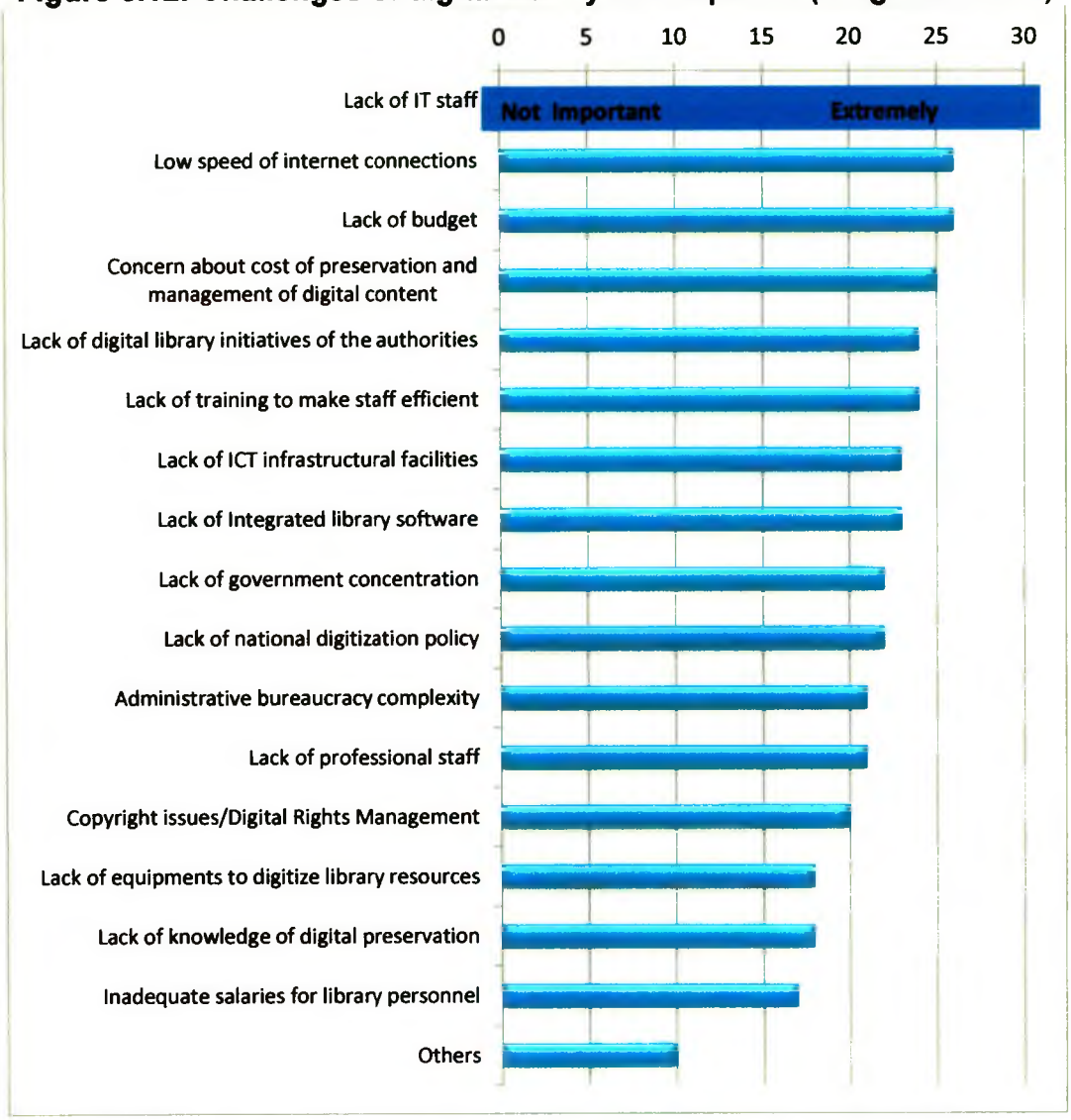
35. The study reveals that majority of the digital library initiatives do not have written digitization policy to perform mass digitization.

3. Training and education in Information Communication Technology (ICT) is fundamental in helping the library staff to become knowledgeable about the digital library technologies and services. Hence the staff should get proper training in ICT. This study reveals that majority of the surveyed libraries do not provide necessary ICT and digital library training programmes to their staff.

37. The digital libraries are facing certain challenges that prevent them in meeting their digitization goals which include additional funding and staffing, need for specialized equipment, support for copyright clearance and development of related infrastructure. A question pertaining to the challenges in setting up and managing digital libraries has brought out the views and concerns of librarians who are covered in the study. When asked about 'Lack of IT staff', a majority percent of the respondents felt that this problem as extremely important constraint while setting up

digital infrastructure. Budgetary constraint and Low speed of Internet connection will become another major blocks in moving the digital library proposals ahead as shown in Figure 6.12.

Figure 6.12: Challenges of digital library development (weighted score)



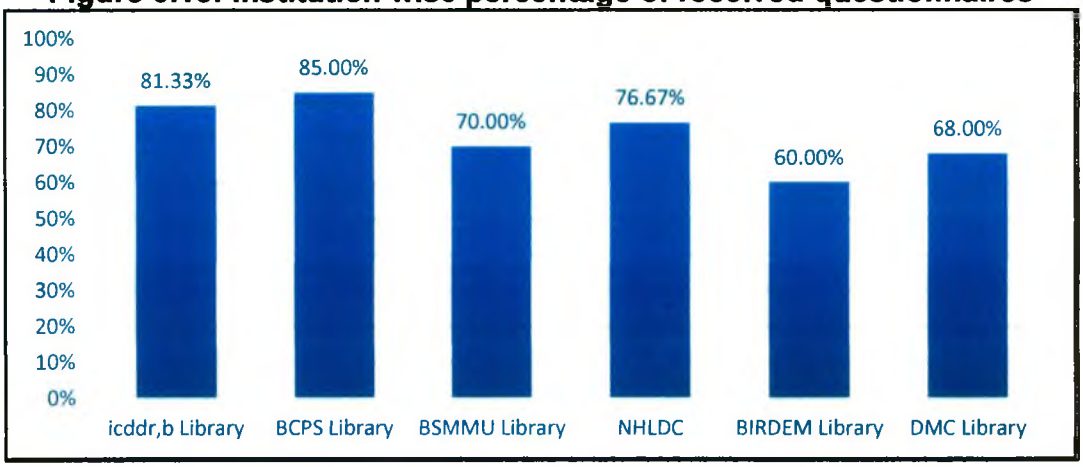
38. Most of the medical libraries covered this survey have not sufficient trained staff for digitization. It means there is a shortage of efficient infrastructural facilities like trained professional staff and latest digitization technology.

39. All of the surveyed libraries have no recurring budget for digitization. These findings showed that in Bangladesh medical libraries find it difficult to secure a consistent budget to digitize their material.

(B) Summary of the Findings (Users)

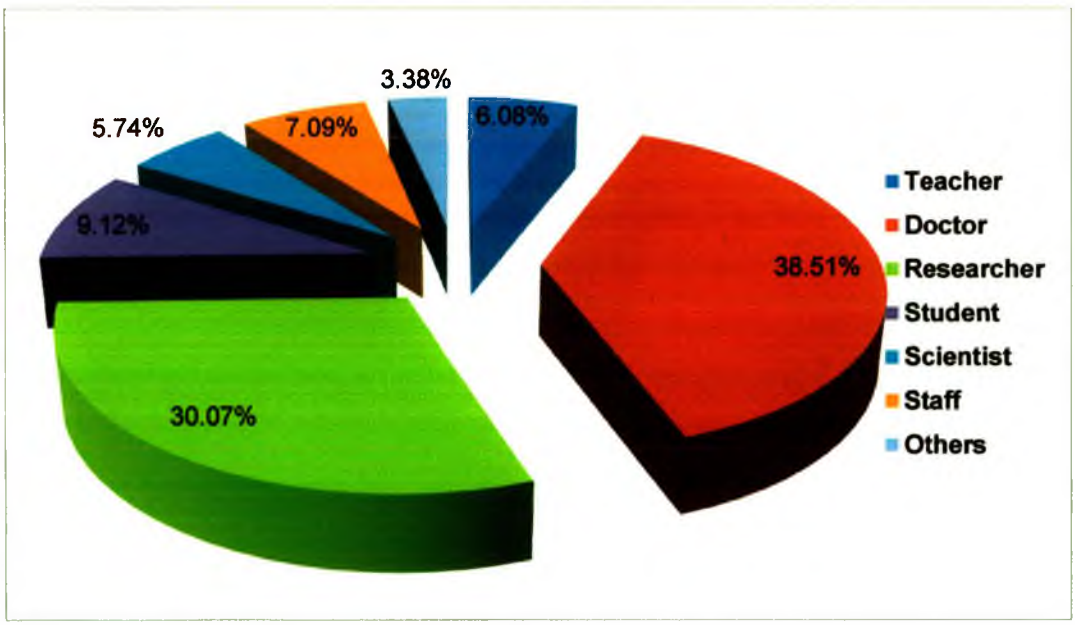
01. Out of 380 questionnaires distributed a total of 296 filled questionnaires were received with a response rate of 77.89%. A highest response received from icddr,b library i.e. 81.33% shown in Figure 6.13.

Figure 6.13: Institution wise percentage of received questionnaires



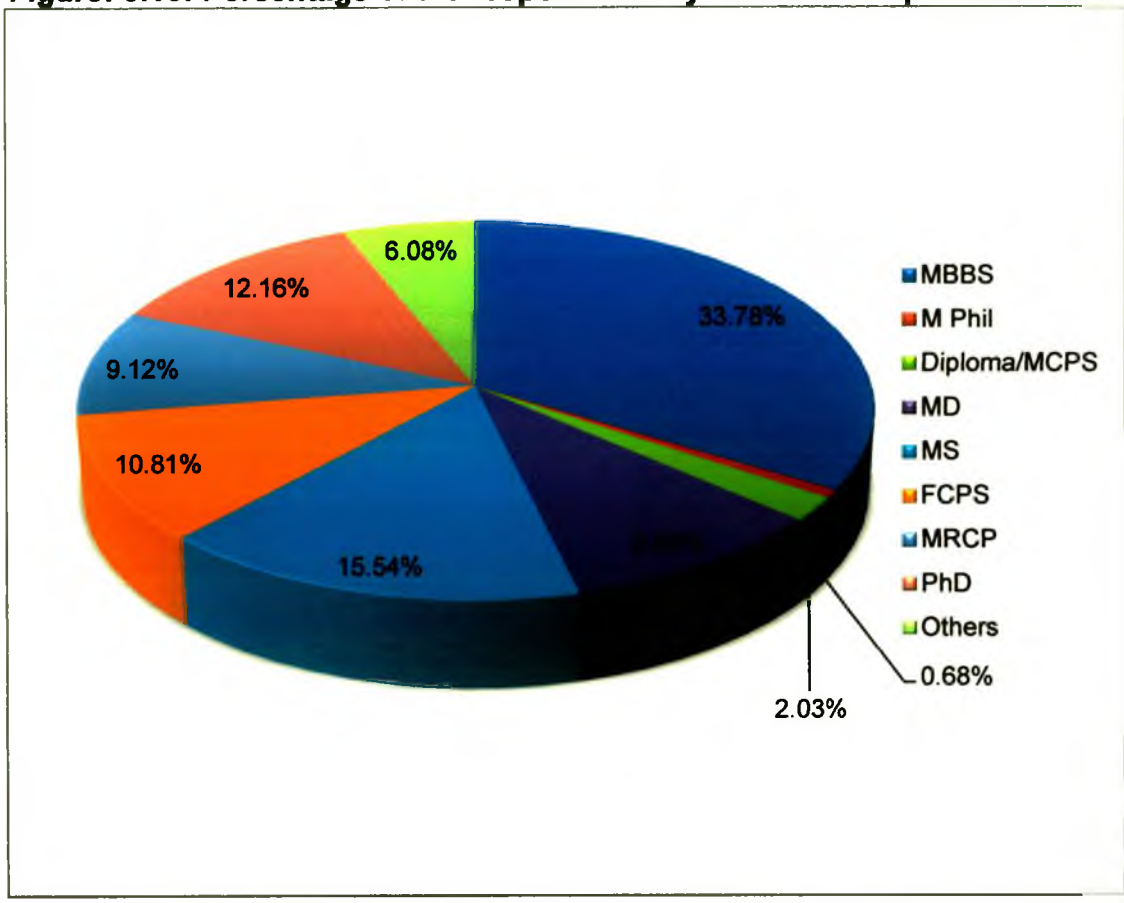
02. The user category "Doctor" has a highest respondent portion i.e. 38.51% of this study as shown in Figure 6.14.

Figure 6.14: Percentage of category of the respondents



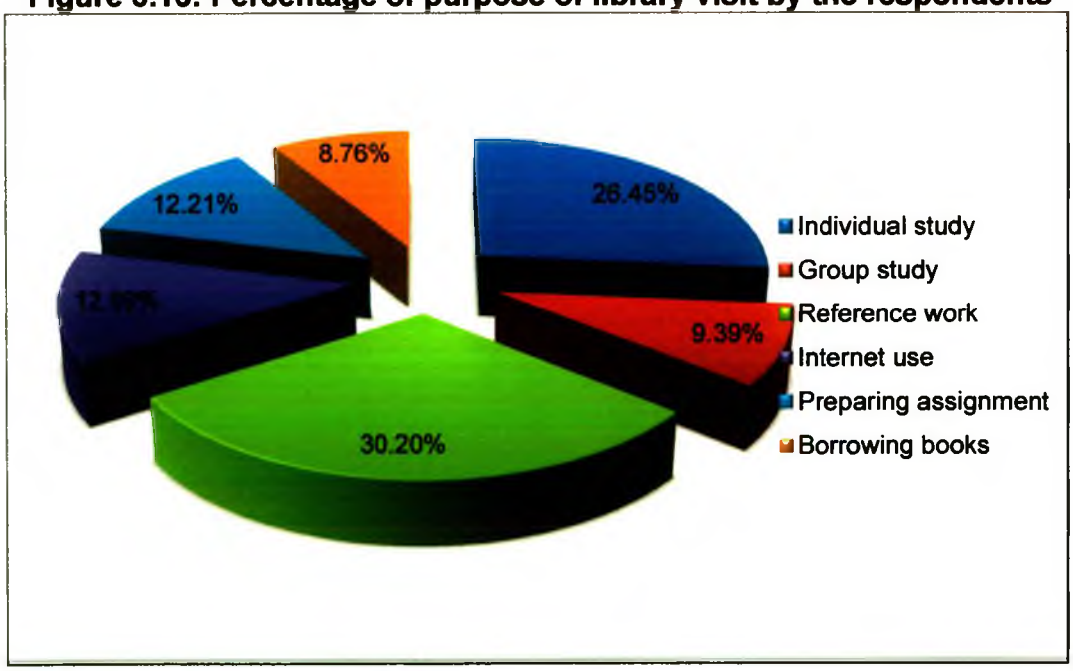
03. It is found that more respondents are from group (i) MBBS 100 (33.80%) than group (vi) MS 46 (15.50%) as illustrated Figure 6.15.

Figure: 6.15: Percentage of the respondents by educational qualification



04. It may be seen from the table that majority of the respondents visiting library 193 (30.2%) for Reference work as shown in Figure 6.16.

Figure 6.16: Percentage of purpose of library visit by the respondents



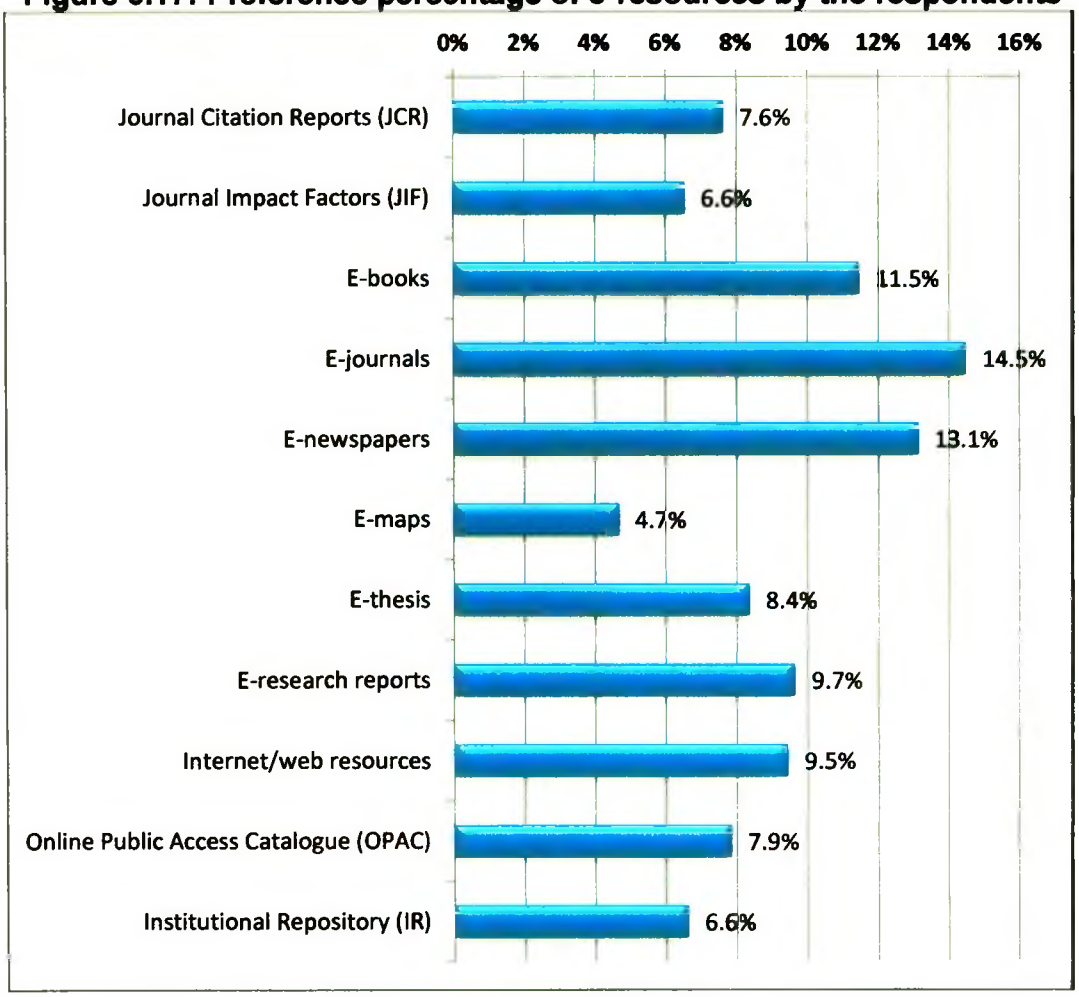
05. A majority of users 34.1% visit library for 2 to 3 times in a week.

06. A significant portion 240 (81.1%) of the respondents are using e-resources.

07. A majority of the respondents accessing E-Resources 113 (38.2%) from Library followed by 90 (30.4%) of the respondents access E-Resources at work.

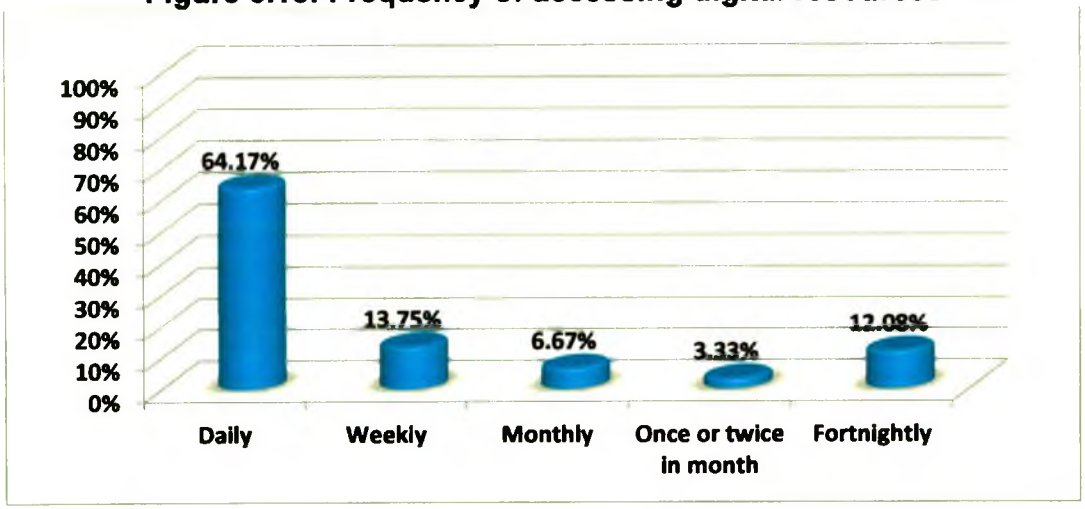
08. It has been observed that majority of respondents use e-journals (14.5%), e-newspapers (13.1%), OPAC (7.9%), Institutional Repository (6.6%), and E-thesis (8.4%) as shown in Figure 6.17 as shown in Figure 6.17.

Figure 6.17: Preference percentage of e-resources by the respondents



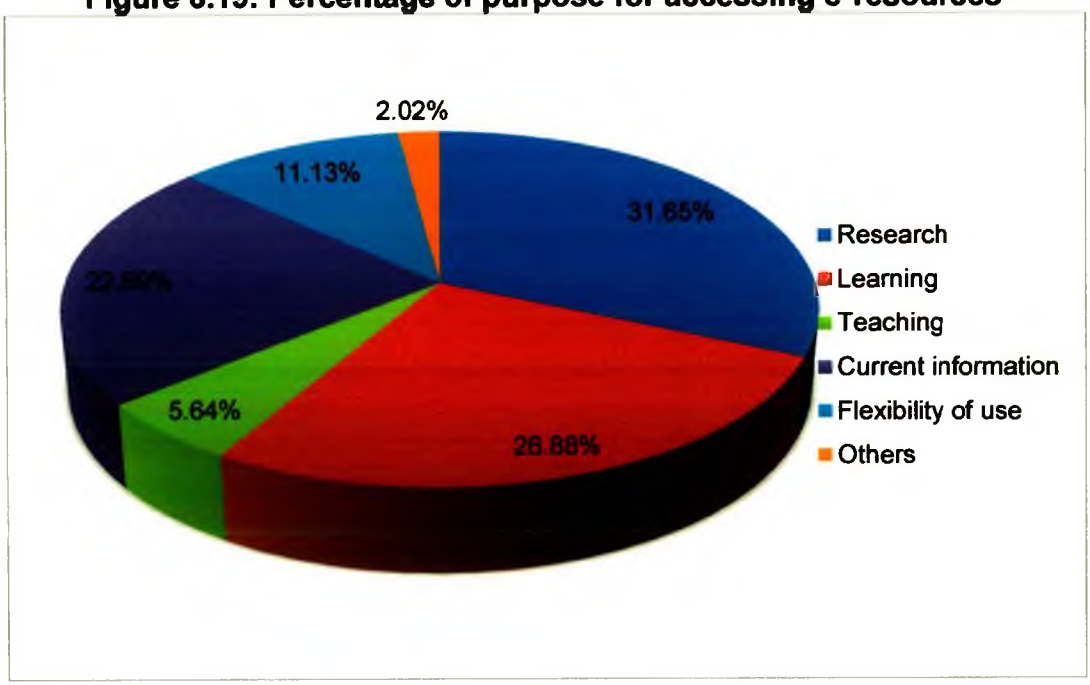
09. A majority of the respondents 154 (64.2%) accessing digital resources Daily followed by 13.8% Weekly as shown in Figure 6.18.

Figure 6.18: Frequency of accessing digital resources



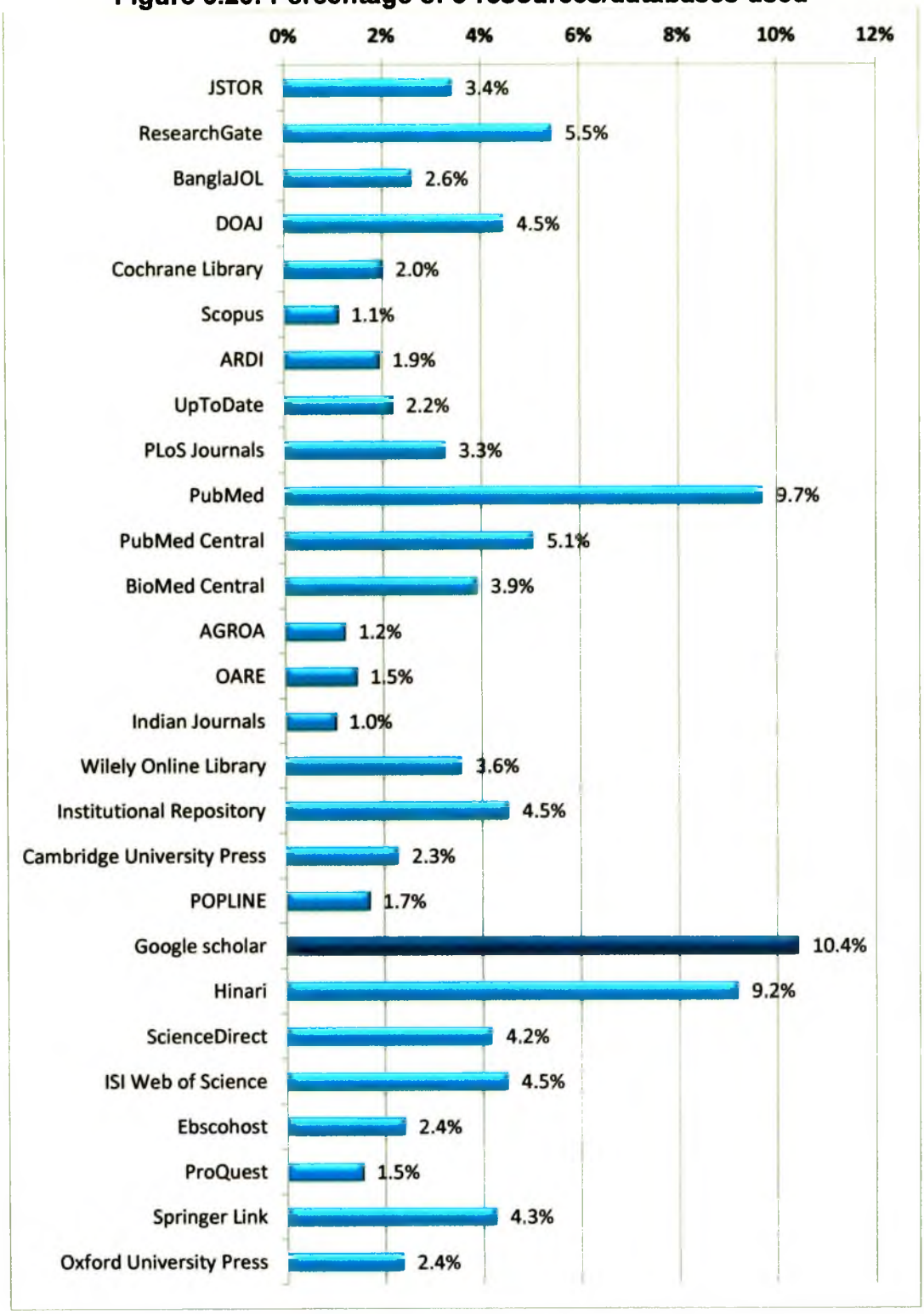
10. 31.6% respondents access e-resources for Research purpose as shown in Figure 6.19.

Figure 6.19: Percentage of purpose for accessing e-resources



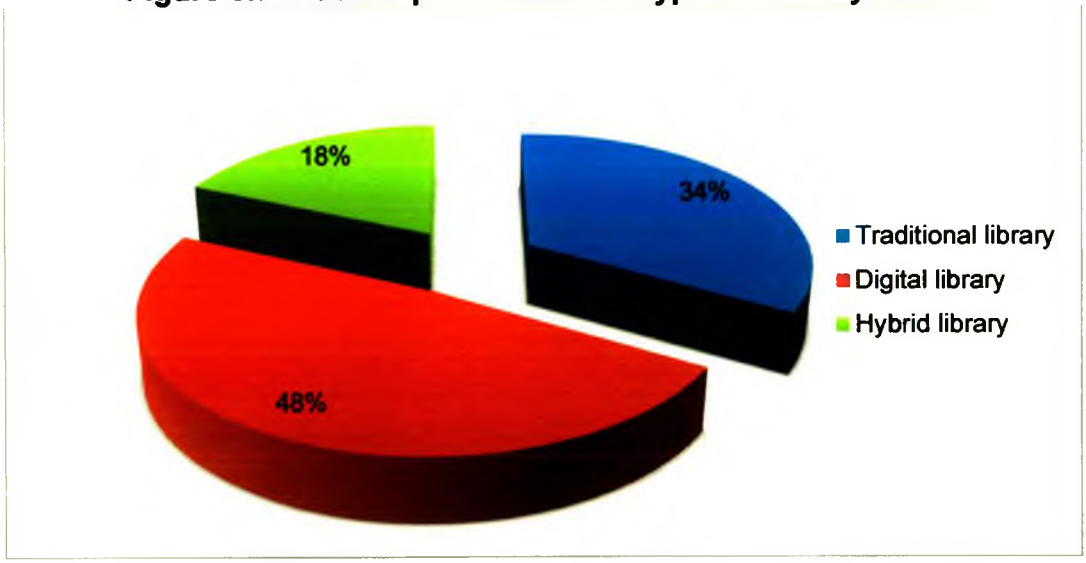
11. It is evident from Figure 6.20 that 10.4% respondents use Google scholar followed by Hinari 9.2% for preference of online databases by names.

Figure 6.20: Percentage of e-resources/databases used



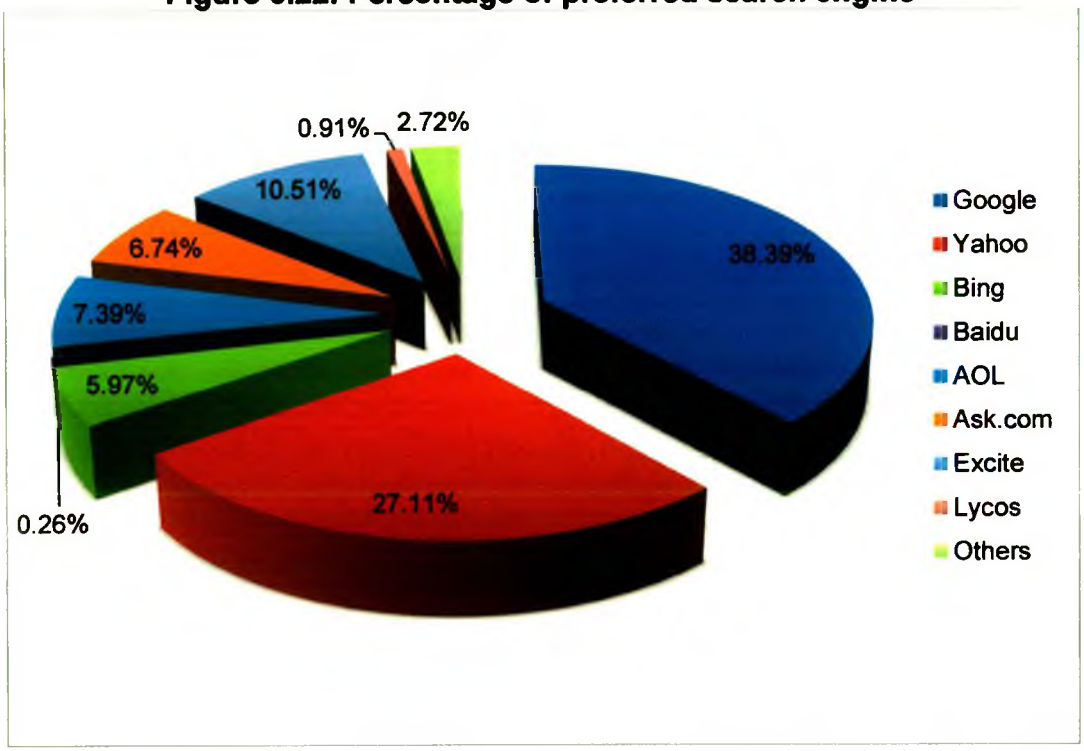
12. Figure 6.21 expresses that the majority of respondents (143, 48.3%) given preference for 'Digital Library' mode.

Figure 6.21: Users' preferences on types of library mode



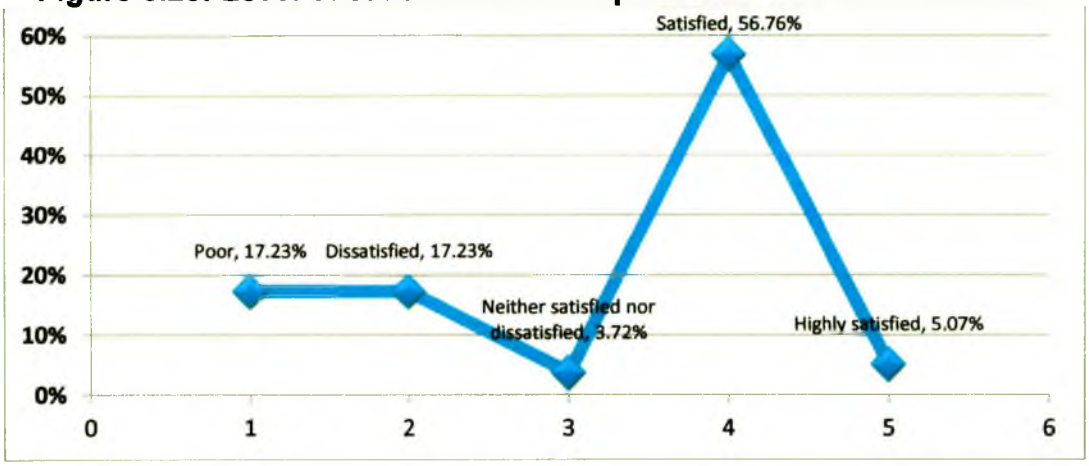
13. The Figure 6.22 shows that out of total responses, Google has the largest percent i.e. 38.39% for accessing digital information.

Figure 6.22: Percentage of preferred search engine



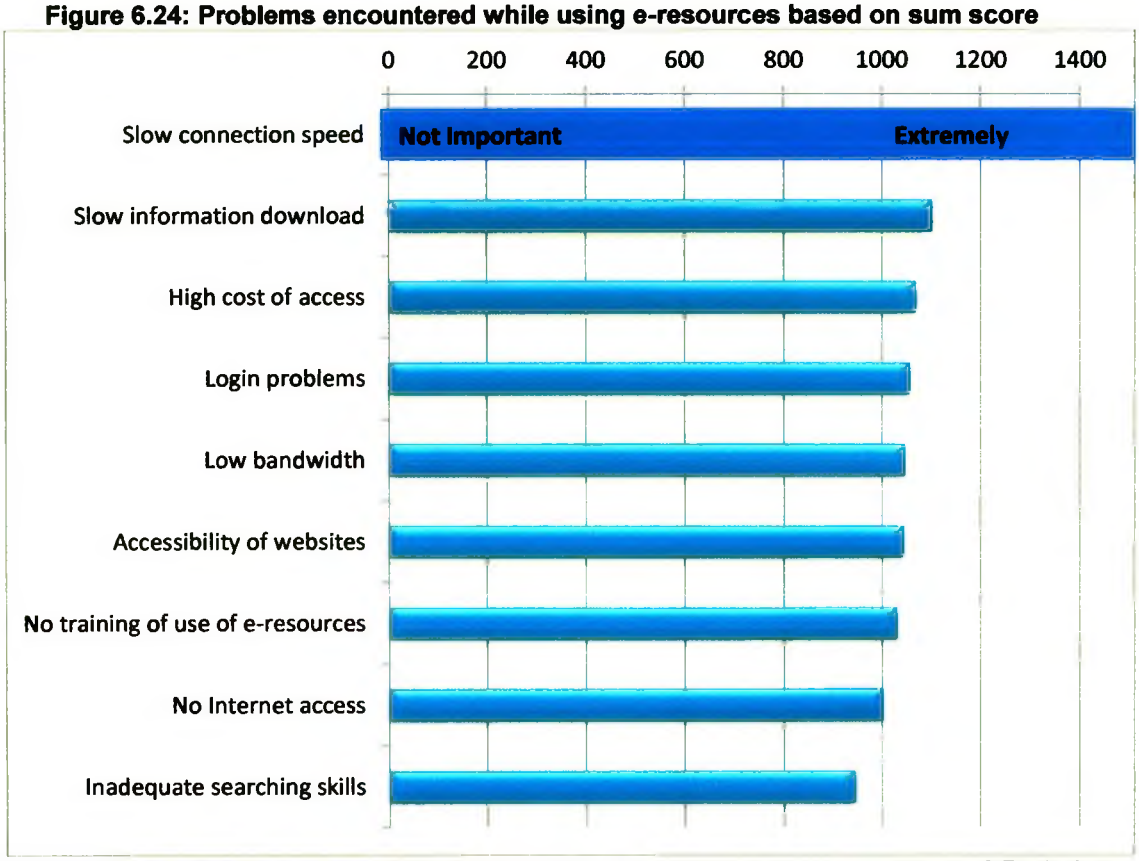
14. The largest portion of respondents (168, 56.8%) reckoned that they are satisfied whereas a medium number of respondents (17.2%) expressed that they are dissatisfied as shown in Figure 6.23.

Figure 6.23: Level of satisfaction of respondents about DL activities



15. The figure 6.24 clearly shows that Slow connection speed' and Slow information download' are two major constraints identified by the respondents for accessing digital resources.

Figure 6.24: Problems encountered while using e-resources based on sum score



The findings of the study lead to a conclusion that the present scenarios of Digital Library Infrastructure of medical libraries are at the marginal level regarding users' satisfaction. It is very hard to maintain the users' satisfaction level yet, it is the duty of the library to fulfill all its users' demands. To refine the existing situation, efforts should be undertaken promptly to facilitate efficient digital library systems among the

libraries through better management and installing the state of the art of technologies and advancement.

Recommendations

This study has identified the existing ICT infrastructure, availability of online databases, Institutional Repository, library consortium particularly in the field of digital library. The use of digital library resources and digital preservation, digitisation process in the medical libraries differs from person to person and library to library. On analyzing the data in chapter five, a number of findings and observations require the formulation of the recommendations to enhance the capabilities of medical libraries. The following constructive suggestions are submitted for the planners, administrators, library managers and policy makers of Bangladesh to take necessary measures so as to bring necessary improvement in the existing services of the contemporary digital library systems in the country. Based on the findings of the study and the insights it has provided with respect to the theme of the study, the following recommendations are put forward to reinforce/strengthen/streamline/fine tune the digital library initiatives in Bangladesh:

Implementation of ILS: The libraries should consider carry out Integrated Library Systems (ILS) in automating library operations which is treated is the first step for developing digital library system. Most commercial library software packages could be quite expensive for an individual library to purchase. There are also several open-source software packages available for library automation. In this regard, Koha and Evergreen might be the best option for the libraries of Bangladesh.

Develop Hybrid Library: Considering the financial condition of the medical libraries in Bangladesh, all the libraries covered this study are in a hybrid environment, with both print and electronic resources existing side by side. So it is proposed that, the libraries should maintain both e- resources and printed materials. The main spotlight should be on journals and books in both forms that comprise e-journals and e-books as well as printed version. In the present budget shrinking environment, developing hybrid library might be the best possible solution for surviving.

Sufficient Budget for e-resources and Digitization: Finance is the most vital factor that governs the effectiveness of the library. Adequate funds are necessary to build library collection to provide services to their users and to purchase and maintain various digital library equipment, hardware and software, online resources etc. 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. The success of any digital library initiatives largely depends on sufficient budget. The librarian should convince the top management towards investing huge amounts on digital technologies.

Awareness build up: Electronic Databases generally identified as online databases are systematized collections of information on a particular subject or multi-disciplinary subject areas. The study reveals that there is a strong need to popularize the use of e-databases among the users to a great extent. The two major indicators in this endeavor are subscribing to relevant databases and creating greater awareness among users about the power of this great knowledge tool.

Strong ICT Infrastructure: Strong ICT infrastructure is the precondition for setting up standard digital library system. Digital libraries are highly resource intensive. They demand cutting edge IT and communication infrastructure such as, high end and powerful servers; structured LAN with broadband Intranet facilities, required number of workstations capable of providing online information services, computing and multimedia applications, internet connectivity with sufficient bandwidth. So the adequate digital library infrastructure should be ensured in the libraries of Bangladesh.

Open Source Software (OSS): A vast majority of surveyed libraries under study are using open source software for the development of IR (Institutional Repository) and Integrated Library System. Hence from the study it is clear that open source software play an important role in the creation and development of digital libraries. We also expect that, open source digital library software might be the right option for digital library initiatives of Bangladesh treated as a welcome move for medical libraries due to the high cost of commercial software. In this regard, KOHA, DSpace, EPrints and Greenstone are the four OSS software may play a dominating role for the overall improvement of digital library initiatives in Bangladesh.

National and Organizational Digital Library Policy: There is an immense need for dependable national policies and procedures for creation and management of digital resources in Bangladesh. The Government and non-governmental agencies, including universities and important research organizations, should take policy decisions and directives for setting up digital libraries in their respective organizations. A national digital library policy can act as a guideline to strengthen and streamline all activities related to digital libraries. 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 (A. J. Rahman et al., 2015).

Digital Rights Management (DRM): It is observed that the problems related to DRM/copyright is a major challenge being faced by the digital library initiatives, especially on the digitization front as well as in the creation of digital libraries. Hence it is recommended that the legal framework for digital library development including the revision and amendments to the copyright act be done by a central agency, moderated preferably by the Ministry of ICT, Government of Bangladesh, to ease the digitization works.

Member of Library Consortium: Due to financial crunch and the rising costs of journals, many academic/ research/scientific libraries cannot subscribe to all the required journals and databases. Libraries formed consortia to overcome the problem and share the resources. Sharing electronic resources have become necessity of individual libraries due to their decreasing excellence, further it is suggested to establishment and development of network and networking systems like BdREN, BIPC and University Digital Library (UDL) Consortium. Medical college Libraries have to join the existing e-resource and digital library consortium such as BIPC, UDL etc. and also should join larger international, multi-national, regional and Trans – Continental digital library federations to further obtain leverage in gaining access to content. Subsequently, other consortia may be formed for exploring more electronic resources at an affordable price and higher education libraries, at least, will then find more users.

Building Institutional Repository: The libraries of Bangladesh may increase their digital collections/digital information resources through "Institutional repository" and make it freely available worldwide. The libraries can store all their own publications, like annual reports, journals, and other publications in digital form. Like developed countries, Bangladesh embraces the concept of establishing institutional repositories but the tendency for establishing IR is not satisfactory so far. Not-for profit organizations, such as higher learning institutions and research organizations might find IR useful for disseminating their intellectual outputs through Internet, for raising funds, and creating interest in the projects and activities of the respective organizations. DSpace can be an ideal solution for the libraries of Bangladesh and more importantly it is open source software and free of cost.

Digitizing Existing Materials: Digitized existing materials can be a good idea in order to build up digital collections /digital information resources/electronic resources among the libraries of Bangladesh. Digitization can help in the preservation of original manuscripts and rare resources. It also changes the way scholars use historical resources. The accessibility and visibility of these rare documents if digitized will increase manifold and scholars across the world will have access to these documents.

Advanced Training Programmes: The study recommends that the library professionals of medical libraries should undergo innovative training programmes on various areas of digital libraries and Digital Library System (DLM), digitization, library website design, e-licensing, Digital Rights Management (DRM), negotiation with e-publishers, subscription of e-resources, e-resources usage statistics system such as Counting Online Usage of NeTworked Electronic Resources (COUNTER) and so on, in addition to participating in workshops and seminars on digital libraries/technologies both inside and outside the country. To deliver effective digital library services the practical training like hands on-labs are very essential. IT expertise should also be developed in the areas of Integrated Library System and Institutional Repository. Library professionals must have advanced knowledge on various online databases and digital consortium for accessing specially e-books, e-theses and e-journals in order to fulfill the diversified information needs of the users.

Formulation of National Taskforce of Digital library: Digital library policy and services was as important as the creation of National Taskforce of Digital library as both were to be used as a form of guidance to streamline all activities that relates to digital libraries. There should be digital library policy on acquisition, born digital materials, information surrogates, reference service, domain types and anything that would serve as national standard guidelines. Availability of a written ICT plan or strategy for the digital library service is highly essential for deploying effective digital library services.

Provision of Remote Access: It is essential that all e-resources should be accessed from anywhere and anytime, thus remote login access to subscribed electronic resources should be provided to all the users of the library, in order to have maximum utilization of the e-resources. The remote login access will provide autonomy to the users to access e-resources from anywhere and anytime. Besides, medical libraries should organize training programes so that users can use e-resources effectively.

Advancement of ISLM Curriculum: Practical digital resource management course should be integrated in the ISLM curriculum at the university level. The Library and Information Science curriculum must be restructured in such a way that it gives more importance to practical skills to library professionals to meet the challenges being posed by technology and the changing dynamics of the user community at large.

User Educational Programmes: It is necessary to conduct user studies periodically in order to ascertain the information needs of users and accordingly plan for the provision of necessary ICT and digital library based services. Further, it is suggested to conduct user education programmes and information literacy programmes about the use of ICT environment, digital library and online resources.

Conclusions

This study highlighted the present scenario of digital library initiatives of six medical libraries in Bangladesh in terms of library automation, ICT infrastructure, Institutional Repository, Library Website, digitization, online databases, and challenges for implementing a digital library system for the libraries in the country. The results put forward that the medical libraries in the country are not well-equipped to deliver proper ICT-based information services, mostly due to the absence of appropriate IT infrastructure and trained manpower and inadequate access to electronic resources and inadequate budget. Comparing to other sectors, Bangladesh is lagging behind in digitization and establishment of digital information systems. It has been evident that there exists no digital library system in the country in true sense of the term. In the recent times a very few initiatives have been noticed taken by leading private universities and special libraries. It is essential for the medical libraries to understand users' needs in order to provide users' focused services. Usage pattern of each electronic resource should be evaluated by the subject experts and feedback should be taken from the group of various users so that good quality of e-resources can be subscribed by the library. In order to spread information about the availability of electronic resources, catching icons regarding electronic resources should be put on the library website. Regular email should be sent to the users. Social Media (Facebook, twitter etc.) tools can also be used to spread the awareness about the electronic resources. Library should have best computer infrastructure with excellent bandwidth and it should organize training programmes, orientation programmes, seminars & workshops for all users regularly. Library professionals with strong IT background should be deployed to help users. Library should automate all its activities like administration, acquisition etc., and should create machine readable

details of their holdings. Digital library is a new zone to many of the surveyed libraries and the fact that they were still learning the modern library applications and taking initial steps in planning digital library initiatives. Some were in the early planning stage, some do not have any bother of their libraries poor condition and some were contemplating what would be the best possible way to approach the matter.

In a nutshell, the medical libraries were moving forward toward digital library development, at different phases and levels. The provision of accessing e-books, e-journals and e-theses are gaining momentum and the development of websites/homepages had been tremendous and significantly becoming the central of digital library activities. In Bangladesh, online databases are objectively to supplement rather than to replace the traditional library services, thus the high preference for the hybrid type at this moment. Digital infrastructure in terms of digital library, e-resources and services, online resources and services, internet facilities, digital library hardware and software are more to be strengthened. The investigator stresses that the present libraries should accept the challenges being faced by ICT which would supplement and complement library users. The librarian should completely transform themselves with the changing scenario. Electronic resources will be fruitful only balanced collection of information resources; provision of ICT based services in addition the service offered by information professional. A close look at the current status of surveyed libraries in Bangladesh shows a number of promising advancements as well as gaps. In the race of digital library initiatives, icddr,b library is at the top most position; others are BSMMU, BIRDEM and BCPS library . DMC library is the most deplorable condition for taking digital library initiatives. This study has observed that digital library development in Bangladesh facing a number of serious challenges that impede the smooth digital library operations. Lack of sufficient funds, lack of infrastructural facilities, skilled LIS professionals and lack of administrative supports are the major hindrances to DL development in Bangladesh. The host of potential challenges identified by the study, starting from ICT infrastructure to financial support, are furnished in the Analysis chapter. If the foregoing suggestions are accepted, the existing condition of medical libraries of Bangladesh will certainly improve and will reach to a new height, besides will case the constraints. It will take more time for medical libraries in Bangladesh to be able to take more digital library initiatives for full-fledged DL systems and to introduce modern library facilities. The journey towards digital library system is a long, so it is imperative to take necessary digital library initiatives to be implemented progressively and professionally in all the medical as well as other types of libraries of Bangladesh.

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APPENDICES

Appendix 1: Questionnaire - (Librarians)

Appendix 2: Questionnaire - 2 (Users)

Annexure 1: Questionnaire for Librarian & Library Head

[Please put tick (√) mark on the relevant ones]

01. **Institutional Profile:**

i. Name of the Library: _____

ii. Year of Establishment: _____

iii. Name of the Parent body: _____

iv. Year of Establishment: _____

v. Present Address: _____

Telephone no: _____

Email: _____

Fax: _____

Website: _____

vi. Type of the organization:

International	Government	Autonomous

vii. Name and Designation of the Head:

_____

02. **Please mention about category of users: (Multiple response)**

Teacher ☐ Student ☐

Doctor ☐ Scientist ☐

Researcher ☐ Staff ☐

Others; please specify:

_____

03. Average number of users per day (Approximately):

_____

04. Total number of library members: _____

05. **Staff members and their qualifications**

5.1 Please mention your total number of staff with their designation, status and qualification

Designation	Number	Educational qualification PhD/Master/Diploma/Certificate in ISLM (Information Science & Library Management)	IT education	
			Yes	**No**
Library Administrator/Chief Librarian/Principal Librarian				
Librarian/Head of Library/ Senior Manager				
Additional Librarian				
Deputy/Associate/Joint Librarian/ Library Manager				
Senior Assistant Librarian/ Sr. Information Officer				
Library Officer/Information Officer				
Jr. Assistant librarian				
IT Specialist/System administrator				
Library Assistant				
Library Attendant				
Others (please specify):				

6. **Library Resources:**

Library Resources	**Total Number**
Books	
Theses/Dissertations	
Reports	
Loose Journals	
Magazines	
Bound Journals/ Magazines	
Audio-Visual materials	
Atlases	
Maps	
Microfilms	
News Clippings	

7. **ICT (Information and Communication Technologies) and Automation Facilities**

Does your library have ICT and automation facilities? Yes ☐ No ☐

If yes, then answer the following questions:

7.1 Year of ICT inception: _____

7.2 Status of automation:

Fully	
Partially	
Not automated	

7.3 Type of automation software you are using: (please tick)

In house developed software	
Commercial software	
Open source software	

7.4 Which software are you using for Integrated Library System?

Software name	
KOHA	
Liberty	
ABCD	
Evergreen	
SLiMs	
OpenBiblo	
Others (pis. specify)	
Not available	

7.5 Internet Facilities and Library Website

7.5.1 Please mention the year when Internet has been introduced in your library: ___

7.5.2 How many computer do you have internet connection in library?_____

7.5.3 Do you charge users to browse Internet? Yes ☐ No ☐

7.5.4 On an average how many user browse Internet within as working day? _____

7.5.5 Status of your Internet connection:

Broadband ☐ Narrow band ☐ WiFi ☐
Others: _____

7.5.6 Please indicate browser software use:

Netscape Navigator ☐
Netscape Gold ☐
MS Internet Explorer ☐
Opera ☐
Chrome ☐
Firefox ☐

Others (Please specify): _____

7.5.7 Please indicate which search engine you use frequently:

Google ☐
Yahoo ☐
AltaVista ☐
Lycos ☐
MSN ☐
Others (Please specify): _____

7.5.8 Does your library have a webpage? Yes ☐ No ☐

7.5.9 If yes, URL of the library Website: _____

7.5.10 Contents of library website [You may tick more than one]

Contents	YES	NO
General information on the library, staff, contact numbers, opening hours, services, collections, rules and regulation.		
Web OPAC		
Access to e- books & e-journals		
Access to commercial online databases		
Access to open Access database		
Link to Institutional Repository		
New book list		
FAQ		
Suggestion page		
Feedback & comments		
Others: please specify		

7.5.11 Does your library have Intranet access? Yes ☐ No ☐

7.5.12 Contents of library Intranet site [You may tick more than one]

Contents	YES	NO
General information on the library, staff, contact numbers, opening hours, services, collections, rules and regulation.		
Web OPAC		
Access to e- books & e-journals		
Access to commercial online databases		
Access to open Access database		
Link to Institutional Repository		
New book list		
FAQ		
Suggestion page		
Feedback & comments		
Others: please specify		

7.5.13 Do you have electronic security system? Yes ☐ No ☐

7.5.14 If yes, what kind of security system is your library using?

Electronic Surveillance System ☐

Radio Frequency Identification System (RFID) ☐

Electronic Access Gate ☐

CC Camera ☐

Any other: _____

8. **Digitization Activities:**

8.1 Have you taken any digital initiatives in your library? Yes ☐ No ☐

If yes, then answer the following questions:

8.2 Please check the following table and provide the number of different technological equipments, currently available in your library.

Hardware	NOs
Servers	
Computers	
Scanners	
Digital Cameras	
Digital Photocopiers	
Printers	
Router	
Other (Please specify)	

8.3 Type of digital materials in your library

a) Born digital (exists only in digital form)
b) Digitally created

8.4 How much of your collection digitized?

Resources	NOs
Books/book chapters	
Journal articles	
Photographs	
Maps	
Thesis/Dissertations	
Audio visual	
Newspapers	
Reports/Protocols	
Governments publications	
Others (Please specify)	

8.5 How do you acquire digital material?

a) Outright Purchase
b) Licensed from a vendor
c) Donation
d) Created in-house
e) Compliment
f) Harvested from web (downloading)

8.6 What kind of digital library software do you use?

a) Commercial software
b) In-house developed
c) Open-Sources software

8.7 What kind of methods you are using to convert conventional media into digital media?

Methods	**Yes**	**No**
Registering		
Scanning		
Optical Character Recognition		
Proofreading		
Reformatting		
Producing the Final Version		

8.8 What is the format do you use for page layout?

a) HTML b) XML c) PDF d) TXT
e) JPEG f) Other

8.9 Does your library have a written digitization policy?

Yes ☐ No ☐

8.10 If you get the resources for digitization, what will be your priorities for digitization of the following types of documents/materials?
(Please encircle the number which matches your opinion most closely according to the following five-point Likert scale to rate each feature
5 = Worthwhile; 4 = Most valuable; 3 = Valuable; 2 = Less valuable; 1 = Not important)

a. Reports/ Government documents	1 2 3 4 5
b. Historical documents/archives	1 2 3 4 5
c. Journals and other serials	1 2 3 4 5
d. Manuscripts	1 2 3 4 5
e. Maps	1 2 3 4 5
f. Old Newspapers	1 2 3 4 5
g. Photographs	1 2 3 4 5
h. Rare books	1 2 3 4 5
i. Theses and dissertations	1 2 3 4 5
j. Audio Visual	1 2 3 4 5

8.11 Have your library followed any metadata standard (e.g. Dublin Core, MARC, etc.)?

Yes ☐ No ☐

If yes, please specify the name of metadata standard used: _____

8.12 If metadata has been assigned, which type of vocabulary is being used?

Controlled vocabulary ☐ Natural language vocabulary (free text) ☐

8.13 Please tick √ the appropriate specialized software that your library used/will be used to manage digitized contents?

Software name	Please Tick
DSpace	
GreenStone	
DigiTool	
E-Prints	
CONTENTdm	
ETD-db	
Fedora	
DIGIBIB	
Others (Pls specify):	
Not decided	

8.14 How does your library save digitized contents (please check all relevant)?

□ CD-ROM/ DVD □ Library Server □ Organizational Server
□ Dedicated computers □ External Hard-disk □ Other (please specify

9. **Institutional Repository (IR):**

9.1 Does your library have Institutional Repository (IR)? Yes ☐ No ☐

If yes, then answer the following questions:

9.2 Name of your IR: _____
9.3 Inception year of IR: _____
9.4 Web address of IR: _____
9.5 Basic objectives for launching IR in your institution:

_____
_____
_____
_____
_____

9.6 Is your IR is enlisted with OpenDOAR (Directory of Open Access Repositories)?

Yes ☐ No ☐

9.7 Total number of items being uploaded for IR:

_____

9.8 Types of items being uploaded: (you may tick more than one)

Thesis	
Dissertation	
Conference proceeding	

Book	
Journal articles	
Scientific report	
Unpublished document	
Research paper	
Internship report	
Audio-visual/multimedia object	
Dataset	
News clipping	
Others(Pls. Specify)	

9.9 Subject coverage for IR: (you may tick more than one)

Child Health	
Climate Change	
Clinical Sciences	
Medicine &Health	
Human anatomy, cytology and histology	
Medical Education	
Health and Family Planning Systems	
HIV/AIDS	
Infectious Diseases and Vaccine Sciences	
Hospitals	
Laboratory Sciences	
Maternal & Neonatal Health	
Non-communicable diseases	
Nutrition	
Population Sciences	
Poverty and Health	
Public Health Sciences	
Reproductive Health	
Universal Health Coverage	
Human physiology	
Surgery and related medical specialties	
Gynecology, obstetrics, pediatrics & geriatrics	

Others (Pls specify):

_____

_____

_____

9.10 Who are mainly involved for adding items to the IR:

Library staff ☐

Institutional members ☐

Both ☐

9.11 Which software do you follow/will follow for building up your IR?

Software name	
DSpace	
GreenStone	
DigiTool	
E-Prints	
Bepress	
ETD-db	
Fedora	
DIGIBIB	
Others (Pis specify)	
Not decided	

9.12 Browsing options to retrieve items of IR:

a. Author b. Title c. Subject d. Date e. keyword

10. **Accessible Digital and Electronic Collections**

Item No.	Total Number
E-Journals (titles)	
E-books	
Online Databases (Subscribed and registered)	
E-Reports	
E-Theses/E-dissertations	
E-Encyclopedias	
E-Dictionaries	
E-Newspapers	

10.1 Please mention which one of the E-journals and online database subscribed/registered by your library.

Online Databases	**Please tick √**
JSTOR	
Emerald	
Oxford University Press	
ASM Journals	
SpringerLink	
Indian Journals	
Cochrane Library	
Hinari	
AGORA	
OARE	
Science Direct	
ProQuest	
EBSCOHost	
ARDI	
TRAVAX	
ISI Web of Science	
Scopus	

Ulrichsweb	
UptoDate	
Others (Pis specify):	

10.2 Digital resources access:

Access Mode	Yes	No
IP enabled (On campus access)		
User name and password		
MyAthens		

11. **Digital/Web based library services:**
Digital library services / facilities in the library which are operational (You may tick more than one)

Digital library services	**Please tick √**
OPAC	
Web OPAC	
Online renewal service	
Institutional Repository (IR)/Digital Repository (DR) service	
Online SDI service	
Online reservation	
Online reference query	
Web 2.0	
Electronic document delivery	
Mobile based services	
Remote access service	
RFID based services	
Wifi service	
Virtual reference service	
Distance learning service	
Internet service	
E-bulletin board service	
E-indexing and abstracting service	

12. **Library consortium/co-operation**

12.1 Are you a member of any e-resource consortium?
Yes ☐ No ☐

12.2 If yes please write the name of e-resources consortium-

BIPC (Bangladesh INASP-PERI Consortium) ☐
UDL (UGC Digital Library) ☐
BdREN (Bangladesh Research and Education Network) ☐

12.3 Do you have any plan to become a member of the e-resource consortium?
Yes ☐ No ☐

13. **Annual budget for digital library maintenance and customization**

13.1 What is the source of funding for your digitization activities?

Government ☐ Internal funding ☐ Other sources ☐

13.2 **Library Budget**

Budget	2013-14	2014-15	2015-16
Total library budget			
Allocation for e-resources			
ICT budget			
Digital library/institutional repository maintenance			
Library software development, up gradation, maintenance budget			

14. **Training of ICT and Digital Library**

14.1 Have any of the library staff been sent for these ICT training?

Yes ☐ No ☐

14.2 If yes please tick the types of training program:

Types of training	Please tick √
Introduction to computers	
Internet and World Wide Web	
Application software [e.g. power point, excel, access, word]	
Web design and home page Development	
Online searching skills	
Introduction and Overview of Digital Libraries	
Metadata and Foundations of Digital Libraries	
Architecture and Systems of Digital Libraries	
Digital Archiving and Preservation	
Digital library services	
Access and User Interfaces to Digital Libraries	
Others: Pls. specify:	

15. **Problems of digitization** (Rate through following five-point Likert scale)
(importance level: 5 = Extremely important; 4 = Very important; 3 = Important; 2 = Somewhat important; 1 = Not important)

Problems	1	2	3	4	5
1. Lack of budget					
2.Lack of IT staff					
3. Lack of professional staff					
4.Lack of training to make staff efficient					
5.Lack of Integrated library software					
6.Lack of digital library initiatives of the authorities					
7. Concern about cost of preservation and management of digital content					
8. Lack of ICT infrastructural facilities					
9. Low speed of internet connections					
10. Lack of knowledge of digital preservation					
11. Copyright issues/Digital Rights Management					
12. Lack of equipments to digitize library resources					
13. Lack of national digitization policy					
14. Administrative bureaucracy complexity					
15. Inadequate salaries for library personnel					
16. Lack of government concentration					
17. Others (please specify):					

16. Please provide your valuable suggestions (if any) to implement digital library system/institutional repository in medical libraries of Bangladesh:

_____
_____
_____
_____
_____
_____
_____
_____
_____

THANK YOU VERY MUCH FOR YOUR TIME, SUPPORT AND KIND COOPERATION

Signature: _____

Date: _____

Annexure 2: Questionnaire for Library Users

Section 1: Background Information

1. Name of the Institution: _____

2. Gender: Male: ☐ Female: ☐

3. Please indicate which category of user you belong to:

   ☐ Teacher ☐ Student

   ☐ Doctor ☐ Scientist

   ☐ Researcher ☐ Staff

   ☐ Others; please specify:

   _____

4. What is age group?

   ☐ 21-25 ☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ 56-65

5. If you are a professional, would you please mention your highest level of educational qualification:

   ☐ MBBS ☐ M Phil ☐ Diploma/MCPS ☐ MD ☐ MS ☐ FCPS
   ☐ MRCP ☐ PhD

   Others; please specify: _____

6. Purpose of library visit: ☐ Individual study ☐ Group study

   ☐ Reference work ☐ Internet use ☐ Preparing assignment

   ☐ Borrowing books

7. Frequency of library visit: ☐ Once in a week ☐ 2 to 3 times in a week

   ☐ 4 to 5 times in a week ☐ More than 5 times in a week

Section 2: Use of e-sources

8. Do you use e-resources from your organization?

   ☐ Yes ☐ No

If yes, answer the following questions:

9. Where do you access e-resources most?
   - ☐ At library
   - ☐ At work
   - ☐ At home
   - ☐ Remote access

10. Please specify which of the following e-resources do you use? (You can choose as many as you use)

Name of e-resources	Yes	No
E-books		
E-journals		
E-newspapers		
E-maps		
E-thesis		
E-research reports		

Name of e-resources	Yes	No
Internet/web resources		
Online Public Access Catalogue (OPAC)		
Institutional Repository (IR)		
Online databases		
Journal Citation Reports (JCR)		
Journal Impact Factors (JIF)		

11. How frequently do you access digital resources to search information?

☐ Daily
☐ Weekly
☐ Monthly
☐ Once or twice in month
☐ Fortnightly

12. How do you look for relevant e-resources on the Internet?

☐ Library Website
☐ Subject guides/portals on the Internet
☐ Web search engines
☐ Online databases with links to full text
☐ Other

13. Would you please indicate for what purpose do you use e-resources? (You can choose more than once)

☐ Research
☐ Learning
☐ Teaching
☐ Current information
☐ Flexibility of use
☐ Others, please specify:

14. Which features of e-resources do you consider to be the most important for the efficiency of your research/study?

☐ Quick retrieve ability
☐ Ease of use
☐ Up-to-date information
☐ Free availability
☐ Full text searching
☐ Others, please specify:

15. Have you ever taken any training course/tutorial/guide to use e-resources?

☐ Yes ☐ No

16. Please mention which one of the following e-resources are used by you. (Please indicate as many as you use)

Name of different databases	Yes	No	Name of different databases	Yes	No
PubMed			ARDI		
Hinari			UpToDate		
ScienceDirect			Travex		
ISI Web of Science			PLoS Journals		
Ebscohost			PubMed Central (PMC)		
ProQuest			BioMed Central (BMC)		
Springer Link			AGROA		
Oxford University Press			OARE		
JSTOR			Indian Journals		
ResearchGate			Wilely Online Library		
BanglaJOL			Institutional Repository		
DOAJ			Cambridge University Press		
Cochrane Library			POPLINE		
Scopus			Google scholar		

Section 3: Role of e-resources

17. Usefulness of e-resources

Excellent ☐
Very good ☐
Good ☐
Average ☐
Unsatisfactory ☐

18. If you use library paid e-resources, please indicate your level of satisfaction with the content and services provided; please rate by five-point Likert scale:

[5 = Excellent; 4 = Very good; 3 = Satisfactory; 2 = Barely satisfactory; 1= Poor]

SL#	Evaluation of quality of content	1	2	3	4	5
1	The level of e-resources available					
2	The coverage of my subject/work					
3	Ease of access					
4	Ease of use					
5	Availability of computer facilities in the library					
6	Adequate bandwidth to access the resources					
7	Easy navigation to resources from library					
8	Overall user satisfaction					

Section 4: Digital Library Activities

19. Which type of library do you prefer most to use?
[ ] Traditional library [ ] Digital library [ ] Hybrid library

20. Which types of search technique do you follow to access digital collections?
[ ] Key word [ ] Subject [ ] Author [ ] Date of publication
[ ] Journal title [ ] Title of the article

21. What is the level of your knowledge about digital library?
[ ] A lot [ ] A little [ ] Nothing

22. Which of the e-resources do you use most often?

☐ Electronic books
☐ Electronic journals
☐ Bibliographic databases
☐ Electronic theses
☐ Online datasets
☐ Online Public Access Catalogue (OPAC)
☐ Others,
please specify: _____

23. Which formats do you like most from a digital library to access?
☐ PDF ☐ HTML ☐ Plain Text ☐
☐ Bitmap page images with zoom in/out
Others (Specify): _____

24. Which search engines give you priority for access in digital information?

☐ Google ☐ Yahoo ☐ Bing ☐ Baidu ☐ AOL ☐ Ask.com ☐
Excite ☐ Lycos ☐

☐ Others (please specify): _____

25. Which of the browser do you use to access in a digital collection in your library?
[ ] Mozilla Firefox [ ] Google chrome [ ] Internet explorer
[ ] Opera mini [ ] Safari [ ] Others (Please specify):.....

26. Indicate your satisfaction with the digital library activities.

[ ] Highly satisfied [ ] Satisfied [ ] Neither satisfied nor dissatisfied
[ ] Dissatisfied [ ] Poor

27. Mention the impact of digital library with the rank list.
(Importance level: 5 = Strongly Agree; 4 = Agree; 3 = Fairly Agree; 2 = Disagree; 1 = Strongly Disagree)
Please Tick (√))

Factors	1	2	3	4	5
Save time					
Multiple access to information					
Timely access to information					
Improved use of information					
Updated and Hyperlinked information					

28. Please indicate the problems that you have faced for accessing digital resources in your library

(Importance level: 5 = Extremely important; 4 = Very important; 3 = Important; 2 = Somewhat important; 1 = Not important)

Please Tick (√))

Barriers	**1**	**2**	**3**	**4**	**5**
Slow connection speed					
Login problems					
Low bandwidth					
Slow information download					
High cost of access					
Accessibility of websites					
No Internet access					
Inadequate searching skills					
No training of use of e-resources					

29. If you have any suggestions or comments about digital library practices in Bangladesh, Please, mention below

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Thank you so much for your kind efforts and cooperation!