Towards the Establishment of Digital Library: An Investigation into the Current Status of University Libraries in Bangladesh

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Towards the Establishment of Digital Library: An Investigation into the Current Status of University Libraries in Bangladesh

by

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Abstract

Purpose

The main aim of this research is to assess the current status of digital library services in Bangladesh. It examines the use of and satisfaction with university subscribed online resources by the faculty members, identify impediments faced by them in case of managing and accessing e-resources. It also provides recommendations for overcoming the problems that hinder the development of digital library and access to digital resources by the faculty members.

Methodology

This study employs a quantitative research methodology for collecting data from the librarians and faculty members. A total of 45 public and 103 private universities were primarily selected for the survey. Two sets of structured questionnaires were designed as instruments of collecting data which contained both open- and close-ended questions. Chi-square and non-parametric tests such as Mann-Whitney and Kruskal-Wallis were carried out.

Major findings

Two categories of results were reported in this study, such as (1) findings which covered the current status of digital library initiatives, and (2) faculty perceptions towards digital resources in both public and private universities in Bangladesh. From the library survey, it was found that most university libraries lack IT-related facilities and majority of the libraries were partially automated and only a few libraries were fully automated. Besides, the training on the use of databases, digital content management, network administration, metadata management, etc. are crucially needed for the library staff working at various public and private universities in the country. The faculty survey results revealed that university teachers are well aware of digital resources but due to the inadequate IT infrastructure and insufficient access to e-resources, they were not generally satisfied with the current level of e-resources accessed by the libraries.

Originality/Value

This is the first time an attempt has been made to assess the current status of digital library and at the same time the use of university-paid digital resources by the faculty members in Bangladesh.

Keywords*:* Digital Library, Electronic Resources, Faculty Members, Public Universities, Private Universities, Bangladesh.

Department of Information Science and Library Management

University of Dhaka

Certificate of Approval

The thesis entitled **"Towards the Establishment of Digital Library: An Investigation into the Current Status of University Libraries in Bangladesh"**, submitted by Umme Habiba (Reg. No.250) for the award of the degree of Master of Philosophy (MPhil) in the Department of Information Science and Library Management, University of Dhaka, is a unique piece of research conducted under my supervision and guidance.

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

Professor Dr. S.M. Zabed Ahmed

Supervisor

Declaration

I hereby certify that the thesis entitled "Towards the Establishment of Digital Library: An Investigation into the Current Status of University Libraries in Bangladesh", submitted to the University of Dhaka, in partial fulfillment of the requirements for the award of the degree of Master of Philosophy (MPhil) in Information Science and Library Management, is the result of my own research work conducted under the supervision and guidance of Professor Dr. S.M. Zabed Ahmed.

The content of this thesis has not been previously submitted to any other university or institution for the award of any degree/diploma. I have duly acknowledged all the sources of information which have been used in the thesis.

Umme Habiba
June 2019

Dedicated to…….

My loving parents and my beloved son Ahnaf Adil…

Acknowledgement

I am profoundly grateful to all those individual and organizations who have helped and encouraged me in pursuing this research study. As part of this research, I had to collect primary data from different public and private university libraries in Bangladesh. I am grateful to the librarians and faculty members of those public and private university libraries who provided me necessary information and extended all possible helps for this work. I owe my deepest gratitude to the authors whose works I have used in this study as I had to depend on different national and international publications for the background information for this thesis.

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June 2019 Umme Habiba

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List of Acronyms/Abbreviations

ADL	Africa Digital Library
AIC	Agriculture Information Centre
ALA	American Library Association
BANBEIS	Bangladesh Bureau of Educational Information and Statistics
BANSDOC	Bangladesh National Scientific and Technical Documentation Centre
BARC	Bangladesh Agriculture Research Council
BASIS	Bangladesh Association of Software &Information Services
BBS	Badcock University Business School
BIPC	Bangladesh INASP-PERI Consortium
BdREN	Bangladesh Research & Education Network
CAS	Current Awareness Service
CD-ROM	Compact Disc-Read Only Memory
CDS	Cataloguing Distribution Service
DARPA	Defense Advanced Research Project Agency
DDS	Document Delivery Service
DL	Digital Library
DLESE	Digital Library for Earth System Education
DLI	Digital Library Initiatives
DLMS	Digital Library Management System
DLS	Digital Library System
DRM	Digital Resource Management
DRS	Digital Reference Service
DVD	Digital Versatile Disc
E-Bank	Electronic Bank
E-BOOK	Electronic Book
ELINOR	Electronic Library Information Online Retrieval
E-PRINT	Electronic Print
E-RESOURCE	Electronic Resource

ESE	European Semantic Elements
ETD	Electronic Theses and Dissertations
E-Journal	Electronic Journal
FAO	Food and Agriculture Organization of United Nations
FTP	File Transfer Protocol
FOSS	Free and Open Source Software
GLAS	Graphic Library Automation System
HEC	Higher Education Commission
HEQEP	Higher Education Quality Enhancement Project
HTML	Hypertext Markup Language
IBM	International Business Machines Corp
ICT	Information Communication Technology
icddr,b	International Centre for Diarrhoeal Disease Research, Bangladesh
IEMSR	Information Environment Metadata Schema Registry
IFLA	International Federation of Library Associations and Institutions
ILO	International Labor Organization
ILS	Integrated Library System
INFLIBNET	Information and Library Network
IRS	Information Retrieval System
ISIS	Integrated Set of Information System
IT	Information Technology
JISC	Joint Information Systems Committee
LANL	Los Alamos National Laboratory
LDI	Library Digital Initiatives
LiCoB	Library Consortium of Bangladesh
LIS	Library and Information Science
LTRS	Langley Technical Report Server
MARC	Machine Readable Cataloguing
MoE	Ministry of Education
NASA	National Aeronautics and Space Administration
NCERT	National Council of Educational Research
NCSTRL	Networked Computer Science Technical Reference Library
NDLTD	Networked Digital Library of Theses and Dissertation

NGO	Non-governmental Organization
NSDL	National Science Digital Library
NSF	National Science Foundation
NTRS	NASA Technical Report Server
OAI-PMH	Open Archives Initiative-Protocol for Metadata Harvesting
OCLC	Online Computer Library Center
OPAC	Online Public Access Catalogue
OS	Open Source
PC	Personal Computer
PDF	Portable Document Format
PRR	Pakistan Research Repository
RDF	Resource Description Framework
RDN	Resource Discovery Network
RFID	Radio Frequency Identification
RSS	Really Simple Syndication
RQ	Research Question
SEM	Structural Equation Modelling
SMETE	Science, Mathematics, Engineering and Technology Education
SPSS	Statistical Package for Social Sciences
STI	Scientific and Technical Information
UDL	UGC Digital Library
UGC	University Grants Commission
UKOLN	UK Office for Library and Information Networking
UNDL	United Nations Digital Library
Wi-Fi	Wireless Fidelity
WWW	World Wide Web

Chapter 1
Introduction

1.1 Background of the Study

The university library is regarded as the "heart of the university". It is regarded as the brain and the focal point of intellectual activities (ALA, 2010). Additionally, libraries are the social institution which intended to maintain and preserve human knowledge and their creativity for centuries. In today's world, libraries are not only considered as a collection of reading resources, they are more commonly recognized as study space. Libraries are providing reading facilities with study-friendly environment and learning opportunity. Furthermore, new and emerging digital technologies have offered many opportunities for the libraries to provide access to the users, no matter where they are and how many they are. This type of change in approach and technology has introduced the concept of digital libraries (Hussain & Mahmood, 2012).

In recent time, the emergence of information and communication technologies (ICTs) has created a dynamic transformation in the structure and functioning of the library and information centres. The traditional library system has been converted into e-learning and virtual learning system. In order to secure the maximum use of information resources for remote users, there is a dire need of digitizing those resources and making them accessible through the web. The most prominent features of such a digitization procedure are to produce digital contents, because without generating contents in digital forms, libraries will not be able to provide services in digital formats to their remote users (Mahapatra, 2012).

Application of information technology in libraries can largely be classified into two main categories:

1. Creation of information, knowledge; and
2. Its distribution and communication to the user communities (Kavitha, 2009).

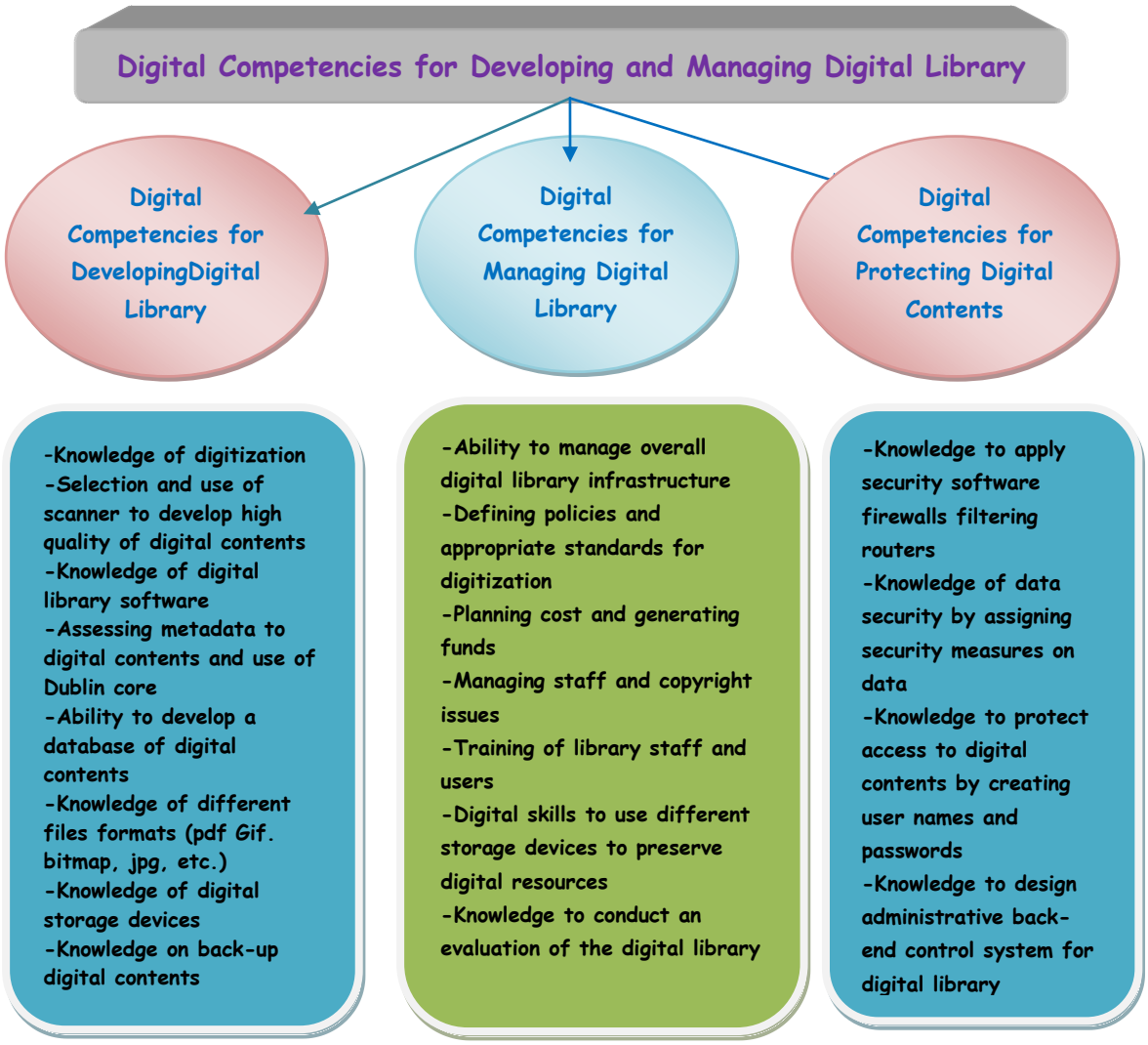
Previously, the foremost responsibility of the librarian was to determine resources according to user needs but now the same has been prolonged to the creation and maintenance of websites, teaching specific references, and other activities. Similarly, the

performance of the librarian and the information officer is changing in the digital library (DL) environment with the growing need to gain new skills for developing and managing digital sources and services (Jain & Babbar, 2006). Moreover, the use of digital information accessories in libraries and information centres necessitates the technological skills to successfully navigate through digital information. Librarians need to acquire new competencies to work efficiently in this digital environment and to meet the challenges of digital librarianship.

Sreenivasulu (2000) noted that digital librarians may be regarded as the managers of digital libraries. A digital librarian has a changing role in providing digital information resources to users by utilizing technology. Machlin-Mastromatteo (2009) regarded digital librarians as professionals with a good practical knowledge of information and communication technologies (ICTs), and that librarians with digital experiences have possibilities to become digital librarians by applying technology in libraries. Khan & Bhatti (2017) categorized the digital skills that are required for developing and managing digital libraries into three main groups (see figure 1).

Kabej, Habib & Hossain (2012) described the major responsibilities of digital librarians, such as forming a web-based integrated library management system, creating a sustainable digital collection, enhancing searching facilities, extending the existing networking systems, promoting electronic documentation services, establishing an computerized tracking of library resources using RFID(Radio-Frequency Identification) that will assure security and also automated circulation systems, etc. If the library professionals perform these responsibilities accurately, then an automated integrated library system can be developed, and all significant functions of the library can be provided through this system.

Figure 1.1: Digital Competencies for Developing and Managing Digital Library



Source: Khan & Bhatti (2017)

With the accelerated growth and use of the internet and web-based technologies, the functional activities and services of most academic libraries in the developed countries are now being automated. Building IT-based information services comprise huge investment in terms of equipment and training and for the acquisition of electronic resources. Consequently, developing countries like Bangladesh are not being benefited much from the rapid improvement of IT applications in libraries. In recent years, several universities in Bangladesh have begun to build their automated catalogues and accessing online resources mostly through LiCoB, UDL and UN-supported Research4Life programs like HINARI, AGORA, OARE, ARDI and GOALI. Despite these initiatives,

Ahmed (2013a) reported that both faculty members and students at public universities in Bangladesh are not satisfied with the current level of online resources.

Ahmed (2014) further examined the present status of the public universities in terms of library collections, IT infrastructure and training need to establish IT-based information services. The findings showed that there are inadequacies in library resources, automation practices, access to online resources and IT facilities in the universities in Bangladesh. The present research will examine the existing status of building digital libraries, IT infrastructure, training requirements, problems in using digital resources by faculty members, their satisfactions with university paid e-resources, and the problems that the faculty members encountered while accessing digital resources.

1.2 Digital Library and Digital Resources: A Brief Overview

1.2.1 Digital Library

The use of information and communication technologies or digital technologies allows the user for easy access and retrieval of various digital resources available in libraries over the internet or online via interactive networks. The real meaning of a digital library or digital archive is to collect, assure long-term preservation or to offer an easy and convenient means of access to its resources. Similarly, the notion of a digital library has many explanations and various definitions that need to be managed with proper supervision. It is often claimed that the internet is a huge digital library, which is incorrect. The internet is a collection of crowds of documents and has nothing about the selection of materials (Cleveland, 1998). Even the Library of Congress says it does not collect everything and would not want it either. Similarly, it is tempting to use the term digital library for any gathering of the digital object that has some means of navigation and retrieval (Jones, Andrew & MacColl, 2006).

Digitization is a process of transforming the traditional contents of physical media (analog) into digital format. A simple definition of a digital library is a "managed collection of information, with associated services, where the information is stored in digital formats and accessible over a network" (Arms, 2000, p.2). Likewise, Witten and Bainbridge (2009) defined, digital library as "a focused collection of digital objects, including text, video, and audio, along with methods for access and retrieval, and for

selection, organization, and maintenance of the collection" (p.7). The digital library structured can be viewed as:

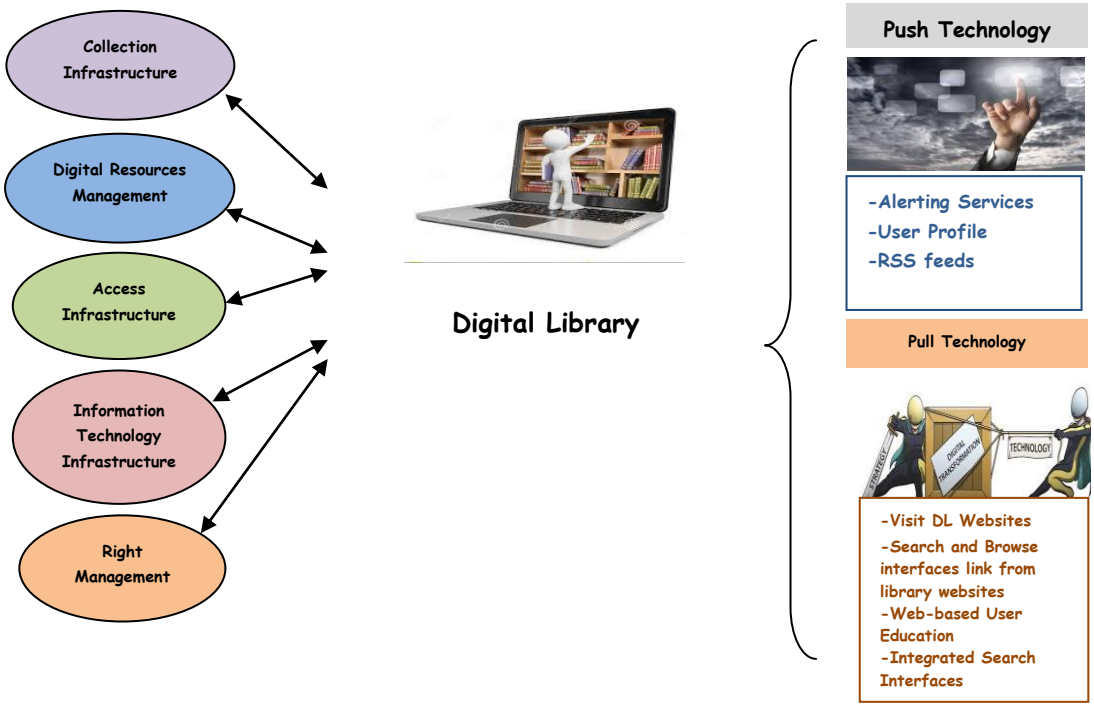


Figure 1.2: Digital Library Infrastructure and Services

Source: http://lisp8.epgpbooks.inflibnet.ac.in/chapter/chapter-1/

In the evolution and growth of digital technologies, digital resources have grown rapidly. Nevertheless, majority of the users may believe that a digital library is just an alternative to accessing online databases, and thus only a few users might be interested in using the services and information in the digital library (Yang, Yuan, Cheng & Liu, 2012).

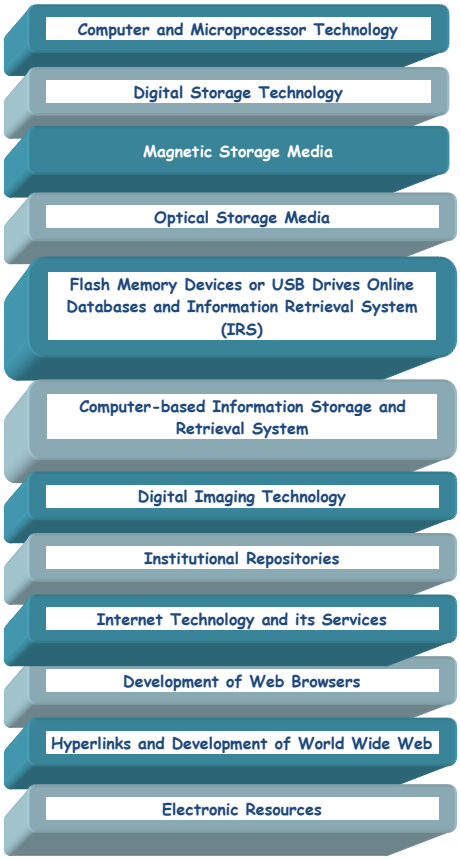


Figure 1.3: Digital Technology as Chronological Stage

1.2.1.1 Characteristics of Digital Libraries

A digital library assures equal and convenient access to a vast amount of different resources in a shared mode and overcoming all the conventional limitations of time and space. Digital libraries have the following features blended with them:

- Digital library preserves the valuable records, rare and special collections of libraries, archives, and museums;
- Digital libraries are the digital embodiment of traditional libraries and cover both electronic as well as traditional and other resources;
- Access to the digital library resources is not limited in space or time. It can be accessed from any place at any time;
- Digital libraries allow access to its resources to various users concurrently, these contents can be listed in various ways by different users simultaneously;

- Digital libraries have collections which are vast and continue over time, these are well- established and controlled, exist various formats, include objects and not just their representations and include some objects that are born digital;
- Resource in digital form will unwaveringly rise and content in printed form will decrease;
- Expense on electronic resources will steadily increase and comparatively, expenditure on traditional resources will decrease;
- Expense on information will move from ownership to subscription and licensing; and
- Expenditure on equipment and infrastructure will increase.

Fox & Marchionini (1998) recognized the following four dimensions of digital libraries:

1. ***Community:*** shows social, political, legal and cultural issues;
2. ***Technology:*** involves technical development in computing, networking, information storage and retrieval, multimedia, interface design, etc.;
3. ***Services:*** incorporates the present and future services, personalization, digital reference services (DRS), real-time question answering, on-demand help, information literacy, and user engagement mechanisms; and
4. ***Content:*** describes all possible kinds of forms and sort of information, printed as well as digital.

It is crucial that digital libraries support organized and structured access to information resources in a shared environment and help user communities in searching, evaluating and using resources irrespective of their format.

1.2.1.2 Benefits of Digital Library

There are numerous advantages of digital libraries, including:

Access to the library from anywhere: Digital libraries are convenient to use from anywhere. The user with a computer with an internet connection can use the library from anywhere in the world. There's no necessity to tour the library for reading a book or collect the necessary information. Library user can explore the library and obtain needed information resources from their PC, home, or workstations.

Access 24/7: A digital library has no time and space frames. Users can use or access the digital library at any time.

Widespread access: The digital library system carries exceptional access to users. It is possible for a different range of users to reach more information and often concurrently. For instance, in a traditional library system, there could be one or two copies of a book restricting only two users to use the book. But in the case of the digital library access, numerous users than the number of copies can access the same item.

Information sharing: Through the digital library, it has become easier to share information with various institutions/ library and information centres. At present, any library or information centre can explore information from other library or information centre without physically going.

Provide current information: In a digital library system, it is easy to update information without wasting much time and labour.

New forms of access: A digital library can satisfy synchronous access requests for the same electronic resources by simply producing multiple copies of the demanded document.

Improved preservation: Through metadata and information exchange protocols, digital libraries can easily share information with other digital libraries and produce enhanced access to users (FAO & UNESCO, 2005).

1.2.2 Digital Resources

In today's world, the information needs of scholars and information seekers are met through a plenty of sources. The digital resources available in a library or information centres played a leading role in supporting access to desired information to the users in an easy and quick way. Moreover, in the traditional system, one need to go to the library to make usage of print formats while as the digital resource users can be made use of by any user by online access via networks or authentication processes at any time by conveniently sitting at home or office. Nevertheless, it is a crucial fact that one should be familiar with the use and exploring of digital resources for their quick and efficient

practice. Besides, digital resources can also be used for effective retrieval of needed information resources. Hence, digital resources in a library perform a vital role in academic libraries as they are mostly harmonized for the development of academic excellence and research. In view of all this, digital resources like internet, CD-ROM and online databases, diverse online journals, OPACs, etc., are gradually replacing the value and usage of print media (Kalbande & Ingle, 2013).

Nowadays, digital resources play an indispensable role in every intellectual movement of higher education (Thangavel & Jayaprakash, 2017). However, intellectual activities of the universities have started investment extensively to provide better service to their library users through easy access of digital resources for the improvement of learning and teaching and research activities (Sundararajan & Balasubramanian, 2018). Moreover, the web-based technologies offer entrance to endless sources of information and search engines which is continuously being developed to give adequate and efficient ways to assist all the users to find out the required information instantly.

The digital resource is characterized as those electronic information resources and services that users access electronically via the computer network technologies from inside the library or remote to the library (Shim *et al.*, 2001).

According to Barker, there are three types of documents used in electronic resources.
(a) Static- Static is the most basic and they contain fixed information and never change their form (such as traditional online data).

(b) Dynamic-Dynamic resources also accommodate fixed information but also able to change their outward form, the way embedded material is presented to users (such as multimedia CD-ROMs).

(c) Living -Living documents are able to change both their form (outward appearance) and this embedded information such as information contained on the web (Devi, 2010).

Roe (2013) described, "electronic resources consist of data (information representing numbers, text, graphics, images, maps, moving images, music, sounds, etc.), programs (instructions, etc., that process the data for use), or combinations of data and programs" (p.106).

According to Thanuskodi (2014), the term electronic resources include “electronic books and journals, bibliographic databases and library website pages” (p.69).

1.2.2.1 Characteristics of Electronic Resources

Electronic resources are an integral part of the educational system whose primary function is to serve users (students, academic and researchers). Electronic resources are also increasingly important to the research process and the majority of research scholars have embraced electronic content. E-resources are also providing a number of benefits in contrast to print resources including fast and easy access, particularly while users are searching retrospectively.

The features of digital resources are given below:

- Digital resources are not restricted and can be used from anywhere, without one even knowing where it is stored geographically;
- Diverse users can utilize the same database or electronic resources at the same time.
- Electronic documents are easily reproduced;
- Documents or other resources stored electronically are very flexible.
- They are easy to update, reorganize, reformat, and consolidate with other documents;
- Collections of documents or resources stored in electronic form are now less cumbersome than paper versions. The trend is to even vaster compactness;
- Do not require physical space and time, space and cost constraints are not a problem in search strategies;
- Hyperlinks direct the users quickly to the required information sources.

Finally, digital resources are those resources which comprise contents in an electronic or digital format that can be reached via the internet in the digital library environment. In this thesis, an attempt has been made to show the use of digital resources by faculty members at public and private universities in Bangladesh.

1.3 Significance of the Study

In the modern era of information explosion, the enormous flow of publications is becoming web-technology enabled. Most of the university libraries have changed their delivery of services towards these functions and services. The traditional environment is rapidly growing to an electronic environment. These technological changes prompted the current research to reveal the existing status of digital library building initiative taken by university libraries and the use of digital resources by faculty members in both public and private universities in Bangladesh.

This study will help to understand the current status of the digital library infrastructures in Bangladesh. The findings of the study will be helpful in investigating the difficulties faced by the librarians and their needs and requirements in establishing digital libraries. It will also help in assessing faculty members' satisfaction with university paid e-resources. Recommendations and suggestions cited in this study will act as a guideline for librarians and their users in building successful digital libraries.

Furthermore, if the recommendations highlighted are completely implemented, it would be possible to solve the difficulties faced by the library staff for building and managing the digital library and the faculty members' use and access of digital resources.

1.4 Statement of the Problem

Tertiary educational institutions regarded as the hubs of learning and knowledge creation, and the student, academic staff, administrative staff, researchers and librarian's performance are associated with information. The construction of digital libraries in university libraries of Bangladesh has not still exposed to acceptable development. Inadequate information technology (IT) infrastructure in libraries, lack of skilled professionals, and budget limitations might be regarded as important problems.

There is a need to identify the essential digital competencies for developing and maintaining digital libraries so that the librarians in Bangladesh may receive these skills to fulfil the digital information needs of library users. It is also important to measure the existing status of digital competencies among librarians to address the challenges of digital librarianship. Moreover, it is also necessary to find out the user related issues such

as digital resources use and access for various purposes and the problems they faced while accessing these resources.

Previous studies revealed digital competencies of university librarians and faculty members for developing and managing digital libraries and for using and accessing digital resources in Bangladesh perspective. None of these research studies was conducted with both service provider and receiver (e.g. librarians and faculty members) regarding digital library and its sources and services. Hence, the aforementioned gap in literature assured the study of the establishment of digital library and use of digital resources by faculty members. The findings will also assist to recognize the necessity for training sessions for those who have inadequate knowledge of IT-infrastructure of building a digital library and digital competencies of faculty members in using these digital resources. The present study attempts to narrow this gap in a comprehensive way.

1.5 Objectives of the Research

The main aim of this research was to assess the existing status of digital library services in Bangladesh. It also examines the use and satisfaction with university subscribed e-resources by the faculty members, identify impediments faced by them in case of managing and accessing the resources and also provide possible recommendations for overcoming all the problems that hinder for building a digital library and faculty members access to digital resources.

1. assess the existing situations of IT facilities at university libraries in terms of implementing digital libraries at public and private universities in Bangladesh;
2. assess the contemporary use of digital resources by the faculty members and level of satisfaction of the faculty members with university paid e-resources; and
3. identify the problems that hinder in developing and managing digital libraries and suggest ways to improve access to digital resources for the universities.

1.6 Research Question

In order to comply with the aforementioned purposes, this study has formulated the following research questions-

RQ1.What is the existing situations of IT facilities at university libraries in terms of implementing digital libraries at public and private universities in Bangladesh?

RQ 2. What is the status of contemporary use of digital resources by the faculty members and level of satisfaction of the faculty members with university paid e-resources?

RQ 3. What are the problems that hinder in developing and managing digital libraries and suggest ways to improve access to digital resources for the universities?

1.7 Terminology Used in the Study

Digital Library System (DLS)

Digital Library System is a software system that is based on a specified architecture and gives all functionality needed by a particular Digital Library. Users interact with a Digital Library by the corresponding Digital Library System.

Digital Library Management System (DLMS)

A generic software system that provides the suitable software infrastructure both (a) to create and manage a Digital Library System combining the suite of functionality considered foundational for Digital Libraries and (b) to blend supplementary software allowing more refined, specialized, or advanced functionality.

DSpace

DSpace is a digital asset management system to create, index and retrieve various forms of digital content. It is adaptable to diverse community requirements specifically in a university setting.

Electronic Databases

Electronic databases are utilized in the library by faculty members, researchers and students to give access to gigantic academic information which is very vital to their overall academic activities and their productivity (Akinola, Shorunke, Ajayi, Odefadehan & Ibikunle, 2018).

Electronic or Digital Library

Electronic library or digital library is a library comprising of electronic sources and services. Electronic or digital resources can incorporate all digital materials, as well as a mixture of traditional formats that need electricity to practice them. Thus, the term

"electronic library" contains all the resources that can be held by a "digital library", and is, therefore, more inclusive (Roy, 1999).

EPrints

EPrints is a free and open-source software package for creating open access repositories that are compliant with the Open Archives Initiative Protocol for Metadata Harvesting. It shares several of the characteristics usually observed in document management systems but is essentially utilized for institutional repositories and scientific journals (Wikipedia, 2019).

Faculty Members

Faculty members or academics are academic personnel who work in a university, and they are essentially connected with learning, teaching, research and consultancy activities.

Fedora

Fedora is a robust, modular, open source repository system for the management and dissemination of digital content. It is especially suited for digital libraries and archives, both for access and preservation. It is also used to provide specialized access to very large and complex digital collections of historic and cultural materials as well as scientific data. Fedora has a worldwide installed user base that includes academic and cultural heritage organizations, universities, research institutions, university libraries, national libraries, and government agencies.

Full text

Full text indicates that the whole journal article/text is available. The full text of a document gives the format choice to the users in a place of just a citation or abstract, it is basically available in pdf or HTML format.

Greenstone

Greenstone is a set of software tools for establishing, administering and disseminating digital library collections on the internet or CD-ROM. It is open-source, multilingual software, issued under the terms of the GNU General Public License. Greenstone is designed by the New Zealand Digital Library Project at the University of Waikato and has been developed and disseminated in cooperation with UNESCO and the Human Info NGO in Belgium (Wikipedia, 2019).

Institutional Repository

The institutional repository is a set of services that a research institution/organization/ university offer to the library staff and user communities for the management and distribution of digital resources produced by the institution and its community members.

LIS Professional

LIS professionals have been applied to mean that work in the library to distribute library sources and services according to user's demand. They should have knowledge of ICT and effective quality for maintaining and disseminating quality services to the user's community**.**

OAI-PMH

The Open Archives Initiative-Protocol for Metadata Harvesting has become the de facto standard for metadata harvesting. Thus, service providers of digital libraries can accumulate metadata, index them and provide useful search results. The examples of OAI verbs show output in XML.

Respondents

Respondents in this research refer to the university librarian, library staff and library users (e.g., students, academics, researchers).

Researcher

A researcher is the research scholars who conduct research on a topic or interested fields of knowledge.

RFID

RFID (radio frequency identification) is a form of radio communication that combines the use of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely recognize an object, animal or person**.**

Sci-Hub

Sci-Hub accommodates academic articles available for straight download without needing subscription or payment. Sci-Hub stores many of the articles by neglecting copyrights obligations.

University

Universities refer to the highest level of educational institutions where students study for degrees and do their academic researches work. Bangladesh has 45 Public universities and 103 private universities. This study was done in some leading public and private universities among them.

University Library

A University library is a library that is connected to a University, serving the teaching and research needs of students and staff. These libraries serve two corresponding purposes: to promote the academic curriculum and to support the research of the university faculty, researcher and students.

Virtual Library

Virtual Library is a system of virtual reality sophisticated computer simulations could be applied to provide users with library and information services by electronic means with networked document delivery and access, as if from a real library but without a physical entity really is being needed. The term is frequently utilized loosely for networked access to conventional library resources (Prytherch, 2005).

1.8 Structure of the Thesis

The thesis is organized into eight chapters as shown in figure 1.4

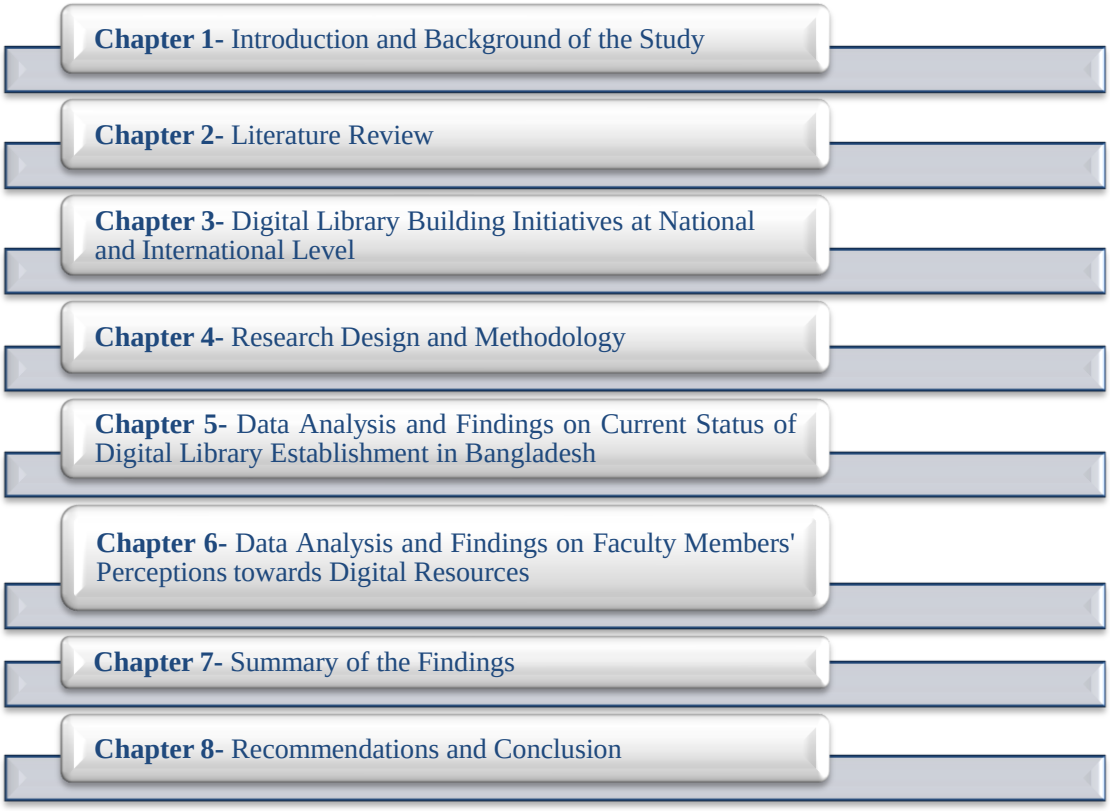


Figure 1.4: Schematic View of the Thesis Chapters

Chapter 1: Introduction and Background of the Study

This current Chapter comprises the introduction, digital library, and digital resources: a brief overview, significance of the study, statement of the problem, purposes of the study, research questions, scope and limitations of the study, terminologies employed in the study and structure of the dissertation.

Chapter 2: Literature Review

This Chapter reviews of relevant studies conducted on different aspects of digital libraries such as the concept and evolution of digital library and digital resources, the concept of library users, ICT infrastructures for developing digital libraries, digital competencies of librarians for building and managing digital library, use of and satisfaction with digital library, its sources and services, obstacles to digitization and use of digital resources.

Chapter 3: Digital Library Initiatives at National and International Levels

This chapter covers the digital library initiatives undertaken at both national and international levels.

Chapter 4: Research Design and Methodology

In this Chapter, the research design, sources of data, sampling methods, questionnaire structure, pilot study, questionnaire distribution systems, data processing and analysis, interpretation of results and implementation of the thesis are explained.

Chapter 5: Data Analysis and Findings on Current Status of Digital Library Establishment in Bangladesh

This Chapter covers the analysis of data collected from the questionnaires that were previously distributed to the librarians of both public and private universities and presentations of findings.

Chapter 6: Data Analysis and Findings on Faculty Members' Perceptions towards Digital Resources

This Chapter covers the analysis of data collected from the questionnaires that were distributed to faculty members of both public and private university libraries in Bangladesh and presentations of findings.

Chapter 7: Summary of the Findings

This Chapter summarizes the results and key findings of the study from Chapter 4and Chapter 5 which include responses from academics and library staff.

Chapter 8: Recommendations and Conclusion

This Chapter consolidated the answer to all the research questions, which is added in the introduction chapter reflecting suggestions, and recommendations of the study.

1.9 Conclusion

This Chapter presented the background for the research with a brief introduction about the research as a whole and what will be discussed in the subsequent chapters. It stated the research problem and discussed the significance of conducting the current research. The next Chapter will review the relevant literature.

Chapter 2

Review of the Literature

2.1 Introduction:

This chapter presents a thorough review of the relevant works regarding the concept of the digital library, digital resources and services, concepts of library users, ICT infrastructures, the initiative taken for building digital library both in national and international level, facilities available in the library for library users, difficulties faced by the library staff and users, etc.

In this era of digital library and digital resources, a great number of studies have been conveyed and increased continuously. A group of closely related literature was examined by exploring web technologies and also gathered a huge amount of articles from renowned journal articles, research monographs, thesis, conference volumes, books, book chapters, etc., for the purpose of obtaining ideas and concept mapping based on the research arena and it was also observed closely linked research works for literature reviewing. It is extremely hard to examine or read the entire body of research. Consequently, some of the considerations in the perspectives of digital library and digital resources issues are critiqued. This study provides bird's eye view of some of the libraries including both public and private universities in Bangladesh involved in digitizing its collections and issues faced by library staff and faculty members as well as what are the initiatives to be taken while maintaining the digital library.

The literature reviewed for this research is grouped under the following key topics:

- Concept of the digital library;
- Concepts of digital resources;
- Concepts of library users;
- The ICT Infrastructures for developing digital libraries;
- Digital competencies of librarians for building and managing digital library;
- The use, purpose of using and satisfaction with digital library, digital resources and services;
- Barriers to digitization and use of digital resources; and
- Digital library building initiative at national and international levels.

Finally, this Chapter indicates the research gaps based on available literature with an assumption that the present study will be able to narrow the gap.

2.2 Concept of Digital Library:

The term digital library was first introduced by the NSF/DARPA/NASA digital libraries Initiative in 1994 with the congeniality of the computer networks of the information resources (Fox, 1999). The term digital library, moreover, is used interchangeably with "virtual library" or "electronic library" or "library without wall". Digital library ordinarily belongs to the meta-resources or subject gateways that extended to virtual approachability of digital collections from diverse sources without the users even grasping where the resource actually remains. Additionally, the electronic library is a library consisting of electronic materials and services. Electronic materials can encompass all digital substances, as well as a variety of analog formats that require electricity to practice. Unlike digital libraries, virtual libraries do not consist of full-text resources as an alternative, they are more like an index of relevant, hand-picked links to resources available on the Web. Moreover, the term "hybrid library" was first introduced by Chris Rusbridge in 1998 in a paper published in D-Lib Magazine. The earliest definition of 'hybrid library' was delivered by Sutton (1996) as, "the balance of print and digital meta-information leans increasingly toward the digital" (p.136).

Virtual libraries produce online access to specialized collections of information resources which incorporate bibliographic citations with links to full-text records and other online resources such as video or images. Virtual libraries can also serve as gateways to information and resources on information science, management, and make policy for researchers, scientists, resource managers, policymakers, stakeholders, and the general public.

2.2.1 Definitions of Digital Library:

Digital libraries can be defined as the most complex and advanced forms of information systems, because they are usually involved in various activities such as collaboration support, digital contents maintenance and preservation, shared database management, hypertext, information filtering, information retrieval, instructional modules, intellectual property rights management, multimedia and web-based information services, question

answering and reference services, resource discovery, Selective Dissemination of Information and Current Awareness Services.

According to Oppenheim (1999), “one of the key points to the digital library is that the information accessed can be remote from the point of access in multiple locations. This means that the place where that access takes place need not be the traditional library building: it could be a workstation situated outside the library” (p. 98).

On the other hand, Rao (2004) informed that a digital library serves the same purpose, functions, and goals as a traditional library; the “digital” part of the term indicates merely that the material is stored digitally and accessed over the internet. The digital library is an umbrella term for conceptual modes of libraries of the future that concentrates on the outline of services linked almost totally with digital content and to express those features of existing library services that have vital elements (Prytherch, 2005; Hussain & Mahmood, 2012).

The British Library’s digital library program defines “digital library as the widely accepted descriptor for the use of digital technologies to acquire, store, conserve and provide access to information and materials in whatever form it was originally published” (p.338).

Gladney *et al.* (1994) provide the most widespread definition of the digital library. He said that, "a digital library is a collection of digital computing, storage, and communications tools together with the content and software which are needed to reproduce, emulate and extend the services provided by conventional libraries based on paper and other material means of collecting, cataloguing, finding, and disseminating information” (Bansode & Pujar, 2008, p.22).

Drabenstott (1994) has identified the following basic elements from several definitions of digital libraries:

- Digital library is not a single entity;
- Digital library requires technology to link the resources of many;
- Its linkages between the many digital libraries and information services are transparent to the end users;

- Universal access to digital libraries and information services is a goal;
- Digital library collections are not limited to document surrogates; they extend to digital artifacts that cannot be represented or distributed in printed forms.

Borgman (1999) examined the definitions of digital libraries, and suggests that a digital library is:

- a service;
- an architecture;
- information resources, databases, text, numbers, graphics, sound, video, etc; and
- a set of tools and capabilities to locate, retrieve and utilize the information resources available (Bansode & Pujar, 2008; Shuva, 2012).

Digital Library Federation (1998) defines digital library as an organization 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 overtime of collections of digital works so that they are readily and economically available for use by a defined community or set of communities" (para 2).

Digital libraries are managed acquisitions of digital objects, formed or procured according to the principles of collection development, in which information is stored and disseminated in digital form with the associated value-added services necessary to allow users to recover and utilize the resources just as in a traditional library. The e-resources in a digital library are readily available with a number of user-friendly environments, and proper methodology guarantees the diligence of such contents over time.

Digital libraries have developed, and advancements in information technology have changed the concept of the library from print and paper media to electronic media. The success of a digital library depends upon the computers, communication skills, and knowledge of library professionals in connection with modern technology (Bhattacharya, 2004).

2.3 Concept of Digital/Electronic Resources

At present, the times are changing with the internet access and electronic reading materials. Visiting the library is no longer a requirement for today's learners. The library has become a great deal over the last decade, due to changing needs from researchers, teachers, and broadly the learners and the inception of a digital revolution of library holdings (Anuradha, 2018).

2.3.1 Evolutions of Digital/Electronic Resources

The first digital resources emerged in the form of bibliographic records in libraries. Machine Readable Cataloguing (MARC) used to produce records that could be read by computers and shared among libraries in the 1960s, which was developed by American computer scientist Henriette Avram (Schudel, 2006). MARC can be recognized as a significant development in this concern. In the meanwhile, automation of libraries commenced in a prominent way in the 1970s with the installation of integrated library automation packages.

Library automation flourished in the early 1980s with the implantation of PCs at a cost affordable to the libraries. The automated catalogues of individual libraries directed to the creation of union catalogues through library networks like Online Computer Library Center (OCLC) that were formed to facilitate online retrieval and copy cataloguing records and for resource sharing with other libraries. Library OPACs and union databases were accessible from remote locations in the early year of the 1970s. Moreover, online exploration services, like DIALOG, ORBIT, BRS Search and Datastar in the USA; BLAISE and PergamonInfoline in the UK; DIMDI in Germany; Euronet and Diane in Europe; ESA-IRS in Italy; and CAN/OLE in Canada, etc. were also made accessible online to the research community. The form of bibliographic and full-text databases on CD ROM by late 1980s can be recognized as a major discovery in the evolution of digital resources. Most of the bibliographic databases that were available through the online search services like DIALOG and STN became available on CD ROM (Arora, 2007).

The appearance of the internet and World Wide Web regarded as a new media of information retrieval, storage, and delivery of information to the user community in the early 1990s. Searching bibliographic databases with full- text documents became familiar,

gradually it enhanced the demands of the user community and it became very difficult for libraries to acquire as well to disseminate it.

In the present time, it is possible for publishers to deliver contents, either as a bitmap page images or other structured formats such as HTML, PDF or RTF. A continuous propagation was noticed while the World Wide Web first introduced and the usage of the electronic version of resources also termed as e-resources (Tenopir*et al.*, 2003; Bar-Ilan & Fink, 2005). An increasingly, a massive number of publishers started using the internet and WWW as their global way to offer their resources to the international user community. Given the evidence that technology is in a situation, it is possible to deliver more contents to more users at a significantly moderate cost per user. These new technologies are continuously pushing the electronic resources to new peaks of usage, significantly beyond the library's subscribed content. Behind this, the effectiveness, efficiency, satisfaction, and learnability are considered as the essential features for the success of e-resources over print versions (Urquhart *et al.*, 2003; Borrego *et al.*, 2007; Olle & Borrego, 2010; Joo & Lee, 2011).

The timeline for e-resources can be symbolized by the following visual representation:

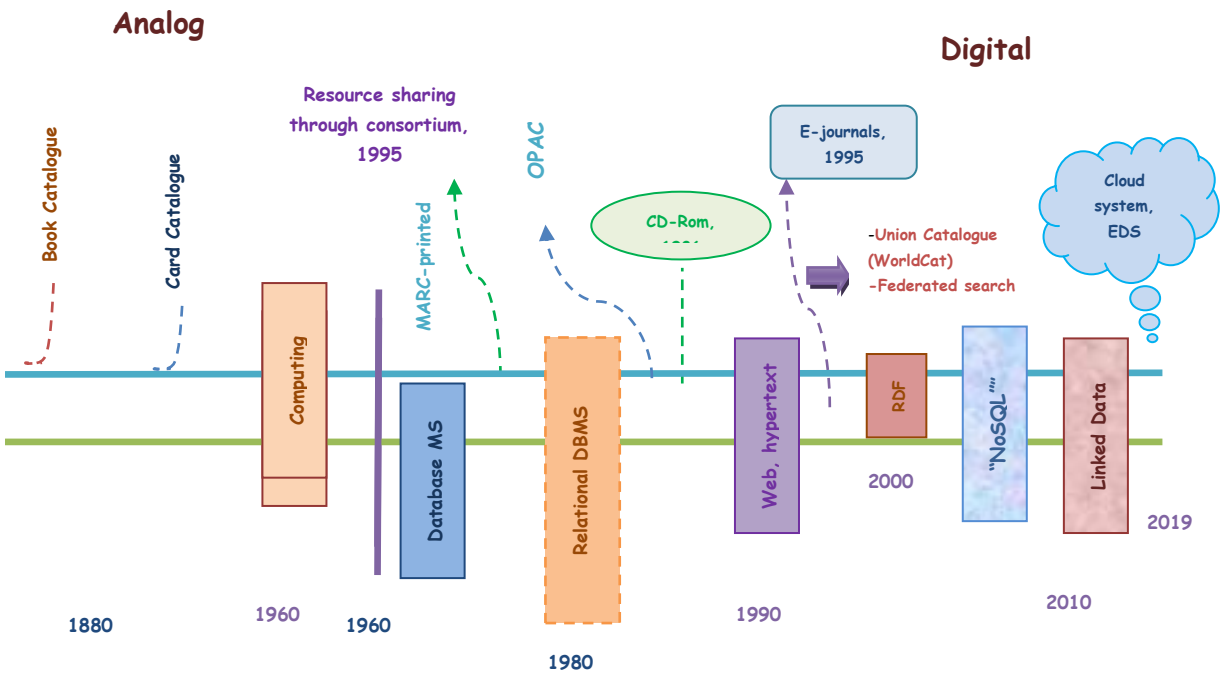


Figure 2.1: Timeline of E-resources (Source: Wikipedia)

2.3.2 Definitions of Digital/Electronic Resources

Since the past few years, the gradual development has been noticed concerning various systems and related standards which have been developed dramatically and that enable documents to be created and disseminated in electronic form. Consequently, to cope with the modern circumstances, librarians are shifting towards new mechanisms/ versions, namely electronic or digital resources for their collection developments that are moving more satisfactorily with useful contents for the users. Even a few years ago, the e-resource on magnetic and optical media was a vast influence on the collections of university libraries at that time. So, the advent technology and proliferation of e-resources have changed the approaches of liaison activities and collection development, especially in university libraries. This is because of the concept of the library has revised and updated its role due to the impact of e-resources. Thus, e-resources have placed themselves at the highest priority level in almost all academic libraries (Sharma *et al.*, 2011).Digital resources are more valuable due to inherent capabilities of vast processing, organization and searching, providing information where access is reasonable to acquire information resources, savings in storage and maintenance, etc. and sometimes the electronic form is the only alternative (Venkadesan & Jagannath, 2004).

In the present time, e-resources are regarded as an integral part in all the university libraries and also a vital academic resource, that facilitate in teaching, learning and research activities (Zhang, 2011). Nowadays e-resources have become a great concern, incitement, and challenges for library staff to understand and fulfill the user requirements and to promote the efficiency of utilization of e-resource.

Frandsen, Tibyampansha, Ibrahim & Von Isenburg (2017) in their paper cited to Georgas (2013) and Wu & Chen (2014) as the increasing usage of electronic resources is a matter of concern nowadays for many libraries all over the world. Many users prefer to use internet search engines such as crawler-based search engines, human-powered directories, and hybrid search engines, over the systems made available by libraries.

Electronic resources or digital resources can be defined as the materials in digital format which is accessible electronically.

Examples of e-resources include:

- Electronic journals (e-journal)
- Electronic books (e-book)
- CD-ROM
- E-thesis/Dissertations
- Online databases
- Adobe Acrobat documents (.pdf) files
- Web pages (.htm, .html, .asp, etc.) and more.

2.3.3 Types of E-resources and E-Services

The e-resources or digital resources can be divided into two major types are:

1. Online e-resources, which may include:

- E-journal (Full text & bibliographic)
- E-books
- Online databases
- Websites

2. Other electronic resources services may include:

- Electronic table of content service
- Current awareness services
- Electronic document delivery
- Externally purchased database
- CD-ROM Databases
- Online Public Access Catalogue
- Remote Information services
- Discovery tools

E-resources generally mean electronic resources or digital resources that may take the form of electronic journals (e-journals), electronic books (e-books), online databases, websites, CD-ROMs/DVD, audio cassettes, video cassettes, etc., whether free or fee-based and which are accessible from all over the world (Nasiruddin, Islam & Islam, 2012).

According to Das & Maharana (2013), electronic resources as the systems in which information is stored electronically and made convenient access for the user community through computer networks and information communication technology with multiple accesses speed, richer in content, reuse, timeliness, anywhere access. Saye (2001) defined as "the resources that are generated through some electronic medium and made available to a wide range of viewers, both on-site and off-site, via some electronic transferring machine or internet" (Garg, Kumar & Vandana, 2017, p.64).

On the other hand, Chithra & Geetha (2019) described electronic resources as- these are collected, stored, and arranged electronically and accessed via computers and other electronic devices. These resources are frequently compared to as online or offline or database or digital content or media. Another definition is provided by Ariffin & Bakar (2013) as, electronic resources such as, the electronic journals also recognized as e-journals, and electronic serials, are scholarly journals or intellectual magazines that can be practiced through electronic transmission. Basically, they are generally published on the web. Electronic resources have been described as a resource which require computer access or any electronic media that delivers a vast amount of data at the same time, be it text referring to full text bases, electronic journals, image collections, other multimedia products which may be delivered on CD ROM, on tape, through the internet and so on.

According to Kwafoa, Anhwere & Manu (2019), electronic resource is digitized information, facilitated by computers, network connectivity, electricity, other peripheral components and most importantly human beings. It comes in different formats including text, videos, audio, maps, graphics, tables, pictures, etc.

2.4 Library Users

The most crucial element of the 21stcentury library is the users. Every effort embedded into the establishment of a 21st-century library is dissipated if the library is not expected for use (Anyira, 2011). Nwalo (2003) stated that the library user is undoubted the most important person in any library environment. The library user is the main focal point to the 21st-century library and information services, as the library fundamentally exist to satisfy their user (Aina, 2004). This is the cause of why the mission statement of any library always reflects the determination of the other elements of the library to provide

high-quality services to library users. In this way, a library is said to be fruitful when the library users are fulfilled with their need. So, who is a library user?

Nwalo (2003) defined library users as anyone who visits the library with the goal of utilizing its resources to meet his/her information need. The word "visits" as practiced in the 21st century, including remote access to the library portal or website. Aina (2004) examines the term "user" that covers all those who avail themselves of the services given by a library. Snow (2008) indicated the term which incorporates different terms such as patrons, clients, information users, information seekers, consumers, readers, etc. these terms can be used interchangeably because they all employ to those exploring the services of a library. Furthermore, Whitakers (1993) divided library users into general readers, subject readers, special readers, and non-reading users.

Digital libraries support user communities and library services are produced and maintained by and for people. In other words, users and their information needs are central to all libraries whether digital or traditional libraries and as such efforts to design and implement digital libraries must be rooted in the information needs, characteristics and connections of the beneficiaries of the library; the user community, in order to assure their acceptance by them and other application communities (Fuhr *et al.*, 2007).

Consequently, satisfaction is a function that includes three central sources – the quality of the information sources, the information system and the services that make the information resources available. These three types of levels of measure in satisfaction are represented by the information resources, facilities, and services in this study. These sources of satisfaction, when accurately harnessed may present to users' overall satisfaction (Sirkin, 2003). The accuracy, completeness, correctness, and relevance of the information materials obtained from public libraries by a user are measures of the product performance (Iwhiwhu & Okorodudu, 2012).

2.5 The ICT Infrastructures for Developing Digital Libraries

Information and Communication Technology (ICT) has made unprecedented diversity and digital transformation in library specially to academic library and traditional information services, such as OPAC, reference service, bibliographic services, current

awareness services (CAS), document delivery services (DDS), inter-library loan, audio-visual services, and user community connections can be provided more efficiently and effectively by using ICT, as they offer convenient time, place, cost-effectiveness, faster and most-up-to-date dissemination and end users involved in the library and information services process (Khan, 2016).

Moreover, for content creation, one needs certain physical and resource infrastructure. These resources are pieces of equipment, software, human resources, and financial resources. Additionally, Khan & Bhatti (2017) affirmed that the construction of a digital library needs careful preparation for accepting the necessary digital library infrastructure to sketch an effective digital information system to generate digital content. Very early study by Jeevan (2000) emphasized that proper preparation before inaugurating any digital library project is essential. A plan must include a mission statement, importance of the project, choosing criteria for the resources to be automated or collected, indexing and metadata schema, formatting and imaging standards and use of preservation technology.

Moreover, Magnussen (2003) recognized the necessary elements for developing a digital library as availability of internet access, integrated access to digital contents, digitization, electronic publishing, and document delivery, distribution of digital information resources, collaboration and end-user services. Similarly, Singh (2003) described that for selection of digital infrastructure while forming a digital library, the following important factors need to be taken into accounts such as digital content quality, computer hardware, and software, accessing digital content, server technology, and copyright related issues, and developing of the digital content database.

Seshaiah & Veeraanjaneyulu (2009) examined the construction of a digital library with the Greenstone Digital Library software and added the following steps:

- Building the digital collections;
- Starting the librarian interface;
- Developing new collections from the file menu;
- Choosing and applying metadata;
- Dragging files to enrich the metadata; and
- Designing a user-friendly interface for seeing the collection

Gesler*et al.* (2002) early study examined some important techniques for improving digitized content and developing a digital library. They explained that, by combining digital library contents with virtual collections, users can access limitless resources of digital information. Sonker & Mahawar (2017) declared that the selection and retrieval of digital content, maintaining digital content, providing access and delivery of digital content, long-term plan for preservation, copyright issues, obsolescence of technology and executive control of digital resources and discovering technically experienced staff are the significant issues that must be examined while developing a digital library.

Furthermore, it may be remarked that in the area of computerization of libraries, many libraries and information science professionals over the world have made notable contributions to the area of research. Basically, digital library infrastructure involved many activities such as networking, information systems, library co-operation, software selection, and online cataloguing. So, the library automation is the part of in-house activities of any library, to apply the techniques to automate library activities through automation software or any other integrated library management software in the field of library and information science (Jayamma & Krishnamurthy, 2017). Consequently, in the present era, technology-enriched environment, online research databases have become an essential instrument in learning and research activities. Libraries worldwide have combined them as an integral part of their modern service delivery.

An international early study conducted by Kemdarne, Khot & Birje (2012) presented the status of using library automation software. This study focused that, R.V. Dental College Library (RVDCL), Krishnadevaraya College of Dental Library (KCDL), M.R. Ambedkar Dental College Library (MRADCL), The Oxford Dental College Library (TODCL) and Vokkaligara Sanga Dental College Library (VSDCL) are using LIBSOFT software and Shyamala Reddy Dental College Library (SRDCL) and M.S. Ramaiah Dental College Library (MSRDCL) are using EASYLIB software and Government Dental College Library (GDCL) are using other software i.e. CRM (Campus Resource Management).

In addition, selection of the appropriate integrated library management software in academic library according to the demands of the user communities as well as the library is essential. But, for managing this integrated library management software and using e-resources, both staff training and user education should be needed (Kemdarne, Khot &

Birje, 2012). Besides, academic libraries all over the world are started to digitize the resources such as books, journal articles, archives of newspapers, artifacts, music, theses and dissertations, and other historical documents and images of international and cultural interest (Rafiq & Ameen, 2013).

Katre (2011) clearly pronounced that the selection of software for digital preservation needs an understanding of the purpose of the software, socio-economic as well as the local needs. He also stated that in India, many universities, institutes are using DSpace, EPrints, Greenstone for Digital Library/Institutional Repository. Among the open source software, DSpace and Greenstone are involved for developing a digital library.

Kumar (2009) attempts to assess some most famous digital library packages. He suggested that this research can help digital library administrators to determine the best digital library software packages among the various packages. The evaluation is made by using a checklist having various categories. The findings of the study showed that most of the software are in the developing stage but are in a good situation for providing a best service and among DSpace, EPrints, and Greenstone, the DSpace digital library package appeared as the best option.

Additionally, Kim & Lee (2016) examined the existing situation of 21 virtual university libraries in Korea and search the potentialities of building a national-level central digital library through which these libraries could distribute their resources. The result showed that many virtual university libraries do not provide adequate library resources and services due to a lack of skilled librarians and lack of enough funds. Consequently, the present study also introduces a hosting model in which shared applications and resources remain on a central server and user communities from various universities discover them remotely through the interfaces of individual library sites.

Sonker & Mahawar (2017) stated that selection and acquisition of digital content, maintaining digital contents, providing access and offering of digital content, planning of long-term preservation, copyright issues, obsolescence of technology and administrative control of digital resources and discovering technically skilled personnel are the major issues that must be considered when forming a digital library.

Rafiq & Ameen (2013) in their study also stated that the practices of digitization were found at the growing stage in university libraries of Pakistan, for example, only one-third of the libraries were preceding their digitization activities. They identified three highest rated digitization goals in their research such as provide access via the web-based technology increase access, and preservation. They also found that theses and dissertations were seen as the highest preference for digitization in terms of natures of material. The top four rated digitization preferences were also found in terms of kinds of materials which were theses and dissertations, rare books, journals, and other serials, and course materials. However, refinements will also necessary for the lessons learned to be shared concerning modern digitization activities.

Ahmed (2014) investigated the current status of public universities in Bangladesh in case of library resources and services, IT infrastructure and status of training facilities for the development of a centralized, networked electronic library for the universities in the country. In recent years, various university libraries in Bangladesh have established to create their automated catalogues and have also created online resources access mostly through donor-sponsored services like INASP-PERI recently have known as LiCoB (Library Consortium of Bangladesh) and UN-supported Research4Life programs like HINARI, AGORA, OARE, and ARDI (Ahmed, 2014).The study further stated that the automation of acquisition, processing, and circulation of library resources is the primary feature of an automated library. The study showed that a vast majority of the public university libraries 17 (54.84 %) had not started their library automation activities yet, while the remaining 14 (45.16%) libraries declared that they are partially automated. None of the university libraries acknowledged that they were fully automated. The author suggested that the universities should allocate adequate funds for staff training and it is also important to recruit trained and skilled library professionals to handle library automation, institutional repositories, and digitization projects.

Alternatively, in Bangladesh, some libraries started their own automation projects. Kabej, Habib & Hossain (2012) reported the project named “Digitalization of Central Library of BUET”. This project is offered to the undergraduate and postgraduate students, researchers, and faculty members of BUET by the Central Library. They claimed that the digitalization of library resources has increased the service network, smoothed the resource sharing process, and modernized the study environment and other services.

The above review confers information about the essential IT infrastructure requirements for developing digital libraries. It also highlights different tasks that are related to inaugurate any digital library building project. Library authorities should develop adequate digital skills for their personnel for the development and control of digital libraries. They should be expert in using any digital library management software, understand server technology, experience in database development, and management, also be concerned about the copyright law and licensing issues and manage access control.

2.6 Digital Competencies of Librarians for Building and Managing Digital Library

Keeping in view the significance of digital libraries and the need for digital competencies among librarians, a number of researchers evaluated several perspectives of digital skills among librarians. These include assessing computer literacy, internet skills, ICT skills, digital literacy, use of web languages, etc.

In a recent study, Khan & Bhatti (2017) examined the digital competencies for developing and managing digital libraries where the study acknowledged the useful training programs for university librarians to achieve digital competencies. This study also estimates the digital knowledge in implementing security standards to protect digital contents. The findings of the study explained that digital skills for developing and managing digital libraries are happened into three main sections: digital competencies for developing digital libraries; digital competencies for managing digital libraries; and digital competencies to protect digital contents. Additionally, training given by experienced professionals is extremely important and helpful for university librarians to obtain digital skills. The study concluded that the university librarians should work with their Higher Education Commission (HEC) for receiving digital literacy competencies for improving and maintaining digital libraries.

Sreenivasulu (2000) highlighted that digital administrators must develop their competencies for promoting and managing digital libraries. They should be experienced in a variety of areas:

- Use of the internet and knowledge of the web such as navigation, search techniques, virtual reference services, and web design;
- Knowledge of multimedia technology, such as image processing and classifying digital contents;
- Use of speech identification software;
- Knowledge of video conferencing;
- Knowledge of multimedia technology; and
- Knowledge of digital systems, including that of digital library software for developing digital libraries, creating user interfaces and developing digital content.

Pearce & Davis (2006) explained that information professionals should be familiar with new technology for offering digital information sources and services. They must obtain digital skills to work in digital libraries. They should be acquainted with systems analysis and design, knowledge of classification and attributing metadata, digitization processes, and management of digital collections.

Satpathy & Maharana (2011) described the digital competencies of library professionals in using digital technological devices in libraries. Their findings of the investigation revealed that a majority of the respondents possessed knowledge of web languages such as HTML, C++ and XML programming languages. Additionally, only 43% of respondents out of 113 were able to implement their knowledge effectively. They acquired knowledge of digital libraries and were expert in using GSDL, DSpace and NewGenLib digital library software. Respondents also identified that a lack of time, poor facilities and inadequate training opportunities are the main difficulties in procuring the necessary skills to work in a digital library.

Mathew (2011) studied the ICT skills of information professionals serving in universities of Kerala. The results revealed that library professionals were familiar with the use of various technologies used in libraries. They were skillful at utilizing the internet (86%), DVD-related technology (72%) and barcode scanners (67%). They were also conscious of other digital technology including image scanners (46.6%), multimedia projectors (41.1%), webcams (40.5%), e-book readers (21.6%) and RFID (10.3%). Findings also reported that a majority of the respondents (86.6%) were skilled in using operating

systems. Their skills in information retrieval, web designing, assigning metadata and computer programming languages were not satisfactory, and their knowledge about digital library software was not encouraging.

Halder (2009) also highlighted the changing role of library professionals and library staff in the ICT era. Today, the librarian designations and their works in the ICT age may be defined as work of an Information Scientists, Information officer, Information Consultant, Content Manager, Knowledge Manager, etc. The author in his paper introduced the working of librarians using modern trends like library 2.0, Web 2.0, Cloud Computing, mobile computing, digital library, etc. The purposes of library professional are the same, but the working culture has changed due to the digital environment. Similarly, Raju (2014) in his study concluded that librarians must have the knowledge of digitization, metadata creation and management, preservation of digital information and computer literacy, which are beneficial to work in online information environments.

Thanuskodi (2011) examined the ICT literacy among library professionals serving in engineering institutions in Tamil Nadu, India. The results intimated that majority of the library professionals were experienced in computer fundamentals n=78 and internet searching skills n=67. Most of them needed training facilities in using library management software. The study also focused that they had awareness of different library management software for library digitization. This study was also found some drawbacks such as continuous work pressure and lack of training opportunities are the major difficulties in getting ICT skills.

Cassella & Morando (2012) study revealed that approximately half (45.0%) of the repository managers stated their competencies as well. They could customize the web layout, offer value-added services and process digital content. Moreover, the largest groups of respondents had a strong awareness of intellectual property rights. The results also designated that technical skills, project management skills, metadata skills and knowledge of copyright issues are indispensable for digital repository managers.

Masrek*et al.* (2012) assessed seven features of competencies among paraprofessionals of a library. Findings revealed that a majority of the respondents had a good level of leadership abilities, conflict management competencies, problem-solving skills, interpersonal skills, and decision-making skills. Nevertheless, their experiences for system analysis, standards of data, the infrastructure of information, knowledge of library technological tools and practices were limited required.

The above literature confirmed there is an urgent need to have digital competencies of the university librarian for building, maintaining and disseminating digital resources for their user communities at the right time.

2.7 The Use, Purpose of Using and Satisfaction with Digital Library, Digital Resources and Services

According to IFLA Digital Library Manifesto, libraries have long been essential drivers in promoting serenity and human values. Libraries in today's world explore digitally, and their digital services inaugurate a new way for the library user communities about the universe of knowledge and information, combining cultures over geographical and social boundaries. The digital library serves as an environment where library collections are brought together, services, and people in support of the whole life period of creation, dissemination, use, and preservation of data, information, and knowledge. In addition, it is an important matter for any user to be familiar with the use and exploitation of digital resources for their quick and efficient practice. Additionally, digital resources can also be utilized for effective retrieval. Thus, a digital resource in a library plays an important role in academic libraries, as they are mostly aimed for the development of academic perfection and research. So, electronic resources like CD-ROM, database, online journals, OPAC and internet, etc. are gradually replacing the importance and usage of print media (Mathivanan & Vijayakumar, 2017).

Moreover, the gradual development of information and communication technology (ICT) has carried out a revolutionary transformation in the information scenario giving various options to handle diverse information resources conveniently and effortlessly as a result of which e-resources have become the most sought after modern library’s reserves in satisfying the varied requirements of students, academics, and researchers with minimum risk and time. Information technology has revolutionized the world and has become one of the most

important tools for retrieving information. The electronic information resources have gained a major portion of library collections. The value and use of information resources, especially e-resources, have expanded with time (Kalbande & Ingle, 2013).There have been a number of investigations conducted on the faculty use of and satisfaction with electronic resources in the university libraries worldwide and also in the developing countries' perspective, a largest number of studies were investigated about digitization in university libraries (Rafiq & Ameen, 2013). But this is the 1st time an attempt has made to conduct this research which covers both the digital library sources and services and their user's viewpoints on digital resources and services in developing country like Bangladesh perspective. Dehghani, Asnafi & Hajizeinolabedini (2018) investigated the users' satisfaction from databases or e-journals may be correlated to various reasons, including the ease of use, the quality of information, the database information related to the demanded subject, the accuracy of the search strategies, up-to-date information, or perhaps the appropriateness of their amount.

A very recent study by Abba & Adamu (2019) explained the level of university lecturers' perception and knowledge of internet-based online services and resources for academic purposes. The results showed that the awareness level of the university lecturers on internet services and resources for academic activities was at a moderate level. This means that a large portion of the lecturers was moderately knowledgeable and skilful regarding internet services and resources usage. This study also suggested that the university libraries should provide information literacy instruction programs on internet services and resources for lecturers in order to increase awareness and competencies on their academic progress.

Alhassan (2015) in his study asserted that, in academic libraries, the electronic resources that are of significant value for practicing are e-journals and e-books. This is because of that they are formed in the electronic version rather than the traditional books and journals located in the library. These types of e-resources are stored, processed and organized in several databases to allow the user communities for easy retrieval of their needed information. Some of these databases are subject based while others contain the broad subject fields of knowledge. Many publishers often have their own databases with all their publications while some other stakeholders organized publications from various databases to give sound access to e-resources.

Dukić (2013) also stated that 73.5% of respondents used online databases in research. For this reason, online databases are observed as a very important research assistance tool by the users. Furthermore, the respondents affirmed some drawbacks such as the lack of foreign language skills, lack of access in full-text and paying for access was limiting factors in using online databases. In respondent's opinion, librarians have not adequately performed their role in training the user's community and inspiring them to work with such e-resources.

One of the major benefits of electronic resources is that they are nonstationary and library user can, therefore, reach them from anywhere in the world. A well-equipped, accessible digital library can afford an extraordinary opportunity to ensure the user's uniform access to these resources, library user can easily perform their searching and browsing according to issues based on the specific need (KosztyánnéMátrai, 2018).

According to Rahman & Muhammed-ul-Islam (2012), each library in this digital environment has to cope with modern technology for protecting the digital information resources for its users and to sustainability. The major issue with digital preservation is hardware and software obsolescence, which pretends challenges of subsistence as well as safeguarding the digital resources for keeping a long period. Preservation should guarantee the records to be accessible, usable, produced by hardware and software applications, even after the hardware and software used for creating the resources are no longer available.

Rahman, Rahman & Chowdhury (2015) investigated a study about the Digital Resources Management (DRM) in libraries in Bangladesh, where the survey shows that half of the libraries prefer to provide open access, but some of the resources are only for registered users, while some libraries are strict to provide the resources available only through the Intranet. Some of the libraries managed a separate web page for subscribed online databases and provide access through the IP login or remote access management system, e.g. MyAthens, EZproxy while some libraries give access to the subscribed journals and e-book databases through the DRM system. The survey also indicates that the libraries have OPAC, a dedicated webpage with a list of subscribed e-resources, Institutional repository, and even full-text collections while others have an access interface based on the collection, for example, thesis paper, internship report, e-book collection, etc.

Ullah & Rafique (2014) conducted a quantitative investigation of the Pakistan Research Repository and highlighted its performance in facilitating researcher communities in Pakistan. The study also estimated the issues related to the repository and noticed that the making of this repository is a landmark initiative by the HEC. Researchers can easily download any needed thesis in the full-text form.

Alzahrani, Mahmud, Ramayah, Alfarraj & Alalwan (2017) developed a research model using Delone & McLean's (1992) information system success model for the actual use of the digital library system. The findings of the study revealed that the quality factors of digital library systems have a strong impact on satisfaction, behavioural intention, and diversity in actual use. Moreover, they also explained that user satisfaction and behavioural purpose to use the system also have a strong positive relationship with the actual use of a digital library system. Besides, they also demonstrated that digital library systems in Malaysia are markedly used for research purposes and all tertiary education institution has its own digital library system that assists its students and staff. They also provides some suggestions that a greater level of information quality, system quality, and service quality guide to a higher level of satisfaction and users' intention to use digital library systems, authorities must concentrate on students' satisfaction and their intention to use the system, and finally digital library system providers of Malaysian universities can introduce sub-social network activities like Google+, Facebook and also include plug-ins for alerts about new services or resources to increase the satisfaction of the students.

On the Other hand, Ekere, Omekwu & Nwoha (2016) investigated the understanding of users towards digital library facilities, resources, and services and discovered that users are highly satisfied with digital library facilities. Users are extremely conscious and satisfied about the digital library resources such as WWW, WIFI and search engines compared to online databases, portals, online abstract, video CDs, CD-ROMs, and online indexes and abstract.

Thangavel & Jayaprakash (2017) discussed the existence of various e-resources, user perception about e-resources, and preference of using e-resources, obstacles that the users encountered while accessing the e-resources and purpose of using e-resources by faculty members of Engineering College Libraries in Erode District, Tamil Nadu. Results

indicated that a substantial number (60%) of the participants used Google search engines for locating e-resources and most of the library users also declared that there has a lack of training on how to use and access e-resources. Moreover, they recommended that High-speed internet should be expanded and as such users can access the e-resources and internet within the library according to their needs. Consequently, topics such as user education on library resources use and hardware and software training should be included in the core curriculum of all the disciplines.

Akinola, Shorunke, Ajayi, Odefadehan & Ibikunle (2018) surveyed a study to find out the status of awareness of postgraduate students regarding e-resources, know the purpose (s) for using electronic databases, level of ability to use such resources. Findings exposed that the majority of the respondents of the University of Ibadan is generally aware of electronic databases but under consideration. The study also discovered that respondents use of electronic databases mainly for research work, literature searching, create new information and for updating knowledge. Findings also explained that the frequency of use of the electronic database by postgraduate students is low. The level of performance of the respondents in using electronic databases was moderate. This study concluded that the library should apply more efficient procedures such as providing e-mail alert messages, text messages system through mobiles services as a process of raising awareness about the use of the library's electronic databases.

Manjunatha & Kumar (2018) investigated the usage pattern of electronic resources among graduates from the various fields of management. The results of the present study exposed that all students acknowledged e-resources as very useful and they consider it more comfortable to use e-resources, as they can access it efficiently from anywhere and at the right time. Besides, academician's guidance and training have emerged as great influencers that have instigated the students to use e-resources. However, it was remarked that these students were using free e-resources more often as compared to paid ones. Additionally, this study recommends that management colleges/institutes should develop computer labs in hostels with trained and skilled staff to train the students about e-resources. Such efforts may also lead to increasing the adaptability of e-resources, especially the paid ones.

The purpose of Islam & Habiba (2015) in their study was to investigate the using pattern of internet and e-resources by the Eastern University (EU) students and faculty members. The results revealed that students and faculty members are usually satisfied with the existing systems of internet and e-resources. They also identified that the limited number of titles, complexity in finding relevant information, restricted access to computers and slow download speed as their primary limitations. However, these barriers are mostly related to the poor IT infrastructure and unwillingness to use the internet and e-resources daily and consequently low satisfaction with such resources.

Dehghani, Asnafi & Hajizeinolabedini (2018) also conducted their study on utilizing university subscribed database of by academics and university graduate students. The finding of the study showed that the satisfaction percentage of the respondents from Shahid Beheshti University's administered databases was high and at the desired level, but they need training in the use of shared databases.

Aina (2014) identified the factors regarding the perception, accessibility, and utilization of e-resources among the Babcock University Business School faculty members. This study stated that faculties are typically the highest users of electronic resources but awareness on electronic resources among early career faculty members in BBS was inadequate and this influences the accessibility and use of electronic resources. So, the author indicated that there is a need to enhance the internet facilities campus wide that would facilitate the accessibility of electronic resources by young faculty members and the whole library users. The study also claimed that proper training should be arranged for the academics on updating their knowledge about diverse sources. Likewise, Akpojotor (2016) study aims to investigate the awareness and practice of electronic information resources with the postgraduate students of the library and information science in Southern Nigeria. The finding of the study revealed that LIS students were considerably aware of the e-resources and the status of using e-resources was high. The study also informed that postgraduate LIS students were experienced in the use of electronic information resources. The study concluded with recommendation such as the electronic information resources were the vital instruments for empowering students of library and information science in Southern Nigeria.

Yang, Yuan, Cheng & Liu (2012) believed that it is the prime duty for the digital library to attract user communities to be more depending on the library. Besides, in case of providing research-based resources, the library yet has many channels to obtain this goal. The main purpose of this study was to examine the library quality system which provides distinct ways to enhance users' viscosity on utilizing the library. The results revealed that the significant proportion of users' viscosity on the digital library was extended and various fields should be given more consideration for building a successful digital library gateway.

Ahmed (2013a) in his paper described the status of electronic information resources use and satisfaction level with university-paid resources by the faculty members, where the eight public universities in Bangladesh were selected as a sample. The results reported that academics in the universities are not usually satisfied with the subscribed e-resources of the university. Moreover, faculty members also encountered some difficulties such as the limited quantity of titles available, restricted access to rear issues, problems in finding relevant information, slow download speed, etc. However, these limitations are largely related to the weak IT infrastructure of their library.

Murugan (2016) in his study observed that 95% of the respondents were using the internet regularly and 97% of the respondents have a good understanding of e-resources. Majority of the faculty members (94%) were practicing e-resources. The study also indicated that most of the respondents needed short term training programs and awareness programs for using e-resources. Faculty members also stated that the latest update on e-journals should be quickly notified and library staff should provide their assistance in that case. Similarly, Parameshwar, Goutami & Patil (2016) paper focused on the use, awareness, utilization, and satisfaction of electronic resources with respect to the UGC-Infonet consortium by the faculty members of various departments of Osmania University and Andhra University at the Andhra Pradesh States. The results indicated that most of the faculty members were aware of electronic resources and consortium resources. In the end, some suggestions have been provided for enhancing the use of the UGC-Infonet consortium for example, the universities should provide a proper training program to the academics concerning the use of electronic information sources.

Meera & Dhanamjaya (2018) on the other hand investigated the usage pattern of electronic information resources in an academic institute by the research scholars at REVA University, Bengaluru. The results showed that there is very little response to 'somewhat dissatisfied' and no response for 'very dissatisfied' regarding e-resources use. It is a strange observation from survey findings that 93% of respondents are very much satisfied with electronic question papers, followed by 63% web OPAC. Consequently, Manjunatha & Sampath (2018) examined the use of the internet, experience in the use of the internet and the use of different internet applications by students and faculty members of Dental Sciences. The study found that the majority (98.69%) of the respondents used the internet and it is mainly used for e-mailing (60.26%), teaching (43.02%), to know the recent trends in their fields of knowledge and also for research work.

Sundararajan & Balasubramanian (2018) investigated the availability of diverse e-resources, awareness of e-resources, the obstacles faced by the faculty members at the time of using the e-resources and the intentions of the using these e-resources in Agricultural College and Research Institute, Killikulam. A majority of respondents (90.67%) were aware of e-resources and (58%) of faculty staff explored information through e-resources to keep updating themselves in their area of interest and other fields. Early related study by Ahmad & Panda (2013) also declared that majority of the faculty members were aware of practicing all e-resources, but some were limited to use only the library's specific resources such as e-theses, patents, and CD-ROM databases. Therefore, awareness and promotion of e-resources were highly imperative to achieve thorough utilization by end-users.

Thanuskodi & Ravi (2011) in their paper examined the practice of digital resources by faculty and research scholars of Manonmaniam Sundaranar University at Tirunelveli. They found that 67.14% of the academics were accustomed to the use of digital resources, and the majority of these faculty members were using electronic resources for their research work. The study also exposed that the majority of the faculty members were getting their needed competencies for the usage of digital resources by themselves. Majority of the faculty members and research scholars (55.71 %) believed that the information available in the digital resources was always "satisfactory".

As human being become more convenient with online education, there is a need to examine how the learning practice in the digital library can be adapted to these new expectations. Cervone (2013) tried to focus on this issue. This paper discussed how modern learning technologies can be used to address awareness associated with outcomes and estimate in library learning experiences. The findings showed that the digital library learning experiences transform to the requirements of the today's learners as well as helps to create more meaningful learning outcomes within the more dynamic learning environments, such as simulation activities in the online environment.

Zha, Zhang & Yan (2014) examined the impacts of the user's understanding of print and digital resources in terms of usage, usefulness, and ease of use. Results also indicated that print books and electronic journals were seemed to be remarkable as favoured sources and additionally most respondents were revealed positive reactions towards print books that "it is easy to read". In the meantime, most of the participants exposed positive attitudes towards electronic journals, because it was easy to download and carry, seeking for relevant information based on keywords can help to accomplish their task swiftly as compared with print journals and it was also convenient to discover the information easily. The paper ended with a suggestion like print books and e-journals should be given special consideration by librarians.

Mátrai (2018) conducted a study and identified some essential principles which should be implemented to the electronic library websites to make them accessible for all people. The intent of this study was to create the easy user interface of the Hungarian Electronic Library (VMEK) that was more accessible and usable by leveraging the latest technologies, standards, and recommendations. Vision-impaired and motor-disabled people were also included in brainstorming and accumulating concepts and ideas while designing the phase and in testing the implemented website. This paper also revealed that the accuracy of the web page is considerably developed by semantically suitable HTML codes, sharply defined links and attributes, hotkeys and written principles.

Dukić (2013) performed a study where the main aim of this study was to determine the extent to which Croatian university teachers use online databases as a research support tool, and what role librarians have in their promotion. Although the results show that within Croatian higher education online databases are widely acknowledged as important,

they are used less frequently than in many other countries, especially more developed ones. The differences in online database perception between certain user groups were also tested. The study has revealed the problems in database usage and indicated the ways in which librarians can respond to users' needs more efficiently and effectively. Out of 102 respondents, 75 (73.5%) stated that they used online databases in research, which is similar to the result obtained by Vrana (2010) in the above-mentioned study of researchers and teachers at a Croatian faculty. This percentage of users cannot be seen as satisfactory, particularly when compared to the results of studies in developed countries, which indicate that only a negligible portion of the academic and research community is not dependent on online databases. The chi-square test confirmed a significant relation between the level of education and online database usage. The biggest proportion of persons using this source of information was recorded among PhDs, and the lowest among those with bachelor's degrees. Still, even in this case the mean indicates that the respondents were mostly in agreement that online database usage can accelerate the research process. These results also showed that online databases are viewed as an important support tool in research for university teachers in Croatia, i.e. for those academics who actually use them.

TandiLwoga & Sukums (2018) recently examined the e-resources usage behavior among the health sciences academics and their level information literacy (IL) practices, and whether individual characteristics and IL skills can influence faculty members' usage of e-resources. The study findings indicated that most faculty members were conscious about the key e-resources (e.g. Google 135 (100%), Wikipedia 123 (91.1%), HINARI 113 (83.7%), Google Scholar 113 (83.7%), PubMed 91 (67.4%) and MUHAS Institutional repository 77 (57%).

Frandsen, Tibyampansha, Ibrahim & von Isenburg (2017) described the results of executing training programs to encourage the use of the digital library. Though the training sessions improved the utilization of library digital resources significantly, but the result seems to be short-lived and training sessions simply may not improve the overall long-term usage. Their results also showed that there was extended use of search engines like Sci-Hub. Sci-Hub contains academic articles available for direct download without requiring subscription or payment. Moreover, they also found some barriers like librarians lacked the experiences and they were not able to assist students with problems

in the use of electronic resources. In the meantime, frequent training sessions needed to be taken under consideration for the improvements in staff skills so that the library staff can expand their skills continuously.

Oluwakemi & Folasade (2018) investigated the awareness and use of e-resources among the faculty members of Afe Babalola University. The study showed that most of the faculty's members were conscious about e-resources and use of the diverse e-resources but a third of the respondents were not aware of some of the subscribed databases. Moreover, in case of the purpose of using e-resources, most of the faculty members used the electronic resources for research, teaching and they also referred these resources to their students. This study recommended that the university authority and faculty members should increase the demand for the improvement of information literacy skills to create more awareness and confirmed the maximum use of university subscribed e-resources.

Similarly, students and faculty members were found practicing e-resources for the purpose of teaching, learning, research and project work, paper presentations, and course activities. These types of resources not only help students by preserving time but also assist access to the needed relevant information. Besides this, these e-resources also contribute to recent knowledge which enhanced the academic performance of students and the faculty members (Garg, Kumar & Vandana, 2017).

Ahmad & Panda (2013) research on the faculty members aware of and thoroughly use the library databases and other electronic information resources inside and outside the libraries explained that the majority of the faculty members were knowledgeable and completely utilized the library e-resources. The study also focused there was also a lack of knowledge among the academics with respect to the efficient practice of e-resources, more expressly the CD-ROM databases and OPAC services in the library.

From the above review of the literature, it is apparent that there is a lack of research on the use of IT-based information sources and services in the university libraries of Bangladesh. Most of these studies were confined to computer applications in various kinds of libraries rather than how the electronic resources and services could be distributed to academic users. Nevertheless, there has been lack of research studies on the use of electronic resources by the faculty members in both public and private universities

in Bangladesh. Moreover, there are no experimental investigations has been conducted on the faculty use and satisfaction with e-resources accessed through university networks. This is the first time an effort has been made to study e-resources use by the faculty members in several public and private universities in Bangladesh. It is expected that this study will also help to identify the faculty needs for e-resources, their satisfaction with recent subscriptions available to various public and private universities in Bangladesh. And finally, this study also tries to find out the difficulties that the librarians faced in developing and managing the digital library and faculty members' e-resources access problem and will also try to provide possible solutions.

2.8 Barriers to Digitization and Use of Digital Resources:

An early study administered by Ameen & Rafiq (2009) to identify the issues linked with electronic theses and dissertations (ETD) initiatives in Pakistan. The authors described a lack of ETD concept, shortage of skilled human resources, lack of financial resources, lack of technological infrastructure and the digital divide as influential issues affecting the growth of ETD initiatives in the country.

In an early study, Islam (2011) identified the inadequacy of digitization initiatives in Bangladeshi libraries. He discovered some major obstacles that hinders the digitization activities as lack of concept, financial constraints, lack of standards and uniformity, lack of technological infrastructure and ICT applications, backward mentality, preference for traditional library systems and services, ineffective management, unawareness of recent library trends, lack of knowledge of the advantages of digitization and copyright issues.

In a recent study carried out by Rafiq, Ameen & Jabeen (2018) where the research objective was to classify the obstacles that are thwarting the digitization initiatives in Pakistan university libraries. The finding showed the difficulties which were obstructing the digitization activities in university libraries, including the insufficiency of IT skilled library professionals which was a vital problem connected to digitization activities and practices. The technological foundation or infrastructure was another major drawback acknowledged by some libraries. This study also provides some recommendations such as library personnel in university libraries require to improve their skills, and library schools, associations, and library authority need to perform an efficient role in case of providing

adequate funding and various seminars, training programs, and comprehensive workshops should be carried out to qualify the library professionals.

Masrek & Gaskin (2016) carried out a study where the objective of the paper is to assess the user's satisfaction with the web digital library. They developed a model based on the re-specified information system success model and experimented using the structural equation modelling (SEM) technique. The findings of the study indicated that information quality, systems quality, service quality, perceived usefulness, perceived ease of use and cognitive absorption were a significant predictor of users 'satisfaction with the web DL.

Similarly, Wang &Wang (2016) carried out a case investigation to examine the resource development method of the Digital Library Promotion Project in Chinese public libraries. The study showed the measures that confirm the success of the digital library project which were sustained financial assistance from the government, scientific mechanisms for collaboration, manageable administration of copyright issues, unified standards in resource development and targeted training programs.

Shuva (2012) explained the procedures that used to construct digital libraries in Bangladesh as well as also narrated the problems that might be faced by the library professionals during digital library system development. He reported that a lack of financial support, lack of skilled staff, inefficient infrastructure, lack of organizational support, lack of coordination among library and IT units and copyright issues as major barriers to digitization and digital library programs in Bangladesh. Finally, several possible strategies for library staff are recommended by the author to build an effective digital library system. Additionally, the findings of this study were also strengthened by Shuva (2014) further investigation through a mixed methods study that was conveyed to represent digitization and digital library developments in Bangladesh. The findings of the study reported that the Bangladeshi Government had commenced diverse initiatives related to digitization activities. Besides, the majority of university libraries in Bangladesh were not prepared to move digital because of certain impediments identified as a lack of funds, infrastructure support, and skilled library and information science (LIS) professionals.

2.9 Conclusion

The above review denotes information about the required infrastructure that is vital for generating digital libraries. It also highlights several tasks that are needed when embarking on any digital library development project. Academic librarians must have adequate digital skills for the development and management of digital libraries. They are expected to have knowledge about using digital library software, know server technology, understand database development and management, and be aware of copyright and licensing issues and manage access control.

From the above literature review, it is evident that there have been many research studies available regarding digital library (IT infrastructure, sources, and services, IT-related training, librarian digital competencies, etc.). There have been some studies on faculty members' digital resources awareness, usage, and problems of accessing digital resources, etc. However, there is a lack of research on digital library and use of digital resources by faculty members in Bangladesh. This gap in the literature motivated the present investigation.

Keeping in view the emerging digital library scenario in Bangladesh, it is a vital to have adequate digital competencies for academic librarians for developing and maintaining digital library. This current research identified three major issues that should be addressed for establishing digital libraries at the university libraries in Bangladesh:

- What is the current status of universities in terms of digital library implementation in terms of IT infrastructure, automation and access to various online resources?
- What is the status of contemporary use of digital resources by the faculty members and their level of satisfaction o with university paid e-resources?
- What are the problems that hinder in developing and managing digital libraries and how to improve access to digital resources for the universities?

Chapter 3
Digital Library Building Initiatives at National and International Levels

3.1 Introduction:

This Chapter gives a brief overview of digital library initiatives undertaken at both international and national levels.

3.2 International Level

The growth of DL initiatives in several countries is a move toward ascertaining the dream of the global information society (Isah, Mutshewa, Serema & Kenosi, 2015). Many government and non-government organizations are presently funding in DL projects for satisfying the information needs of their user communities (Chowdhury, 2002). The plan and implementation of DL initiatives are diverse. Each project according to Magnussen (2003) was designed to meet the information needs of its user community. In that way, they applied various procedures. Some of the DL initiatives were designed to meet the information needs of a heterogeneous society whereas some were tailored to address the socio-cultural needs of a homogenous community.

Numerous investigations have been carried out which highlighted the digital library initiatives in various countries of the world. Smeaton (1999) discovered that in Europe, the European Union gave funds to start digital library initiatives. Beagrie (2003) examined projects in Australia, France, The Netherlands, and the UK. Similarly, Chen and Yang (1999) emphasized digital library research in Singapore, Asia, Taiwan, and Japan. Additionally, Gaur (2003) explained the state of digitization in India. Mujahid (2002) described the digital library initiatives in Pakistan. Ezeani (2009) investigated the state of digitization in Nigeria.

Moreover, the popularity of the word Digital Library can be traced back to the Digital Library Initiatives (DLI) that was started in 1994 as a joint initiative of the National Science Foundation (NSF), Department of Defence Advanced Research Projects Agency (DARPA), and the National Aeronautics and Space Administration (NASA). Six universities were given the funds for investigation and development of underlying technologies for digital libraries. The second phase of the project was initiated in

February 1998. The landmark initiatives that led the path towards the Digital Library movement are the project MERCURY at Carnegie Mellon University; CORE project at Cornell University, the TULIP project and ENVISION at Cornell Institute of Digital Collection, Open Book Project at Yale University, Networked Digital Library of Theses and Dissertation (NDLTD), National Science, Mathematics, Engineering and Technology Education Digital Library (NSDL).

Additionally, the world presently experiences with the increasing number of digital library (DL) initiatives in various information institutions such as libraries, museum, archives centres, etc. Libraries, particularly academic libraries, are at the forefront of institutions that have encompassed with DL services with a view to satisfying the information needs of users in the digital arena. The previous efforts at DL initiatives were those launched in the developed nations and were formed on the needs of the concerned organizations. For example, Project Gutenberg developed in 1971 by the University of Illinois, US, the project was designed to provide a full text of contents mainly on literature to the University and the world. Another project was the Electronic Library Information Online Retrieval (ELINOR), which was formed in 1992 by De Montfort University, UK to provide network access to electronic resources within the University campus (Isah, Mutshewa, Serema & Kenosi, 2015).

Consequently, more research on digital resources availability such as Ali (2007) described an overview of digital libraries in several countries. He explained that the Universal Digital Library, which is a mutual project of the USA and India that implements access to about one million electronic books. The California Digital Library gives access to more than 32 million items, including databases, journals, magazines, and abstracts. The Harvard University Digital Library provides electronic information services and training for librarians and professional staff in using digital tools. However, the Digital Library of India consists of a huge collection of electronic books on Indian language arts, music, movies, and other disciplines. It also offers full-text indexing and searching for user communities. The VIDYANIDHI Digital Library is known as a treasure of electronic collections of dissertations to promote doctoral research in India. It has a rich collection of resources in the Sanskrit language.

Moreover, the Digital Library of Georgia supports the research and services of GALILEO by giving digital collections to the public. The Science, Mathematics, Engineering, and Technology Education, properly known as SMETE, provide a digital library assisting students, teachers, and researchers learning in science backgrounds. Furthermore, the Digital South Asia Library offers digital reference services and research services for scholars in South Asia. It is a global attempt to deliver important information resources accessible to the participant countries in South Asia (Khan, 2017).

The early paper Bhattacharya (2004) focused on the digital library initiatives in India which were taken into account with the government of India and state governments towards the development of digital library activities and policies. The central challenges for building digital libraries such as the difficulties that were faced by the libraries while promoting digital libraries, the obstacles of the digital divide faced by the country were the main purposes of this study. The result concluded that DL initiatives in India were yet at a nascent stage of development of the digital library. With the appearance of the internet and the World Wide Web, digital library construction in India faces new challenges.

3.2.1Digital Library Initiative in UK

In the United Kingdom, a series of digital library initiatives were started during the late 1990s. British library was one of the key players in development and digitization initiatives in UK. The UK Public libraries established a National Grid for Learning and become a leading provider of electronic information resources.

3.2.1.1Early Digital Library Project

ELINAR (Electronic Library Information Online Retrieval)

The ELINAR project was established in 1993 with the funding assistance of the University of De Montfort, the British Library and IBM UK (Chowdhury & Chowdhury, 2003). The main purpose of this project was to store course elements such as books, journals, reading lists, and question papers, etc., for undergraduate students through the PC and their workstations.

3.2.1.2 Major Funding Agencies in UK

Joint Information Systems Committee (JISC) (https://www.jisc.ac.uk/)

Since, 1993, the Joint Information Systems Committee (JISC) worked as one of the main funding agencies that support research and, technology improvement movement in the higher education sector in UK.

UK Office for Library and Information Networking (UKOLN)
(http://www.ukoln.ac.uk/)

The UKOLN is a centre of expertise in electronic information management, providing guidance and assistance services to the library, information, learning communities in UK. The important focus fields were metadata, interoperability, creating an innovative system and services based on web technologies.

3.2.1.3 Major Digital Library Projects in UK

Table 3.1: Major Digital Library Projects in UK

Major Digital Library Projects	Description	Website link
eLib: Electronic Libraries Programme (eLib)	The Electronic Libraries Program (eLib) was an initiative of the Higher Education Funding Councils' Joint Information Systems Committee (JISC), founded to implement the IT support for approaching the issue of change in higher educational institution libraries.	http://www.ukoln.ac.uk/services/elib/
The Resource Discovery Network (RDN)	The Resource Discovery Network (RDN) was started in 1999, devoted to providing adequate access to high-quality internet resources for learning, teaching, and research purposes. The RDN catalogues gave connections to websites holding large volumes of learning resources, including e-books, e-journals, bibliographies, research,	http://www.jisc.ac.uk/whatwedo/programmes/x4l/rdnfe.aspx

Table 3.1 *Continued*

	and teaching materials. The resources were picked by subject specialists for particular subjects based on the analysis of quality, usability, and reliability.	
Intute	Intute was the new face of the Resource Discovery Network (RDN). Millions of web resources were available through this network. According to user requirements, Intute was launched in 2006 by a consortium of seven universities in UK including, the University of Birmingham, University of Bristol, Heriot-Watt University, Manchester Metropolitan University, University of Nottingham, University of Oxford and Mimas at the University of Manchester as the hosting co-worker with funding assistance from JISC.	http://www.intute.ac.uk/
JISC IEMetadata Schema Registry	The JISC IE Metadata Schema Registry (IEMSR) project was run between 2004 and 2010 into four phases. This project was financed by JISC through its Shared Services Program. The IEMSR project goal was to form a metadata schema registry as a pilot shared service within the JISC Information areas.	http://www.ukoln.ac.uk/projects/iemsr/
eBank UK	eBank UK was a JISC-funded project which was operated between 2003 and 2007 into three phases. This project was a part of the Semantic Grid Program and Autonomic Computing	http://www.ukoln.ac.uk/projects/ebank-uk/

Table 3.1 *Continued*

	Program. The eBank UK project accumulated metadata about research data from the e-data repository.	
Focus on Access to Institutional Resources (FAIR)	The focus on Access to Institutional Resources (FAIR) Program was started by JISC in 2002, with the intention of managing digital resources which were produced from the academic institutions in UK and distribute these resources to the academic communities for broader access and maximize the practice of e-resources.	https://www.jisc.ac.uk/rd/projects/focus-on-access-to-institutional-resources-fair
ePrints UK	The e-Print UK was a national service originated as the portion of the FAIR project in 2002 by economic support from JISC. The purpose of this project was to implement single point access to e-print repository collected from further learning and Higher education institutions in UK.	(http://www.ukoln.ac.uk/projects/eprints-uk/)

Source: http://lisp8.epgpbooks.inflibnet.ac.in/chapter/digital-library-initiatives-in-uk/

More digital library initiatives are also existed in UK.

3.2.2 Digital Library Initiative of USA

3.2.2.1 Major Digital Library Projects in USA

Table 3.2: Major Digital Library Projects in USA

Major Digital Library Projects	Description	Website link
The Networked Digital Library of Theses and	The primary functions of the Networked Digital Library of Theses and Dissertations (NDLTD) are to	http://thumper.vtls.com:6090/

Table 3.2 *Continued*

Dissertations (NDLTD)	devote in improving the adoption, creation, use, dissemination, and maintenance of electronic theses and dissertations (ETDs). NDLTD assists e-publishing and open access to scholarship in order to improve the sharing of information worldwide.	
National Science Digital Library System (NSDL)	The National Science Foundation (NSF) has launched the National Science, Mathematics, Engineering, and Technology Education Digital Library (NSDL) program in 2000 for stimulating and sustaining constant developments.	https://nsdl.org/
Digital Library for Earth System Education (DLESE)	The Digital Library for Earth System Education (DLESE) launched in 2001, where the mission of this project was to "enhance the quality, quantity, and effectiveness of teaching and learning about the Earth System. Moreover, this project also supported in developing, managing, and providing access to high-quality educational resources and support services by a community-based, shared digital library".	http://www.dlese.org/library/index.jsp
ArXiv	ArXiv project was started in August 1991, which was also recognized as the Los Alamos National Laboratory (LANL) e-print service. It was a completely digitized archive and distribution server for research papers.	http://arxiv.org/
CiteSeer (ResearchIndex)	CiteSeer also is known as the ResearchIndex is a scientific literature digital library and search engine that	http://citeseerx.ist.psu.edu/index

Table 3.2 *Continued*

	concentrates basically on the literature in computer and information science. It comprised freely available, full-text research articles downloaded from the web.	
Networked Computer Science Technical Reference Library (NCSTRL)	The Networked Computer Science Technical Reference Library (NCSTRL) is a worldwide acquisition of scientific reports in the fields of computer science and industrial and government research laboratories made accessible for non-commercial and educational use.	http://www.ncstrl.org/
NASA Technical Report Server (NTRS)	NASA's history with web-based DLs dates back to 1993 during a WWW interface was implemented for the Langley Technical Report Server (LTRS). Prior to this, LTRS was just an anonymous FTP server that disseminated technical reports with authored and sponsored by NASA Langley Research Center. The types of resources include, conference papers, journal articles, meeting papers, patents, research reports, images, movies, and technical videos – scientific and technical information (STI) created or funded by NASA.	http://data.nasa.gov/
OAIster	OAIster is a union catalogue of millions of records embodying open access electronic resources that were created by collecting from open access collections worldwide using the Open	http://oaister.worldcat.org/

Table 3.2 *Continued*

	Archives Initiative Protocol for Metadata Harvesting (OAI-PMH).	

Source: http://lisp8.epgpbooks.inflibnet.ac.in/chapter/digital-library-project-in-usa/

3.2.2.2 International Collaborative Projects

International digital library research projects were assigned to promote a system that can work in multiple languages, formats, media, social and organizational settings.

Major International Collaborative projects as follows:

- National Science Foundation (NSF) – Joint Information Systems Committee (JISC) (US- UK): International Digital Libraries Collaborative Research and Application Test beds
- NSF- German Research Foundation (DFG) (US-Germany): International Digital Libraries Research
- Network of Excellence in Digital Library System (DELOS)/NSF Working Group Reference Models for Digital Libraries: Actors and Roles
- NSF/European Union (EU) Digital Libraries: Future Directions for a European Research Program

3.2.3 Europeana Digital Library Initiative

The appearance and propagation of digital libraries is a common feature of the current millennium. Europeana was Europe's DL initiatives established to provide socio-cultural needs of the European countries. Europeana currently features content from 33 countries including all 27 Member States of the European Union (Brunelle *et al.,* 2012). But now it explored 58,794,452 artworks, artifacts, books, films and music from European museums, galleries, libraries, and archives.

The Europeana homepage (http://www.europeana.eu/portal/) was created with a robust user interface which is available in all official EU languages. Entitled user communities can have free access to their resources through the internet. Moreover, for accessing the resources with detail, the users are redirected to the content provider's website where the distinct terms and conditions of access employ.

In order to make the resources more accessible, metadata called Europeana Semantic Elements (ESE) was employed in order to gain a single common standard. It also introduces a richer metadata standard "Europeana Data Model," which is supposed to provide users with more and useful information resources. Nevertheless, the European Union effort approaching focused on adopting cloud computing among member states is expected to provide the European digital library in a greater platform or the preservation and distribution of cultural heritage materials (Isah, Mutshewa, Serema & Kenosi, 2015).

3.2.4 Harvard University Library Digital Initiative (LDI)

Harvard University started the Library Digital Initiative (LDI) in July 1998. It was financed by Harvard University for a 5-year project to create a first-generation production infrastructure to maintain digital library collections. Key project activities include metadata, technical formats, reformatting, legal issues, preservation, interfaces and access defining an overall technical framework, and the development of a core set of systems to support digital collections such as catalogues and access tools, repositories, user interfaces, access management, and naming (Flecker, 2000). The digitization project was designed to capture traditional library collection through retrospective conversion from analog to digital resources.

The university digitization project as noted by Isah, Mutshewa, Serema & Kenosi (2015), Harvard University project was a five-year program to develop the University's capability to handle digital information with the following set objectives- building the technological infrastructure to promote the acquisition, organization, delivery, and archiving of digital library resources; providing a team of specialists to guide librarians and others in the University community on key issues in the digital environment; providing librarians and staff with experience in a wide range of technologies and digital materials; and, enhancing the Harvard University Library collections with an important set of digital resources (HLDI 2001).

3.2.5 Digital Library Initiative in Africa

Isah, Mutshewa, Serema & Kenosi (2015) in their study stated that, Africa Digital Library (ADL) was formed in 1999 by the Center for Lifelong Learning at Technik on South Africa with the following goals: improvement of digital library that is accessible free-of-

charge to residents and institutions of Africa, for academic and business use and provision of digitized full text resources to learners in Africa via the internet (ADL 2012).

The library has used its partnerships with the Association for African Universities and US commercial e-library firm (netLibrary) to accumulate a collection of 8,000 e-books. The collection covers 52 subject areas and is available in 54 countries of Africa. The ADL homepage (http://www.africandl.org.za/) is created to permit users to navigate the digital content entirely on one page. Registration to use ADL within the African continent is automatic, whereas Africans living outside the continent will have to wait for confirmation of the registration before access could be granted. ADL was formed to bridge the gap in access to digital information in Africa.

This according to Wade (2002) will facilitate any resident of Africa to access books in the library at no cost, provided they have access to the internet. The ADL project aimed to help access to library resources without the expense of promoting and supporting physical infrastructure. The library resources collection includes books and other resources, in digital format, available through the internet. This allowed African countries to fill the information gaps between developed and developing nations. Kavulya (2007) on the other hand described that the digital library facilitated the reliable information gathering, processing, distribution, access, and application in Africa.

3.2.6 Digital Library Initiative in India

The concept of digital libraries in India originated in the mid-1990s with the spread of information technology by embracing the internet and the support of the Central Government. In 1996, this idea was known throughout the Conference on Digital Libraries arranged by the Society of Information Science at Bangalore. Though a few libraries had made an endeavour earlier in this way, the digital library initiative in India is yet at the growing stage.

Similarly, Jain & Babbar (2006) argued that the thought of DLs in the developed countries started during the 1970s, but in India, it started in the mid-1990s with the advent of information technology on a broad range with the assistance and support of the central government. Another previous study conducted by Gurram (2008) reported that most of the Digital library initiatives were mainly restricted to confined use of resources such as

subscribing to e-journals, scanning documents and fitting them on the intranet. But, some government agencies and institutions, basically in the public area were also involved in the digitization of their libraries in an inadequate way. Some of the leading digital library initiatives and programs launched across the country are given below:

3.2.6.1Major Digital Library Projects of India

Table 3.3: Major Digital Library Projects of India

Major Digital Library Projects of India	Description	Website link
Digital Library of India, 2003	Digital Library of India was executed by Indian Institute of Science (IISc), Bangalore with the assistance of Ministry of Communications and Information Technology, Government of India, National Science Foundation, USA. For storing knowledge and cultural heritage of India, later, this project was formally introduced by the president of India Dr. A. P J. Abdul Kalam on 8th September 2003.	http://www.dli.ernet.in/
Vigyan Prasar Digital Library, 1989	Vigyan Prasar Digital Library initiative, which was implemented by Vigyan Prasar, and approved by Department of Science & Technology, Government of India. Vigyan Prasar manages an open-access digital library to broadcast	http://www.vigyanprasar.gov.in/digilib/

Table 3.3 *Continued*

	scientific knowledge, where the electronic collection includes automated full-text reports of all relevant scientific activities that are being published by Vigyan Prasar.	
NCERT Online Text Books, 1961	NCERT Online Text Books that was executed by the National Council of Educational Research and Training (NCERT), New Delhi and supported by the Ministry of Human Resource Development, Government of India, and the NCERT had inaugurated with a national portal where school textbooks, based on the National Curriculum Framework 2005, were freely accessible on the internet for students and teachers.	http://www.ncert.nic.in/textbooks/testing/Index.htm
ShodhGanga: Indian ETD Repository, 2010	ShodhGanga: Indian ETD Repository was another digital library initiative in India which was implemented by INFLIBNET Centre and supported by University Grants Commission. ShodhGanga is a digital repository set-up for submission of a digital version of theses and dissertations by research scholars in universities in India and given them freely accessible in open access to the worldwide academic	http://shodhganga.inflibnet.ac.in/

Table 3.3 *Continued*

	communities.	
NISCAIR Research Journals	NISCAIR had formed the Online Periodicals Repository (NOPR) to maintain its 17 research journals, working papers, preprints, scientific reports, conference papers and data sets in different digital formats. All publications can be accessed with full text in PDF format via NOPT platform.	http://nopr.niscair.res.in/
Open Journal Access System @ INFLIBNET	Open Journal Access System @ INFLIBET Centre gives a digital platform for hosting of the digital version of journals into open access form with all methods of submission, peer-reviewing, editing, layout designing, and publishing formulated into it.	http://www.inflibnet.ac.in/ojs/

Source:http://lisp8.epgpbooks.inflibnet.ac.in/chapter/digital-library-initiatives-in-india-part-i/

3.2.7 Digital Library Initiatives in Pakistan

As a matter of fact, DL culture is just at beginning level in Pakistan. The creation of DL involves a number of technological, social, usability, financial and legal issues.

3.2.7.1 Major Digital Library Projects of Pakistan

Table 3.4: Major Digital Library Projects

Major Digital Library Projects	Description	Website link
United Nations Digital Library (UNDL), 2002	United Nations Digital Library (UNDL) was established in 2002 at Pakistan is the first of its kind. This is an online	http://library.un.org.pk/gsdl/cgi-bin/library.exe

Table 3.4 *Continued*

	repository with full text digital resources of the different United Nations Agencies, Programs, and Funds which was yet active in Pakistan. The collection includes comprehensive documents, reports, publications, newsletters, press releases, and other public information resources.	
HEC-National Digital Library (HEC-NDL, 2004	HEC-National Digital Library, a project of Higher Education Commission (HEC) of Pakistan was established in 2004, is a unique project giving access to full-text digital databases to the users of both public and private universities and non-profit research and growing organizations throughout Pakistan.	www.digitallibrary.edu.pk
Pakistan Research Repository, 2006	The Higher Education Commission (HEC) of Pakistan implemented a project named Pakistan Research Repository (PRR) in 2006. The project can be assigned as a showcase of the intellectual output of	http://www.eprints.hec.gov.pk/

Table 3.4 *Continued*

	Pakistani higher education institutions. The primary approach for the development of content in the repository has been an initiative to digitize and make freely available online every Ph.D. and MPhil thesis published in Pakistani universities.	
Allama Iqbal Urdu Cyber Library, 2007	Allama Iqbal Urdu Cyber Library was initiated in 2007, as a project of Iqbal Academy, Pakistan, is the first digital library of books in the Urdu language. The main plans and objectives of the Academy are to develop and distribute the knowledge and perception of the works and teachings of Allama Iqbal.	http://www.iqbalcyberlibrary.net/

It seems that the digital era is on the rising in Pakistan in all kinds of institutions including libraries. Consequently, libraries required to plan in such a way, where it is possible to assist the users' information needs through digital resource delivery. Libraries in Pakistan can now satisfy the users' ever-growing information needs by promoting DL and giving remote way to communities with access to ICT. Digital libraries can also improve the situation of the LIS profession and library services. Nevertheless, the sustainability of the DLs expects to be ensured with proper governmental and institutional assistance as well as support and professional commitment.

3.3 National Level

Bangladesh is also not away from the establishment of digital libraries. The number of initiatives was taken-up in Bangladesh towards digitization of libraries. At the Atomic Energy Commission, the computer was first introduced in 1964 at Bangladesh with the installation of an IBM 1620 computer (BASIS, 2005). The digitization projects in libraries and information centres of Bangladesh extended after the years of 2005. Many libraries were taken many digitization projects, which led to fully digitalize libraries. Moreover, for software selection, it was observed that the largest numbers of the libraries prefer to have free and open source (OS) software for building digital libraries/institutional repositories. Since Bangladesh is a developing country, and its libraries encounter a lack of funds, open source, free digital library software gives a reasonable way to build digital libraries (Shuva, 2012).

3.3.1 Early Initiative of Bangladesh

Table 3.5: Early Initiative of Bangladesh

Major Digital Library Projects	Description	Website link
National Archives of Bangladesh "Digitization of District Records Collected from 1760 to 1900"	A five-year (2002 to 2007) project was initiated by the Bangladesh government in July 2002. District records are the correspondence throughout the district during the East India Company's rule. This project was digitized 150 District records onto CD and more than 1000 records onto DVD by the costing about 7.5 million taka. This project primarily intended to digitize about 5000 volumes of district records, but due to administrative support, lack of staff, lack of tools, lack of adequate funds, and supply of uninterruptible power supply, the project did not see its successful conclusion.	http://www.nab.gov.bd/

Table 3.5 *Continued*

Digitization project of BANBEIS	This project digitized 400 books, reports, and statistical documents most usually utilized by its users from April to June 2009.	http://new.banbeis.gov.bd/index.php/services/digital-library
HEQEP	University Grants Commission (UGC) of Bangladesh has set up an e-resources consortium for both public and private universities which was recognized as the UGC Digital Library (UDL) as a sub-component of Higher Education Quality Enhancement Project (HEQEP) in 2012 (Ahmed, 2014).	http://www.heqep-ugc.gov.bd/

3.3.2 Others Digitization Projects/Programs/Activities in Bangladesh

In Bangladesh, the first bibliographic database was launched by the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) library. icddr,b library has also been a pioneer in building and managing institutional repository in the country. The Agricultural Information Centre (AIC) of Bangladesh Agriculture Research Council (BARC) inaugurated their digitization activities with a microcomputer in 1987 (Khan, 1989; Foote, 1993).

North South University (NSU) Library offered CD-ROM database services on Economic Literature (EconLit), AHEAD, and Global Development Finance databases. In 2003, NSU Library started a full-text digital repository with customized software named NSU-Library Management System (Rahman, 2015). In the same year, University of Dhaka began an automated library system with GLAS (Graphical Library Automation System) (Munshi, 2003), but the software failed to continue its functionality (Chowdhury & Khan, 2012).

In 2006, the Bangladesh INASP-PERI (International Network for the Availability of Scientific Publications - Program for the Enhancement of Research Information) was launched to reach e-journal databases (Uddin, 2009; Tariq, 2010; Islam, 2013). This consortium officially started in January 2007. Through this network, a greater number of resources from world-famous publishers were made available. Later, all public and private universities, research institutes, laboratories in the country were informed of this network and were encouraged to join. Consequently, a large number of universities and research organizations became members of this network.

Later in 2008, BRAC University Library began to achieve and manage their electronic resources with DSpace software and started to build an Integrated Library System (ILS) using Koha in 2010 (Afroz, 2014). The library acquired financial support from INASP for the creation of its institutional repository. Similarly, East West University (EWU) Library, another leading private university library in Bangladesh, obtained funds from Waikato, NZ, and UNESCO to build its digital library using Greenstone in 2011.

Rahman, Rahman & Chowdhury (2015) indicated that Bangladesh National Scientific and Technical Documentation Centre (BANSDOC) Library began to provide CD-ROM database abstract service on Biological Abstract, Physics Abstracts, and Current resources on life sciences in1997 (BANSDOC, 1998). BANSDOC launched the Bangladesh National Scientific and Library Information Network (BANSLINK). In 1998, this was the first online library network of 15 libraries (6 outside of Dhaka and 9 in Dhaka) through dial-up connections under the project (BANSDOC, 1998; Chandel & Begum, 1998). This initiative, nevertheless, failed to sustain due to lack of cooperation from the parent organizations of the member libraries (Uddin & Chowdhury, 2006).

3.3.3 Current Initiative

In recent time, most of the libraries including both public and private university libraries get connected with the Research4Life consortium. Research4Life is a public-private partnership of some International bodies like WHO, FAO, UNEP, WIPO, ILO, Cornell and Yale Universities, the International Association of Scientific, Technical & Medical Publishers and up to 155 international publishers. The main goal of Research4Life was to overcome the knowledge gap between high-income developed countries and low- and

middle-income developing countries by offering reasonably priced access to scholarly, professional and research information.

Since 2002, the five programs, Research in Health (Hinari), Research in Agriculture (AGORA), Research in the Environment (OARE), Research for Development and Innovation (ARDI) and Research for Global Justice (GOALI), have offered research scholars and learners at more than 8900 institutions in more than 120 low- and middle-income countries with free or low-cost online access to up 90,000 prominent journals and books in the areas of health, agriculture, environment, applied sciences and legal information.

The University Grants Commission (UGC) of Bangladesh has launched Bangladesh Research and Education Network (BdREN) with the assistance from the World Bank. BdREN is a multi-gigabit capacity network to combine universities, research institutions, libraries, laboratories, healthcare, and agricultural institutions across the country to assist geographically separated academics, scientists, and other researchers with secure access to high-end computing, simulation tools, and datasets. BdREN is also connected to other regional and trans-continental Research and Education Networks (RENs, e.g., TEIN3).

Moreover, in the present time, in light of the changing attitudes of information users in acquiring particular information resource, a number of libraries and information centres in the country have piloted the initiative to build a suitable system for offering desired information to users through digitization facilities. Since 2011 until 2019, a greater number of libraries both public and private in Bangladesh have tried to implement digital library systems. These include: University of Dhaka, Asian University for Women, Bangladesh Agricultural University (BAU), Bangabandhu Sheikh Mujib Medical University (BSMMU), Chittagong Veterinary and Animal Sciences University (CVASU), Daffodil International University (DIU), Green University of Bangladesh, East West University (EWU), Eastern University (EU), Independent University Bangladesh (IUB), Islamic University of Technology (IUT), Shahjalal University of Science & Technology (SUST).

Further, Bangladesh University of Engineering and Technology (BUET), Khulna University of Engineering & Technology (KUET), Sher-e-Bangla Agricultural University (SBAU), South East University (SEU), Stamford University Bangladesh (SUB), University of Rajshahi (RU) library had taken initiatives to introduce Digital Resource Management system.

Despite these initiatives, no major efforts regarding the creation of full-fledged digital libraries have been initiated in Bangladesh thus far.

Chapter 4
Research Design and Methodology

4.1 Introduction

The selection of suitable research design and the methodology to be applied is essential for any research study. This Chapter explains the research design and data collection methods adopted in this thesis. This research mostly employs quantitative research methodology for collecting data from the concerned universities.

4.2 Research Design: Quantitative Approach

Quantitative research can be defined as the systematic examination of aspects by collecting measurable data and conveying statistical, mathematical or computational systems. Quantitative research accumulates information from existing and potential populations using sampling methods and sending out online surveys, online polls, questionnaires, etc., the results of which can be described in the form of numerical. Quantitative research including the use and analyses of numerical data using statistical techniques and they pose questions of who, what, when, where, how, how much and how many.

4.3 Research Design and Methodology at a Glance

Table 4.1: Research Design and Methodology

<table>
<tr>
<td rowspan="5">Sources of Primary data

Filled up questionnaire through e-mailed link

from 51 university librarians and 757 of faculty members from public and private universities</td>
<td>Research Philosophy
Towards the Establishment of Digital library: An Investigation into the Current Status of University Libraries in Bangladesh</td>
<td rowspan="5">Research Area and Respondents

Bangladesh

Public and Private Universities

Total Respondents:
Digital library:
Public: 23
Private: 28

Digital Resources:
Public: 31
Private: 17

Respondent Types:
Librarians and Faculty Members</td>
</tr>
<tr>
<td>Data Collection Methods and Techniques
Survey Questionnaires</td>
</tr>
<tr>
<td>Data Analysis Tools
MS Excel and SPSS</td>
</tr>
<tr>
<td>Research Question Design
Quantitative approach used</td>
</tr>
</table>

4.4 Sources of Data

Data is the foremost element for any research. For assembling data, the survey method was implemented. Data were obtained randomly from the librarians of 51universities and from faculty members working at both public and private universities in Bangladesh. The background data associated with this study were collected using primary and secondary information sources.

4.4.1 Primary Data

For gathering primary data, this research followed the questionnaire survey method. It is often used as a crucial instrument for all quantitative research designs. This study received primary information by utilizing two different questionnaires which were sent separately to the university librarians and faculty members through e-mail links.

4.4.2 Secondary Data

For secondary data, different types of publications were identified and reviewed such as academic and professional journals, conference papers, and different types of web-based e-resources which were related to this research.

4.5 Area and Time of the Study

The survey was conducted at both public and private universities in Bangladesh. As of June 2019, Bangladesh has a total of 147 universities, and out of them public universities are 45, whereas the number of private universities is 103 (UGC, 2019). These universities were surveyed during the period from January to March2019.

4.6 Sample and Sampling Technique

The present study captures both the perception of librarians and faculty members of public and private universities. Two surveys were conducted at public and private universities, one is for librarians regarding the current status of establishing and managing digital library and another one is for faculty members that focused on the use of digital resources by them. For the library survey, a total of 45 public and 103 private universities were primarily selected and for achieving faculty responses regarding the use of digital resources, questionnaires were sent randomly through email links. There are numerous ways to choose a sample size and sampling methods. To conduct this research, random

sampling was applied to collect data from both librarians and university academics from both public and private universities in Bangladesh.

(A) A total number of 23 public universities and 28 leading private universities located in different divisions of Bangladesh responded to the survey questionnaire about establishment of digital libraries. Table 4.1 shows the background information about the responding universities.

4.6.1 Libraries Responded in the Survey on Digital Library

Table 4.2: Libraries Responded in the Survey on Digital Library

Name of your University	Type	Year of Establishment	Location	Name of your University	Type	Year of Establishment	Location
Chittagong University of Engineering and Technology (CUET)	Public	2003	Chittagong	Bangladesh University of Professionals (BUP)	Public	2008	Dhaka
Eastern University (EU)	Private	2003	Dhaka	Stamford University Bangladesh (SUB)	Private	1994	Dhaka
Noakhali Science and Technology University (NSTU)	Public	2005	Noakhali	American International University-Bangladesh (AIUB)	Private	1994	Dhaka
Chittagong Independent University (CIU)	Private	1999	Chittagong	Jatiya Kabi Kazi Nazrul Islam University (JKKNIU)	Public	2005	Dhaka
United International University (UIU)	Private	2003	Dhaka	Patuakhali Science and Technology University	Public	2000	Patuakhali

Table 4.2 *Continued*

				(PSTU)			
University of Rajshahi (RU)	Public	1953	Rajshahi	Mawlana Bhashani Science and Technology University (MBSTU)	Public	1999	Tangail
East West University (EWU)	Private	1996	Dhaka	Independent University, Bangladesh (IUB)	Private	1993	Dhaka
International Islamic University Chittagong (IIUC)	Private	1995	Chittagong	Bangladesh Army University of Science &Technology (BAUST)	Private	2015	Saidpur
East Delta University, Chittagong (EDUC)	Private	2006	Chittagong	Islamic University-Kushtia (IUK)	Public	1979	Kushtia
Independent University of Bangladesh (IUB)	Private	2013	Dhaka	Bangladesh Army International University of Science and Technology (BAIUST)	Private	2015	Comilla
Shahjalal University of Science and Technology (SUST)	Public	1986	Sylhet	Rangamati Science and Technology University (RSTU)	Public	2014	Rangamati
KhwajaYunus Ali Uiversity (KYAU)	Private	2010	Sirajganj	Green University of Bangladesh (GUB)	Private	2003	Dhaka
BRAC University (BRACU)	Private	2001	Dhaka	Manarat International University (MIU)	Private	2001	Dhaka
Begum Rokeya University (BRU)	Public	2008	Rangpur	Bangabandhu Sheikh Mujibur Rahman Maritime University	Public	2013	Dhaka

Table 4.2 *Continued*

				(BSMRMU)			
University of Chittagong (CU)	Public	1966	Chittagong	Khulna University of Engineering & Technology (KUET)	Private	1967	Khulna
Hajee Mohammad Danesh Science & Technology University (HMDSTU)	Public	1999	Dinajpur	Khulna University (KU)	Public	1991	Khulna
Asian University for Women (AUW)	Private	2008	Chittagong	Rajshahi University of Engineering and Technology (RUET).	Public	1964	Rajshahi
Northern University of Bangladesh (NUB)	Private	2002	Dhaka	Sylhet Agricultural University (SAU)	Public	2006	Sylhet
Southeast University (SEU)	Private	2002	Dhaka	Asian University of Bangladesh (AUB)	Private	1996	Dhaka
Islamic University of Technology (IUT)	Private	1981	Gazipur	Sylhet International University (SIU)	Private	2001	Sylhet
Chittagong Veterinary and Animal Sciences University (CVASU)	Public	2006	Chittagong	Jagannath University (JU)	Public	2005	Dhaka
University of Liberal Arts Bangladesh (ULAB)	Private	2002	Dhaka	Pabna University of Science and Technology (PUST)	Public	2008	Pabna
Daffodil International University (DIU)	Private	2002	Dhaka	Bangladesh university of Engineering and Technology (BUET)	Public	1876	Dhaka

Table 4.2 *Continued*

Sher-e-Bangla Agricultural University (SAU)	Public	2001	Dhaka	University of Dhaka (DU)	Public	1921	Dhaka
North South University (NSU)	Private	1992	Dhaka	State University of Bangladesh (SUB)	Private	2002	Dhaka
				Leading University, Sylhet (LUS)	Private	2001	Sylhet

Source: Wikipedia (2019)

B) Data about the use of digital resources by faculty members were randomly obtained from 31 public and 17 private universities in Bangladesh. The questionnaires used for this research are given in Appendix 1and 2.

4.6.2 Universities Responded in the Survey on Digital Resources

Table 4.3: Universities Responded Under the Survey for Digital Resources

Name of the University	Type
Bangabandhu Sheikh Mujibur Rahman Agricultural University	Public
Bangabandhu Sheikh Mujibur Rahman Maritime University	Public
Bangabandhu Sheikh Mujibur Rahman Science and Technology University	Public
Bangladesh Agricultural University	Public
Bangladesh Open University	Public
Bangladesh University of Engineering and Technology	Public
Bangladesh University of Professionals	Public
Begum Rokeya University, Rangpur	Public
BRAC University	Private
Chittagong University of Engineering and Technology	Public
Comilla University	Public
Daffodil International University	
Dhaka University of Engineering and Technology	Public
East Delta University	Private
East West University	Private
Eastern University	Private
Hajee Mohammad Danesh Science and Technology University	Public

Table 4.3 *Continued*

Independent University, Bangladesh	Private
International Islamic University Chittagong	Private
Islamic University of Technology	Private
Islamic University, Kushtia	Private
Jagannath University	Public
Jahangirnagar University	Public
Jatiya Kabi Kazi Nazrul Islam University	Public
Jessore University of Science and Technology	Public
Khulna University	Public
Khulna University of Engineering and Technology	Public
KhwajaYunus Ali University	Private
Leading University	Private
Mawlana Bhashani Science and Technology University	Public
Noakhali Science and Technology University	Public
North South University	Private
Northern University Bangladesh	Private
Pabna University of Science and Technology	Public
Patuakhali Science and Technology University	Public
Rajshahi University of Engineering and Technology	Public
Shahjalal University of Science and Technology	Public
Sher-e-Bangla Agricultural University	Public
Southeast University	Private
Stamford University Bangladesh	Private
State University of Bangladesh	Private
Sylhet Agricultural University	Public
United International University	Private
University of Barisal	Public
University of Chittagong	Public
University of Dhaka	Public
University of Liberal Arts Bangladesh	Private
University of Rajshahi	Public

4.7 Instrument Used

The data about digital library infrastructures were collected from 23 public and 28 private university (n=51) libraries in Bangladesh. On the other hand, a total of 757 responses were obtained from faculty members with regard to the use of digital resources.

4.8 Conducting Pilot Survey

De Vos (1998) describes a pilot study as the method in which the research plan for an expected survey is tested. The main intention of the pilot study was to ascertain the

practicability of the study; to test the reliability and validity of the instrument and the participants loyalty for data collection in the main research; to learn how suitable, understandable and practical the instrument is; to mark any problems prior to the central study, and to monitor the time needed for the completion of the questionnaire. The pilot study authenticated that the questionnaire did not include any confusing items and the participants discovered it easy and quick to finish. In this study, the following efforts were carried out:

First effort: This study conducted a pilot study to note inconsistencies in the questionnaires applied. Fifteen faculty members and 10 respondents from the libraries participated in this initial study.

Second effort: During the pilot study which was conducted in December 2018, some of the inconsistencies and difficulties were recorded. The questionnaires were finalized on the basis of feedback obtained from the respondents.

4.9 Questionnaire Structure

After conducting the pilot, two sets of well-structured questionnaires were designed. Web versions of the questionnaires (see Appendix 1and 2) were employed to gather data from both public and private universities in Bangladesh. The questionnaires were developed based on research topic, objectives, and research questions. The data were obtained from December 2018 to January 2019. The link to the questionnaire on DL infrastructure survey was e-mailed to a total of 147 universities librarians who had their e-mails available on the university websites. The questionnaire included the following elements:

1. University information including type and establishment year, etc.;
2. ICT infrastructure available in their library regarding building digital library;
3. Web-based sources and services available in their library;
4. Training and funds situation that the university authority provide for their library staff;
5. Constraints encountered by a librarian while building and managing the digital library.

The web version of the questionnaire on use of DL resources (see Appendix 2) was also used at the same time to collect data from both public and private universities in

Bangladesh. The data were collected from December 2018 to February 2019. The link to the questionnaire was also e-mailed to all the faculty members from various disciplines in Bangladesh who had their e-mails available on the university websites and university diary. The questionnaire consisted of the following items:

1. demographic features such as faculty category, gender, age, teaching experiences and areas of specializations;
2. awareness of digital resources and where they seek their desired resources;
3. purpose and frequency of internet and digital resources use;
4. faculty users' satisfaction with university-paid resources and the performance of the library in satisfying their information needs via electronic resources;
5. constraints faced by them when accessing university subscribed resources; and
6. their future need and demand for e-resources.

4.10 Data Processing, Analysis and Presentation

Finally, data obtained from the librarians and faculty members of both public and private university were analyzed using IBM SPSS, and the graphical presentations were administered using MS Excel.

For the category element 2, 4, 5 (Faculty questionnaire) above, faculty members were asked to evaluate each questionnaire item from 1 - "lowest" to 5 - "highest", on a five-point Likert scale. In order to examine the significance of demographic characteristics on the level of computer literacy, awareness of digital resources, frequency of access digital resources, library performance, overall satisfaction with university-paid e-resources and constraints, chi-square, Mann-Whitney and Kruskal-Wallis tests were carried out. Mann-Whitney is a nonparametric test used on two groups of scores that are independent of each other whereas Kruskal-Wallis test compare the scores of more than two groups.

The questions used in faculty questionnaire have been adapted from previous studies (Ahmed, 2013a; Ahmed 2013b; Kumar, Vandana & Batra, 2018; Khan & Bhatti, 2017). Cronbach alpha scores were obtained to see the reliability of the questionnaire items. For DL infrastructure survey, the alpha score was 0.870 while the alpha score was 0.818 for faculty perceptions on digital resources. These scores denoted that the two questionnaires used had reliable alpha scores.

Chapter 5

Data Analysis and Findings on Current Status of Digital Library Establishment in Bangladesh

This Chapter describes and analyses the data gathered through a nation-wide survey of university libraries. Out of 147 university libraries (public-45 and private-103) surveyed, 51 universities responded to the survey. The Chapter begins with background information about the university libraries to make the discussions easy to follow. The findings are organized in accordance with the stated objectives.

5.1: Frequency Distributions of University Categories

Table 5.1: Frequency Distributions of Nature of University

Nature of University	Frequency	Percentage
Public	23	45.1
Private	28	54.9
Total	51	100.0

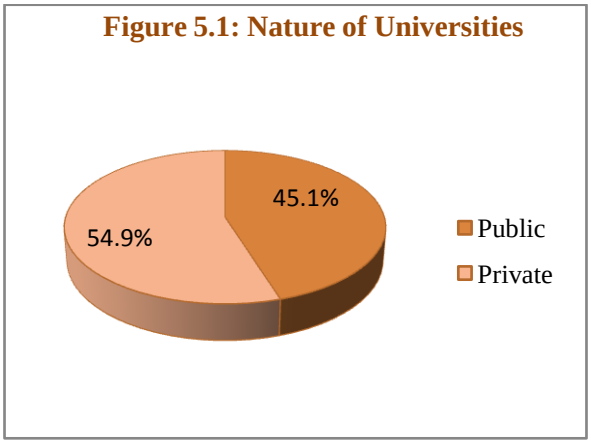


Table 5.1 shows the category of university libraries responded to this survey. The questionnaire, both online and printed copy, was sent to 147 public and private universities in the country. Out of them, 23 public universities and 28 private universities responded to the survey.

5.2: Library Resources and IT Infrastructure in the Public and Private Universities

A sufficient ICT infrastructure with networked and internet-connected workstations is imperative for a library to provide access to e-resources and develop e-services. Table 5.2 highlights the data on library resources and IT infrastructure such as the total numbers of computers in the universities and university libraries, LAN connectivity, software used for library automation and digital libraries/institutional repositories. Moreover, it also presents the current membership in library consortia and the discovery tools used by these university libraries.

Table 5.2: Library Resources and IT Infrastructure at the Public and Private Universities

University Name	*Computers in the University*	*Computers in the Library*	*LAN Connection in University*	*Number of Computers connected to LAN*	*Library Automation Software*	*Digital Libraries/ institutional Repositories*	*library Consortium*	*Discovery Tools*
CUET	500 Approx.	42 Pcs	Yes	42	Koha	DSpace	UDL	RemoteXs
EU	160	12 Pcs	Yes	160	Koha	Dspase, Greenstone	LiCoB	None
NSTU	200 Approx.	6 Pcs	Yes	Yes	Koha	None	LiCoB	RemoteXs
IUB	1200	94 Pcs	Yes	Almost all	Koha	DSpace	LiCoB, UDL	EDS
UIU	200	20 Pcs	Yes	All	Koha	DSpace	LiCoB, UDL	EDS
RU	2000 Approx.	130+ Pcs	Yes	2000 Approx.	Koha	DSpace, Greenstone	LiCoB, UDL	EDS
EWU	1100 Approx.	41 Pcs	Yes	1013	Koha, VuFind, Drupal	DSpace, GSDL)	LiCoB, UDL	EDS
IIUC	1500	30 Pcs	Yes	1500	Koha	DSpace	LiCoB, UDL	EDS

Table 5.2 *Continued*

EDUC	300	5 Pcs	Yes	All	Koha	None	None	EDS
CIU	300 Approx.	16 Pcs	Yes	Yes	Koha	DSpace	UDL	EDS
SUST	1000 Approx.	60 + Pcs	Yes	All	Koha	DSpace	LiCoB, UDL	EDS
KYAU	50	5 Pcs	Yes	50	None	None	None	None
BRACU	2000	60 Pcs	Yes	2000	Koha	DSpace	LiCoB, UDL	RemoteXs, Vufind
BRU	14	14 Pcs	Yes	12	None	None	UDL	EDS
CU	1000 Approx.	25 Pcs	Yes	All	Koha	None	UDL	None
HMDSTU	200	15 Pcs	Yes	200	None	None	UDL, LiCoB	EDS
AUW	500	40 Pcs	Yes	500	In-house software	DSpace	LiCoB, UDL	None
NUB	320	30 Pcs	Yes	All	Koha	DSpace	LiCoB	EDS
SEU	300	18 Pcs	Yes	300	Koha	None	LiCoB, UDL	EDS
IUT	400 Approx.	57 Pcs	Yes	All	Koha	DSpace	LiCoB, UDL	EDS
CVASU	250	45 Pcs	Yes	250	Koha	DSpace	LiCoB, UDL	None
ULAB	500 Approx.	15 Pcs	Yes	500+	Koha	DSpace	UDL	EDS
DIU	4500	21 Pcs	Yes	4500	Koha	DSpace	LiCoB	EDS
SAU	42 Approx.	15 Pcs	Yes	All	Koha	DSpace	LiCoB, UDL	EDS
NSU	2100 Approx.	85 Pcs	Yes	All	NSU ILMS & Koha	None	UDL, LiCoB	EDS
BUP	20	20 Pcs	no	All	Koha	None	UDL	None
SUB	991	17 Pcs	Yes	991	Koha	DSpace	UDL	None
AIUB	750 Approx.	10 Pcs	Yes	more than 400	UMS	None	UDL	None
JKKNIU	220	24 Pcs	Yes	180	Koha	None	UDL	EDS
PSTU	220 Approx.	41 Pcs	Yes	110	Koha	None	UDL, LiCoB	EDS
MBSTU	1000 Approx.	16 Pcs	no	All	Koha	None	UDL	EDS
IUB	1000	95 Pcs	Yes	All	Koha	DSpace	UDL	EDS;

Table 5.2 *Continued*

	Approx.							Summon
BAUST	500 Approx.	3 Pcs	Yes	100+	None	None	None	None
IUK	100	6 Pcs	Yes	yes	Koha	None	None	None
BAIUST	500 Approx.	12 Pcs	Yes	All	Koha	None	UDL	EDS
RSTU	50	2 Pcs	Yes	30	None	None	None	None
GUB	556	16 Pcs	Yes	556	Koha	DSpace	UDL, LiCoB	EDS
MIU	325	35 Pcs	Yes	325	Koha	None	UDL	None
BSMRMU	70 Approx.	430 Pcs	Yes	All	Koha	DSpace	UDL	EDS
KUET	500	57 Pcs	Yes	500	Koha	DSpace	UDL, LiCoB	EDS
KU	10 pcs	10 Pcs	Yes	10 Pcs	Koha	None	LiCoB, UDL, TEEAL	RemoteXs
RUET	500 Approx.	70 Pcs	Yes	500	Koha	None	LiCoB, UDL	EDS
SAU, Sylhet	550	70 Pcs	Yes	425	Koha	None	UDL, TEEAL	None
AUB	300	02 Pcs	Yes	All	In-house software	None	UDL	None
SIU	200	04 Pcs	Yes	100	None	None	None	None
JU	1000Approx.	100 Pcs	Yes	All	None	None	UDL	EDS, RemoteXs
PUST	400 Approx.	30 Pcs	Yes	All	None	None	UDL	None
BUET	2000 Approx.	75 Approx. Pcs	Yes	N/A	Koha	DSpace	LiCoB, UDL	EDS
DU	3000 Approx.	150 Pcs	Yes	N/A	Koha	DSpace	LiCoB, UDL TEEAL	EDS, RemoteXs SciFinder
SUB	150 Approx.	4 Pcs	Yes	N/A	None	None	None	None
LU, Sylhet	145 Approx.	5 Pcs	Yes	N/A	None	None	None	None

Note: LiCoB- Library Consortium of Bangladesh, ***UDL-*** UGC Digital Library, ***EDS-*** EBSCO Discovery Service.

Table 5.2 displays the status of university libraries in terms of DL implementation in Bangladesh. The survey findings showed that all universities including public and private universities and their libraries had computers. Out of 51 respondent universities, most libraries were connected to university LAN (Local Area Network) and only two universities (MBSTU and BUP) had no LAN connections. Additionally, libraries were requested to indicate the number of computers connected to the LAN and it was found that most libraries had adequate number of computers connected to the local network.

Moreover, 10 university libraries (public and private, i.e. KhwajaYunus Ali University (KYAU), Begum Rokeya University, Hajee Mohammad Danesh Science & Technology University, Bangladesh Army University of Science & Technology (BAUST), Rangamati Science and Technology University, Sylhet International University, Jagannath University, Pabna University of Science and Technology, State University of Bangladesh, Leading University, Sylhet) did not use any library automation software at the time of this survey. Most universities used Koha for library automation whereas university libraries namely, Asian University for Women and Asian University of Bangladesh developed their in-house software and two university libraries, i.e. North South University adopted both NSU ILMS (RFID-based Library Management System) and Koha and American International University-Bangladesh employed UMS (University Management Software). As indicted in Table 5.2, only 15 private and nine public university libraries used digital libraries/institutional repositories at the time of the survey**.**

The participating libraries were also asked about their membership with library consortia. Library consortium can be defined as the organization of libraries built to realize the benefit, opportunities and sharing resources to develop collaborative activities to satisfy their users. From the survey result, it was found that 8(15.7%) university libraries were not attached to any library consortium whereas the vast majority of university libraries, i.e. 43 (84.3%) were affiliated with the Library Consortium of Bangladesh (LiCoB).

A total of 33(64.7%) university libraries (public and private) used discovery tools while 18(35.3%) universities did not use any discovery layer for their users.

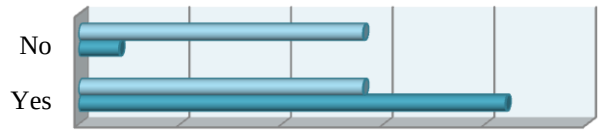
5.3: Internet Connection in the University

The fundamental requirement for a digital library is to be attached to a campus backbone so that library resources can be accessed not only from within the university library but also from anywhere in the campus. The status of internet connectivity at the university libraries in Bangladesh is encouraging as all participating university libraries 51(100%) had internet connectivity.

5.4 University Connected to BdREN

BdREN with its multi-gigabit ability aims to connect all universities, research institutions, libraries, laboratories, healthcare, and agricultural institutions across Bangladesh to support geographically scattered academics, scientists and researchers with reliable access to high-end computing, simulation tools, and datasets. University libraries were asked whether they were connected to BdREN. The results indicated that out of 51 libraries, 21 public and 14 private universities had BdREN connection. This status is visually illustrated in Figure 5.2.

Figure 5.2: BdREN Connection



	Yes	No
Private	14	14
Public	21	2

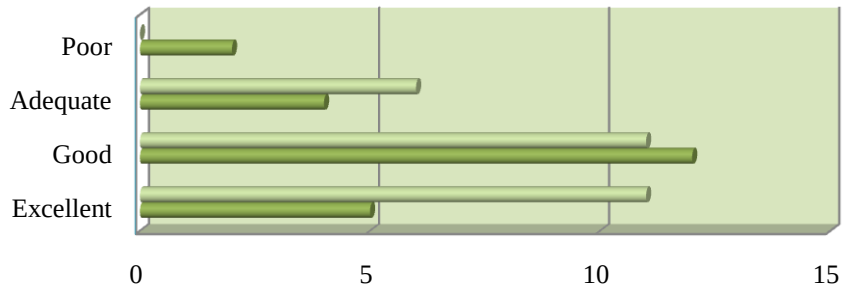
5.5 Speed and Status of the internet Connectivity at the Library

As shown in Table 5.3, a total of 23(45.1%) university libraries, including both public and private, indicated that the internet connectivity of these libraries was reasonably good whereas 16(31.4%) rated having excellent connection and 10(19.6%) university libraries reported their internet connectivity as adequate. Only 2(3.9%) libraries indicated that they had poor internet connection.

Table 5.3: Speed and Status of the internet Connectivity

University Type	Speed and Status of the Internet Connectivity				Total
	Excellent	Good	Adequate	Poor	
Public	5	12	4	2	23
Private	11	11	6	0	28
Total	**16(31.4%)**	**23(45.1%)**	**10(19.6%)**	**2(3.9%)**	**51**

Figure 5.3: Internet Connection



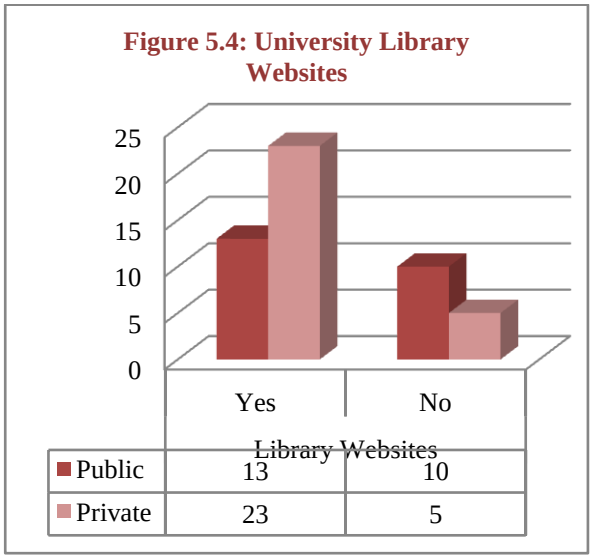
	Excellent	Good	Adequate	Poor
Private	11	11	6	0
Public	5	12	4	2

5.6 University Library Websites

Websites are viewed as an essential marketing tool and as a mirror for any institution. Additionally, library websites can make more prosperous communication with their users and can promote or advertise their collections to them. For establishing digital library, a website is a fundamental requirement to boost the use of resources and services provided by the library. The survey attempted to examine the present status library website at both public and private universities in Bangladesh. Table 5.4 demonstrated that, out of the 51 participants libraries, 36(70.6%) had their websites, and 15(29.4%) did not have websites at the time of the survey (see Figure 5.4).

Table 5.4: Library Websites

University Type	Library Websites		Total
	Yes	No	
Public	13	10	23
Private	23	5	28
Total	**36**(70.6%)	**15** (29.4%)	**51**



5.7 University Library Automation Status

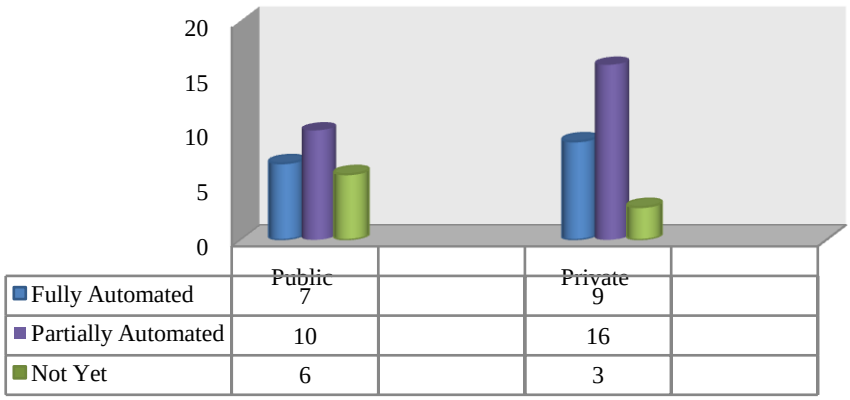
The motto of library automation is to provide the right information, to the right person, in the right manner, at the right time. For doing this, a library should be automated with digitalizing the sources and services of the library, without this it is not possible to provide the right information at the right time. The automation of acquisition, processing, circulation, stock verifications etc. are necessary features to develop a digital library. From Table 5.5, it was shown that a majority of the responded libraries 26(51.0%) were partially automated followed by 16(31.4%) university libraries declared that they were fully automated (fully automated refers to the process of in-house functions such as circulation, cataloguing, acquisitions, serials controls etc. are done automatically).

Alternatively, the remaining 9(17.6%) university libraries reported that they were yet to start the automation process.

Table 5.5: Library Automation Status

University Type	*Library Automation Status*			*Total*
	Fully Automated	*Partially Automated*	*Not Yet*	
Public	7	10	6	23
Private	9	16	3	28
Total	16(31.4%)	26(51.0%)	9(17.6%)	51

Figure 5.5: Library Automation Status



5.8 Library Automation Activities Status

The participant libraries were requested to answer about library automation activities that had been taken. Table 5.6 describes the status of library automation activities. In the case of acquisitions and budgets, only 14(27.5%) libraries had these operations automated, whereas 37(72.5%) libraries operated them manually. Besides, the majority of the libraries 38(74.5%) performed their circulation activities automatically while 13(25.5%) accomplished this manually. Additionally, 26(51.0%) libraries ran management functions automatically whereas management activities were not automated in 25(49.0%) of the surveyed libraries. The vast majority of the responding libraries 44(86.3%) reported that

the cataloging activities such as management of bibliographic records were made automated.

Table 5.6: Library Automation Activity Status

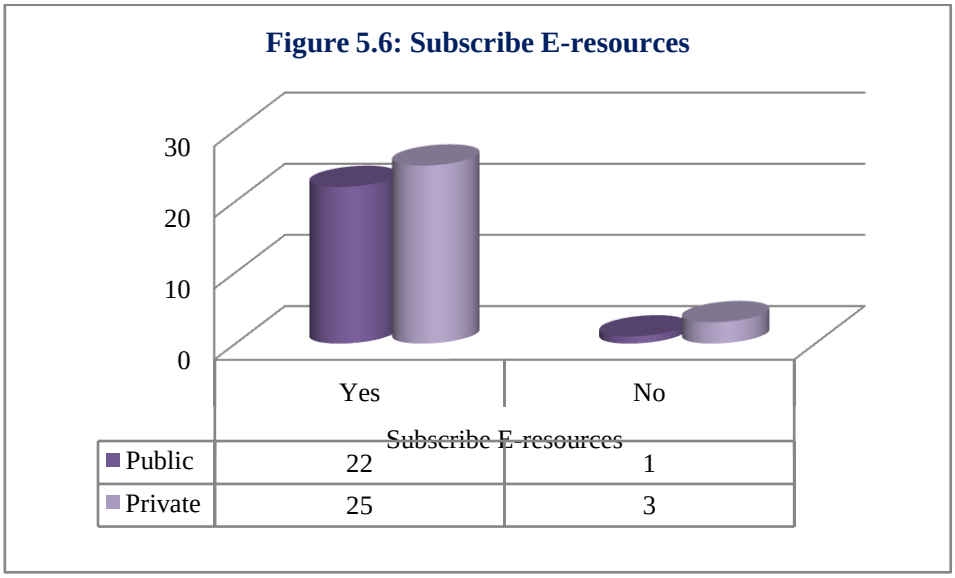
University Type	Acquisitions and budgets		Circulation control		Management		Cataloguing		Serials Control	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Public	4	19	15	8	10	13	19	4	9	14
Private	10	18	23	5	16	12	25	3	15	13
Percentage and Frequency	14(27.5%)	37(72.5%)	38(74.5%)	13(25.5%)	26(51.0%)	25(49.0%)	44(86.3%)	7(13.7%)	24(47.1%)	27(52.9%)

According to Table 5.6, more than half of the libraries 27(52.9%) reported that the serials control activities such as placing, canceling, claiming of orders; returning defective, unwanted and unordered material and accounting and statistical information, etc. were performed manually.

5.9 University Library's Subscription to E-resources

In response to the question whether the libraries subscribe to e-resources, the vast majority of the libraries 47(92.2%) indicated that they were subscribed to e-resources for their users.

Figure 5.6: Frequency of University Library Subscribe E-resources



5.10 E-resources Possess by University Libraries

Table 5.7: Status of E-resources Possess by University Libraries

E-Resources	*Public*		*Private*		*Percentage (Both Public and Private)*		*Total*
	Yes	**No**	**Yes**	**No**	**Yes**	**No**	
E-Journals	23	0	27	1	50 (98.0%)	1(2.0%)	51
E-Books	22	1	26	2	48(94.1%)	3(5.9%)	51
Electronic Theses and Dissertations (ETD)	10	13	19	9	29(56.9%)	22(43.1%)	51
Course Materials	7	16	13	15	20(39.2%)	31(60.8%)	51
Subject Gateways	4	19	11	17	15(29.4%)	36(70.6%)	51
Reports	9	14	18	10	27(52.9%)	24(47.1)	51
Archives	9	14	17	11	26(51.0%)	25(49.0%)	51
CD/DVD	17	6	25	3	42(82.4%)	9(17.6%)	51

As clearly illustrated in Table 5.7, a vast majority of libraries 50 (98.0%) acknowledged that they subscribed to e-journals for their user community. Other key findings include: 48(94.1%) of libraries reported that they procured e-books, followed by 29(56.9%) of the libraries preserved electronic and theses dissertations (ETD). Besides, in terms of course

materials, a large group of libraries 31(60.8%) indicated that they did not preserve online course materials. A subject gateway is basically a classified directory for a specific subject, which usually practiced for academic purposes. Out of 51 libraries, the majority of libraries 36(70.6%) reported that they did not use subject gateways while the remaining 15(29.4%) claimed that they used this for their users.

Research reports hold recorded data prepared by researchers or statisticians after investigating information gathered by conducting organized research. The survey found that more than half of the participating libraries i.e., 27(52.9%) stored such type of reports of their own. According to Table 5.7, nearly half of the responding libraries 26(51.0%) used digital archives to preserve digital collections. The majority of the libraries 42(82.4%) hold CDs/DVDs whereas only 9(17.6%) university libraries did not have any CDs/DVDs.

5.11 Information Services Provided by University Libraries

Table 5.8: Status of Information Services Provided by University Libraries

Information Services	**Computerized**			**Manual**			**Both Computerized and Manual**			**Not Provided**			**Total**
	Pub.	***Priv.***	**%**	***Pub.***	***Priv.***	**%**	***Pub.***	***Priv.***	**%**	***Pub.***	***Priv.***	**%**	
Bibliographic Service	10	13	23(45.1%)	8	9	17(33.3%)	3	1	4(7.8%)	2	5	7(13.7%)	51
Current Awareness Service	8	15	23(45.1%)	8	5	13(25.5%)	5	3	8(15.7%)	2	5	7(13.7%)	51
Selective Dissemination of Information	6	13	19(37.3%)	9	5	14(27.5%)	5	3	8(15.7%)	3	7	10(19.6%)	51

Table 5.8 *Continued*

Document Delivery Service	7	13	20(39.2%)	8	8	16(31.4%)	3	3	6(11.8%)	5	4	9(17.6)	51
Indexing Service	5	5	10(19.6%)	9	9	18(35.3%)	0	1	1(2.0%)	9	13	22(43.1%)	51
Abstracting Service	5	6	11(21.6%)	8	8	16(31.4%)	1	0	1(2.0%)	9	14	23(45.1%)	51
Reference Service	10	10	20(39.2%)	8	13	21(41.2%)	5	4	9(17.6%)	0	1	1(2.0%)	51
Audiovisual Service	8	12	20(39.2%)	9	13	22(43.1%)	3	1	4(7.8%)	3	2	5(9.8%)	51
Bulletin Board Service	4	7	11(21.6%)	9	8	17(33.3%)	2	2	4(7.8%)	8	11	19(37.3%)	51
Newspaper clippings	5	11	16(31.4%)	13	10	23(45.1%)	2	2	4(7.8%)	3	5	8(15.7%)	51

The universities libraries were requested to indicate what type of information services they offer to their users and which standards formats were followed for providing these information services. As demonstrated in Table 5.8, in case of providing bibliographic service, 23(45.1%) libraries claimed that they delivered this services in electronic format, while 17(33.3%) libraries confirmed the availability of this service but manual procedure was maintained by these libraries.

Current Awareness Services (CAS) is a mechanism for alerting user communities towards the latest developments and new publications acquired by the libraries or information centers. As indicated above Table 5.8, the participating libraries were asked to report about this service. Out of 51 libraries, 23(45.1%) libraries confirmed computer-aided CAS while 13(25.5%) libraries claimed that they provided this service manually, 8(15.7%) libraries reported that they provided both computerized and manual CAS while 7(13.7%) respondents indicated that they did not provide this service.

According to Weaving (1991), "Selective Dissemination of Information (SDI) is the activity of supplying a clientele on a regular basis with requested, specific type of information the emphasis is on the specific" (p.301). The survey results indicated that 19(37.3%) libraries had computerized SDI service, whereas 14(27.5%) libraries claimed that they provided manual SDI service followed by 8(15.7%) reported they had both online and manual methods and 10(19.6%) libraries did not provide this service.

In case of Document Delivery Service, 20(39.2%) university libraries claimed that they provided this services in computerized formats followed by 16(31.4%) were providing this service manually, while 6(11.8%) libraries maintained both online and manual formats.

In terms of indexing service, 22(43.1%)libraries claimed that they did not provide this service whereas 18(35.3%) libraries revealed that they followed manual procedure in this case, whereas 10(19.6%) libraries provided this service in automated way and one university stated that it had both computerized and manual indexing service.

Abstracting service was not provided by 23(45.1%) of the responding libraries, whereas 16(31.4%) libraries maintained a manual process in providing abstracting service followed by 11(21.6%) had computerized method for this service and 1(2.0%) library was found to use both online and manual methods of abstracting service.

Reference service had provided manually by 21(41.2%) of libraries followed by 20(39.2%) used the computerized method, 9(17.6%) claimed they had both manual and online method and only one library reported not having this service. In case of audiovisual service, 22(43.1) libraries indicated that provided this service manually whereas 20(39.2%) libraries were following online method. Bulletin Board Service was

provided manually by 17(33.3%) of the respondents while 19(37.3%) libraries reported not having this service and 11(21.6%) libraries confirmed that they provided this service online. Manual newspaper clippings services were made available in 23(45.1%) libraries, whereas 16(31.4%) libraries had online service and 4(7.8%) had used both online and manual methods.

5.12 Web-based Services Provided by University Libraries

Table 5.9: Status of Web-based Services Provided by University Libraries

Web-based Library Services	Public		Private		Percentage (Both Public and Private University)		Total
	Yes	No	Yes	No	Yes	No	
Access to full-text documents in digital format	18	5	23	5	41(80.4%)	10(19.6%)	51
Web- based current awareness services	14	9	16	12	30(58.8%)	21(41.2%)	51
Web access to in-house library databases/OPAC	14	9	20	8	34(66.7%)	17(33.3%)	51
In-house online tutorials on how to use the information services	9	14	15	13	24(47.1%)	27(52.9%)	51
Subscriptions to web-based e-resources, online journals, e-books, databases, etc.	19	4	24	4	43(83.3%)	8(15.7%)	51
Organized access to free subject-based information gateways/ portals on the internet	14	9	17	11	31(60.8%)	20(39.2%)	51

Table 5.9 *Continued*

Access to donor sponsored resources, e.g. INASP-PERI, AGORA, HINARI, OARE, Research4life, etc.	12	11	22	6	34(66.7%)	17(33.3%)	51

The web-based service utilizes web technologies to deliver information and services to user communities. The respondent libraries were asked to give their opinions about the types of web-based services they provided for their users. Table 5.9 indicated that most of the libraries 41(80.4%) had access to full-text documents in digital format whereas 10(19.6%) libraries claimed they did not have such access. In case of web-based current awareness services, 30(58.8%) libraries reported that they provided this service whereas 21(41.2%) libraries stated that this service was not available in their libraries.

Additionally, the largest group of the participant libraries 34(66.7%) described that they used web access to an in-house library databases/OPAC for processing library materials whereas only 17(33.3%) libraries stated that they had their processing functions done manually.

From Table 5.9, it was found that the majority of the responding libraries 27(52.9%) indicated that they did not provide online tutorials whereas 24(47.1%) libraries provided tutorials on how to use web-based information services. Besides, in terms of subscriptions to web-based e-resources, online journals, e-books, databases, etc., the vast majority of responding libraries 43(83.3%) claimed positively while only 8(15.7%) libraries did not subscribe to such resources.

In case of organized access to free subject-based information gateways/portals on the internet, 31(60.8%) libraries claimed that they organized access to such services while 20(39.2%) reported that they did not have free access on subject-based information gateways/portals on the internet.

Libraries also requested to indicate to what extent they had access to donor sponsored resources, such as INASP-PERI, Research4life, etc. The majority of the libraries 34(66.7%) declared that they had access to donor sponsored resources whereas 17(33.3%) libraries reported they did not have such access.

5.13 Registration for R4L (i.e. HINARI, AGORA, OARE, etc.)

Table 5.10: Status of Registration for R4L (i.e. HINARI, AGORA, OARE, etc.)

University Type	Yes	No
Public	15	8
Private	23	5
Total	38(74.5%)	13(25.5%)

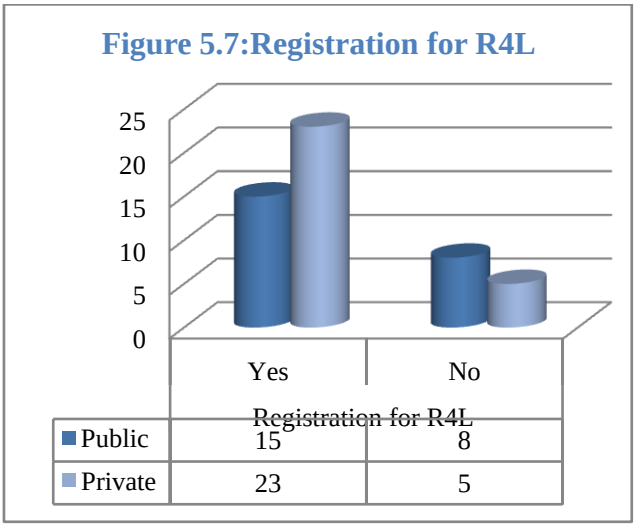


Table 5.10 presents the current status of library registration for Research4Life. The result showed that out of the 51 libraries, the majority of libraries 38(74.5%) including both public (n=15) and private (n=23) had registered for Research4Life resources while 13(25.5%) university libraries did not register with this service.

5.14 Training

This section presents the status of training facilities available for the library staff on modern technologies.

5.14.1 Funds for Training

The participant libraries were inquired about the funds that the university libraries allowed to their library staff for professional and technological training. As shown in Table 5.11, a significant number of respondent libraries claimed that the university authority provided funds for professional training. Moreover, three universities confirmed that they received training funds from Higher Education Quality Enhancement Project

(HEQEP) which was implemented by the University of Grant Commission, Bangladesh with the support from the World Bank. Moreover, out of 51 university libraries, three libraries did not response to this question.

Table 5.11: Training Funds

University Name	Training Funds	University Name	Funds for Training
CUET	University Authority	***BUP***	University Authority
EU	University Authority	***SUB***	University Authority
NSTU	University Authority	***AIUB***	University Authority
IUB	University Authority	***JKKNIU***	University Authority
UIU	Higher Education Quality Enhancement Project (HEQEP)	***PSTU***	University Authority
RU	Depends upon the situation	***MBSTU***	University Authority
EWU	University Authority	***IUB***	University Authority
IIUC	University Authority	***BAUST***	-
EDUC	University Authority	***IUK***	University Authority
CIU	University Authority	***BAIUST***	University Authority
SUST	University and Library Authority	***RSTU***	-
KYAU	University Authority	***GUB***	University Authority
BRACU	University Authority	***MIU***	University Authority
BRU	University Authority	***BSMRMU***	University Authority
CU	University Authority	***KUET***	Higher Education Quality Enhancement Project (HEQEP)
HMDSTU	Library Authority	***KU***	University Authority
AUW	University Authority	***RUET***	Library Authority
NUB	University Authority	***SAU, Sylhet***	University Authority
SEU	University Authority	***AUB***	University Authority
IUT	University Authority	***SIU***	University Authority
CVASU	Higher Education Quality Enhancement Project (HEQEP)	***JU***	University Authority
ULAB	University Authority	***PUST***	Library Authority

Table 5.11 *Continued*

DIU	University Authority	***BUET***	University Authority
SAU	University and Library Authority	***DU***	Library Authority
NSU	University Authority	***SUB***	-
		LU, Sylhet	-

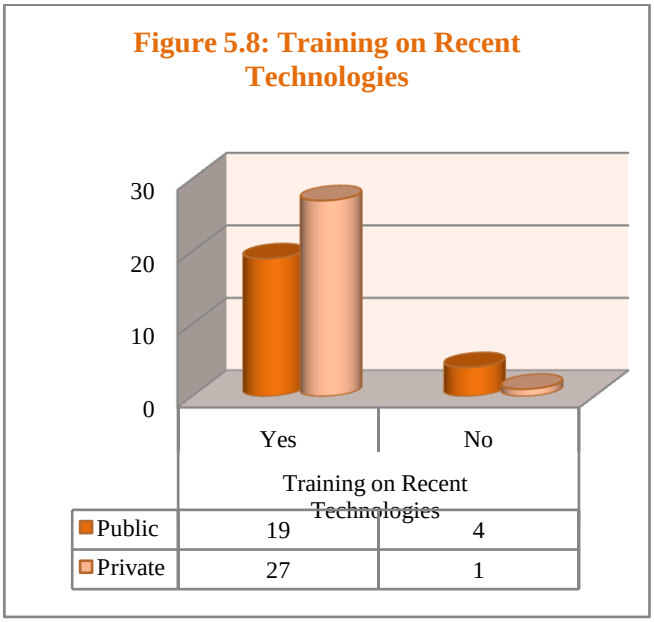
5.14.2 Training on Recent Technologies

Table 5.12 examined the present status of training on recent technologies. The results indicated that, in case of public universities, 19 libraries claimed that their university authorities allowed them to participate training program on recent technologies. In case of private universities, the majority of the universities i.e., 27 of them stated that the university authority provided support to attend such training programs (see the visual representation in figure 5.8).

Table 5.12: Status of Training on Recent Technologies

University Type	Training	
	Yes	No
Public	19	4
Private	27	1
Total	46(90.2%)	5(9.8%)

Figure 5.8: Training on Recent Technologies



5.14.3 Training that is Available or Needed for Library Staff

Table 5.13: Status of Training that is Available or Needed for Library Staff

Qualified Personnel Skills	Public		Private		Percentage (%)	Total
	Available	*Needed*	*Available*	*Needed*		
Development and administration of databases and library systems	11	12	16	12	Total:(public and private) **Available=27(52.9%)** **Needed=24(47.1%)**	51
Hardware maintenance	8	15	18	10	Total:(public and private) **Available=26(51.0%)** **Needed=25(49.0%)**	51
Digital content management, including digital libraries	7	16	17	11	Total:(public and private) **Available=24(47.1%)** **Needed=27(52.9%)**	51
Development and management of bibliographic databases	10	13	16	12	Total:(public and private) **Available=26(51.0%)** **Needed=25(49.0%)**	51
Network administration	10	13	14	14	Total:(public and private) **Available=24(47.1%)** **Needed=27(52.9%)**	51
Metadata management	8	15	14	14	Total:(public and private) **Available=22(43.1%)** **Needed=29(56.9%)**	51
Computer/ web programming	6	17	12	16	Total:(public and private) **Available=18(35.3%)** **Needed=33(64.7%)**	51
Website/ portal development and maintenance	6	17	16	12	Total:(public and private) **Available=22(43.1%)** **Needed=29(56.9%)**	51

Respondent libraries were asked to identify useful training programs which are available or needed for acquiring digital competencies of the library staff. As apparent in Table 5.13, the largest groups of the respondents, 27(52.9%) indicated that their libraries provided training on development and administration of databases and library systems while 24(47.1%) claimed they needed this training for their library staff. Besides, in case of hardware maintenance, most of them stated they had such training available while 25(49.0%) libraries reported the need for such training. For digital content management, the majority of the respondents declared that they needed this training whereas 24(47.1%) libraries claimed that they had already received training on this.

Moreover, in terms of developing and managing of bibliographic databases, 26(51.0%) of the libraries claimed that they organized training program for their library staff whereas 25(49.0%) libraries had no such training programs. Responding librarians also stated that network administration is an essential skill that the library staff should have for resources maintenance and sharing, but in this case, 24(47.1%) libraries had such training whereas 27(52.9%) libraries considered this training is necessary for their library staff.

For metadata management training, 22(43.1%) libraries reported they had such training facilities where the largest groups of respondents 29(56.9%) declared that their libraries did not provide such training. Computer/web programming is another inherent skill which is required for building and maintaining digital resources, in that case, only 18(35.3%) of the libraries stated that they had training on this but the majority of the libraries 33(64.7%) reported this type of training is required for them. Furthermore, 29(56.9%) of the respondents argued that they severely felt the need of training on the website/portal development and maintenance and 22(43.1%) libraries informed that they had such training.

5.15 Finance

The present survey explores the financial supports for ICT (e.g. network, computers, etc.) and e-resource from the university funds.

5.15.1 Approximate Percentage (%) of ICT Facilities and E-resources Acquired from the University Funds.

Table 5.14: Status of approximate percentage (%) of ICT facilities and e-resources acquired from the university funds (Open ended question)

University Name	*Approximate percentage (%) of ICT*	*Approximate percentage (%) of e-resources*	*University Name*	*Approximate percentage (%) of ICT*	*Approximate percentage (%) of e-resources*
CUET	70%	100%	***BUP***	-	2%
EU	65%	70%	***SUB***	20%	5%
NSTU	50%	60%	***AIUB***	100%	60%
IUB	-	-	***JKKNIU***	-	100%
UIU	50%	10%	***PSTU***	3%	5%
RU	More than 80%	More than 90%	***MBSTU***	-	5%
EWU	100%	30% Approx.	***IUB***	-	-
IIUC	100%	50%	***BAUST***	20-25%	1%
EDUC	50%	40%	***IUK***	5%	0.50%
CIU	100%	100%	***BAIUST***	-	
SUST	100%	100%	***RSTU***	-	-
KYAU	-	100%	***GUB***	100%	100%
BRACU	60%	60%	***MIU***	-	-
BRU	40%	3%	***BSMRMU***	100%	100%
CU	100%	100%	***KUET***	-	100%
HMDSTU	100%	90%	***KU***	100%	During HEQEP 80% provides through UGC and 20% provided by Khulna University
AUW	80%	80	***RUET***	10%	90%
NUB	40%	10	***SAU, Sylhet***	20%	25%
SEU	100%	100%	***AUB***	-	-
IUT	100%	100%	***SIU***	20%	-

Table 5.14 *Continued*

CVASU	30%	0%	***JU***	-	100%
ULAB	100%	100%	***PUST***	0.05%	40%
DIU	100%	100%	***BUET***	100%	90%
SAU	100%	100%	***DU***	Around 5% of library Budget	-
NSU	75%	100%	***SUB***	100%	80%
			LU, Sylhet	-	-

Libraries were asked about the approximate percentage (%) of ICT facilities (e.g., network, computers, etc.) acquired from the university funds (see Table 5.14). Out of 51 libraries, 17 confirmed that they received 100% budget for ICT-related facilities from their university whereas many claiming to receive about 50-90%. Moreover, some of the libraries declared that the university authorities provided only 0%-40% ICT-related funding.

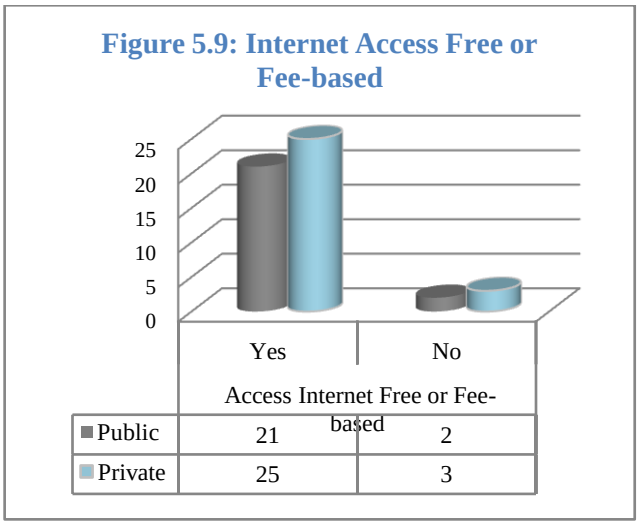
Table 5.14 also indicated the status of approximate percentage (%) of e-resources (e-journals, e-books, etc.) purchased by the libraries from the university funds. The results revealed that the majority of the respondents, i.e., n=16 asserted that they acquired 100% financial support for purchasing e-resources. Others claimed that the university authorities provided about 50%-90% funding for purchasing e-resources. Besides, the table also showed that some of the libraries got support for purchasing e-resources where the ratio was about 0% to 40%. Only one university (i.e. Khulna University) claimed that 80% of funds were obtained through HEQEP while the remaining 20% were provided by the university.

5.16 Access to Internet Free or Fee-based

Table 4.15 represents the status about free or fee-based internet facilities that the university library provided to their user communities. From the findings, it is reported that out of 51 of libraries, the majority of the libraries 46(90.2%) including both public (n=21) and private (n=25), had free or fee-based internet access where only 5(9.8%) libraries had not such internet access (see Figure 5.9).

Table 5.15: Internet Access free or fee-based

University Type	Yes	No
Public	21	2
Private	25	3
Total	**46(90.2%)**	**5(9.8%)**



5.17 Problems of Launching Digital Library:

5.17.1 Constraints in Establishing and Managing Digital Libraries

Table 5.16: Constraints in Establishing and Managing Digital Libraries

Constraints	*Public*		*Private*		Percentage (%)	Total
Digital Infrastructures:	**Yes**	**No**	**Yes**	**No**		
• ***Procurement***	14	9	14	14	Total:(public and private) **Yes=28(54.9%)** **No=23(45.1%)**	51
• ***Maintenance***	13	10	18	10	Total:(public and private) **Yes=31(60.8%)** **No=20(39.2%)**	51
• ***Upgrading***	14	9	17	11	Total:(public and private) **Yes=31(60.8%)** **No=20(39.2%)**	51
Availability/Procurement of Software	13	10	12	16	Total:(public and private) **Yes=25(49.0%)**	51

Table 5.16 *Continued*

					No=26(51.0%)	
Financial/Budgetary support by Management	20	3	17	11	Total:(public and private) **Yes=37(72.5%)** **No=14(27.5%)**	51
Absence of funding by Govt. agencies	16	7	19	9	Total:(public and private) **Yes=35(68.6%)** **No=16(31.4%)**	51
Lack of trained staff	19	4	20	8	Total:(public and private) **Yes=39(76.5%)** **No=12(23.5%)**	51
Lack of interest among staff	13	10	9	19	Total:(public and private) **Yes=22(43.1%)** **No=29(56.9%)**	51
Lack of standards and uniformity	16	7	21	7	Total:(public and private) **Yes=37(72.5%)** **No=14(27.5%)**	51
Unawareness of modern library trend	11	12	19	9	Total:(public and private) **Yes=30(58.8%)** **No=21(41.2%)**	51
Failed to understand the benefits of digitization	10	13	15	13	Total:(public and private) **Yes=25(49.0%)** **No=26(51.0%)**	51
Copyright issues	13	10	14	14	Total:(public and private) **Yes=27(52.9%)** **No=24(47.1%)**	51

The respondent libraries were requested to explain the constraints that they encountered in establishing and managing digital libraries. As illustrated in Table 5.16, the majority of the libraries claimed that they had problems such as procurement 28(54.9%), maintenance 31(60.8%) and upgrading 31(60.8%) of digital infrastructures. In case of availability/ procurement of software, almost half of the libraries 26(51.0%) reported they did not face such problem whereas the remaining half 25(49.0%) reported having such problem.

Besides, financial/budgetary support by management authorities was another problem stated by the highest groups of respondents 37(72.5%) and only 14(27.5%) libraries reported that they did not have this problem. Moreover, the inadequacy of funding by government agencies is a critical issue for developing countries, and the present report found that the majority of the libraries 35(68.6%) affirmed that they did not get sufficient fund from government sources but 16(31.4%) libraries claimed that they had received such type of fund.

For building and managing digital libraries, IT skilled manpower is a fundamental requirement. The findings reported that 39(76.5%) of the libraries had shortage of skilled manpower. Alternatively, 12(23.5%) libraries claimed that they had skilled library personnel. Table 5.16 indicated that lack of interest among staff was also an interference to build digital library. Out of 51 libraries, 22(43.1%) libraries reported that some of their staff members did not have any interest regarding digital library whereas 29(56.9%) libraries reported that their library staff were more concerned and provided efficient support in this regard.

Another shortcoming was the absence of standards and uniformity for building digital. A vast majority of libraries 37(72.5%) considered this as a major issue whereas 14(27.5%) libraries did not consider this issue as a drawback. Moreover, libraries also stated that unawareness of the modern library trend was another impediment for launching digital libraries. As indicated in Table 5.16, it was found that the largest group of respondents 30(58.8%) argued that they were not aware of modern library trends whereas 21(41.2%) libraries asserted that they were updated with information.

Moreover, in terms of understanding the benefits of digitization, half of libraries 26(51.0%) apprised that they understand the benefits while 25(49.0%) answered that they were not fully aware of the benefits of digitization. This is not a good sign for any institutional library. Moreover, there is a growing inconvenience among members of the library community that copyright reforms will unfavorably influence on their ability to provide digital collections and services. As indicated above, the present study found that 27(52.9%) libraries claimed that they had encounted copyright-related issues whereas 24(47.1%) libraries had not faced such problems.

5.18 Conclusion

The findings of this Chapter indicate that the digital library initiatives are still at a growing stage in Bangladesh. It was found that the private university libraries are more advanced in terms of IT use than the public university libraries. These libraries are continuously developing their libraries for providing better service to their users than the public universities. Majority of the libraries participated in the survey used e-resources whereas a large number of libraries were connected to Library Consortium of Bangladesh (LiCoB). Moreover, the findings reported the difficulties faced by the libraries for building and maintaining digital libraries. These difficulties included: inadequate IT infrastructures, budgetary constraints, lack of skilled manpower, etc.

Chapter 6

Data Analysis and Findings on Faculty Members' Perceptions towards Digital Resources

This Chapter analyzes the findings on university faculty members' perceptions towards digital resources. It begins with demographic information about faculty members and then proceed to analyze their opinions with regard to university subscribed resources. The findings are described in accordance with the stated objectives.

6.1 Participating Universities

Table 6.1: Types of Participant Universities

University Types	Frequency	Percentage
Public (31)	605	79.9%
Private (17)	152	20.1%
Total	**757**	**100.0**

An online questionnaire was sent arbitrarily to faculty members from different disciplines at some selected public and private universities in Bangladesh. This survey found a total of 757 responses, among them 605(79.9%) were from 31 public universities whereas 152(20.1%) faculty member from 17 private universities participated in the survey.

6.2 Respondents Demographic Characteristics

The demographic data obtained from the survey were organized and analyzed as presented in Table 6.2.

Table 6.2: Demographic Characteristics of Respondents

Variable	Classification	Frequency	Percentage
Respondent Gender	*Female*	145	19.2%
	Male	612	80.8%

Table 6.2 *Continued*

Faculty Members	*Lecturer*	226	29.9%
Position	*Assistant Professor*	312	41.2%
	Associate Professor	102	13.5%
	Professor	117	15.5%
Age in Years	*Below 25*	13	1.7%
	26-30	228	30.1%
	31-35	190	25.1%
	36-40	153	20.2%
	41-45	87	11.5%
	46-50	35	4.6%
	51-55	23	3.0%
	56-60	14	1.8%
	Above 60	14	1.8%

6.2.1 Respondent Gender

According to University of Grant Commission (UGC Annual Report, 2017-2018), the total number of faculty members working at universities in Bangladesh was 13,580. While 1900 questionnaires were sent randomly to the selected universities, 757 faculty members from different universities responded to the survey with a response rate of 39.8%. Majority of the participants were males 612(80.8%) compared to 145(19.2%) female faculty members. According to Bangladesh Bureau of Educational Information and Statistics (BANBEIS, 2016), the numbers of female faculty members were 2887(22.65%) and 4343(28.86%) respectively in all public and private universities in Bangladesh. This suggests an imbalance between male and female ratios. This gender difference was also evident from the survey responses (See Table 6.2).

6.2.2 Faculty Members' Position

Of the 757 respondents, the majority of the faculty members were Assistant Professors 312(41.2%) from different disciplines. The second largest group was the Lecturer category 226(29.9%). Additionally, there were 117(15.5%) Professors from different universities and the remaining respondents were Associate Professors 102(13.5%).

6.2.3 Age in Years

According to Table 6.2, among 757 of faculty members from different universities, majority of the respondents 228 (30.1%) were from the age group 26-30years, followed by 190(25.1%) were from the second largest age group 31-35 years, 153(20.2%) were aged between 36-40 years and 87(11.5%) of faculty members were from the age group 41-45 years. Table 6.2 also revealed fewer responses of different age groups, such as 35(4.6%) were from the age group 46-50 years, 23(3.0%) respondents belonged to the age groups 51-55 years, and the smallest groups of 14(1.8%) respondents were aged between 56-60 and above 60 were 14(1.8%) of respondents and remaining 13(1.7%) respondents were below 25 years respectively.

The demographic characteristics of respondents are shown individually by the following figures (Figure 6.1 to Figure 6.3).

Figure 6.1: Gender

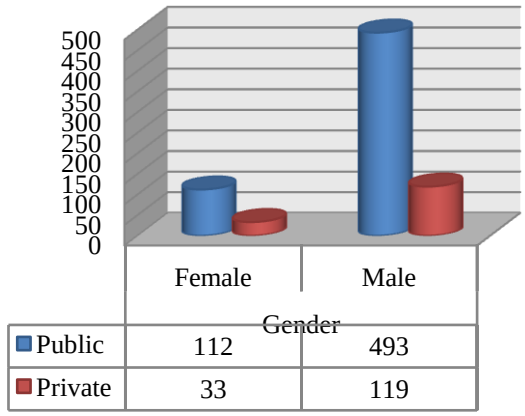


Figure 6.2: Faculty Members Position

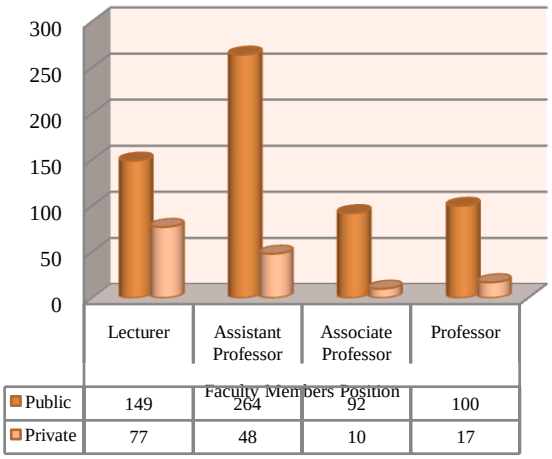
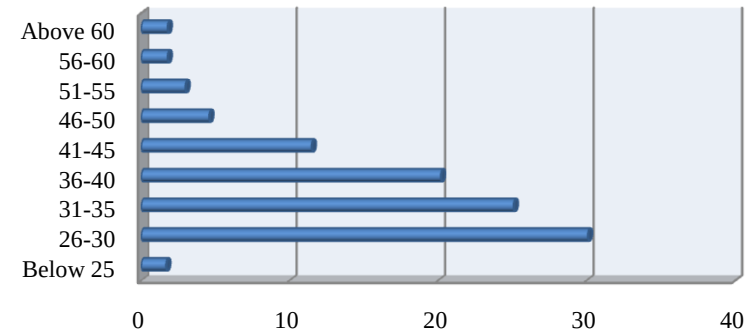


Figure 6.3: Age (in Years)



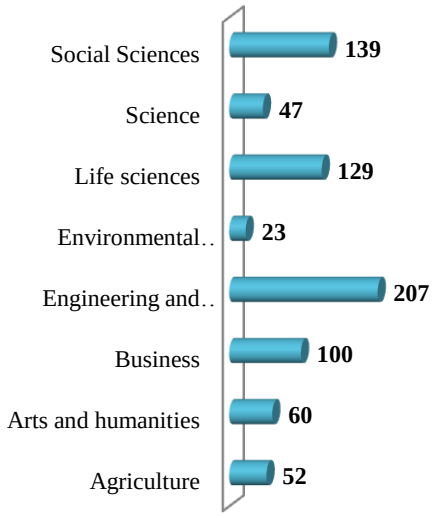
	Below 25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	Above 60
Percent	1.7	30.1	25.1	20.2	11.5	4.6	3	1.8	1.8

6.2.4: Area of Specialization within the Academic Discipline

Table 6.3: Area of Specialization

Areas of Specialization	Frequency	Percentage
Agriculture	52	6.9%
Arts and humanities	60	7.9%
Business	100	13.2%
Engineering and technology	207	27.3%
Environmental Sciences	23	3.0%
Life sciences	129	17.0%
Science	47	6.2%
Social Sciences	139	18.4%
Total	757	100.0

Figure 6.4: Areas of Specialization



This survey adopted eight areas of specialization to identify the faculty members' background. Table 6.3 represents the area of specialization where the faculty members belong with their disciplines. The results found that the largest groups of the respondents were from the area of engineering and technology 207(27.3%) and the second largest group was from social sciences 139(18.4%) background. Additionally, 129(17.0%) and

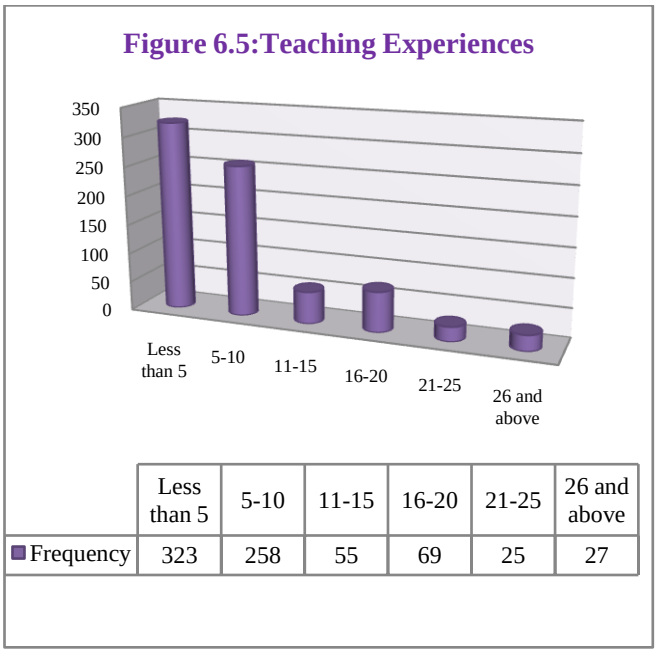
100(13.2%) were from life sciences and business studies respectively. The survey received lowest responses from the following disciplines like arts and humanities 60(7.9%), followed by agriculture 52(6.9%), pure science 47(6.2%) and environmental sciences 23(3.0%) respectively. The visual representation of areas of specialization of faculty members was also shown in Figure 6.4.

6.2.5 Teaching Experiences

Table 6.4 shows the faculty members' teaching experiences in years. Out of 757 of respondents, the largest group of respondents 323(42.7%) had less than five years of experiences. The next largest group of participants 258(34.1%) had 5-10 years of teaching experiences. Overall, the result indicated that young faculty members' response rate was higher than the senior and experienced faculty members. The table also showed that 69(9.1%) faculty members had 16-20 years of teaching experience followed by 55(7.3%) had 11-15 years of experience, 27(3.6%) had 26 and above, and 25(3.3%) respondents had 21-25 years of teaching experience (see Figure 6.5).

Table 6.4: Teaching Experiences (in years)

Teaching Experiences	Frequency	Percentage
Less than 5	323	42.7%
5-10	258	34.1%
11-15	55	7.3%
16-20	69	9.1%
21-25	25	3.3%
26 and above	27	3.6%
Total	**757**	**100.0%**



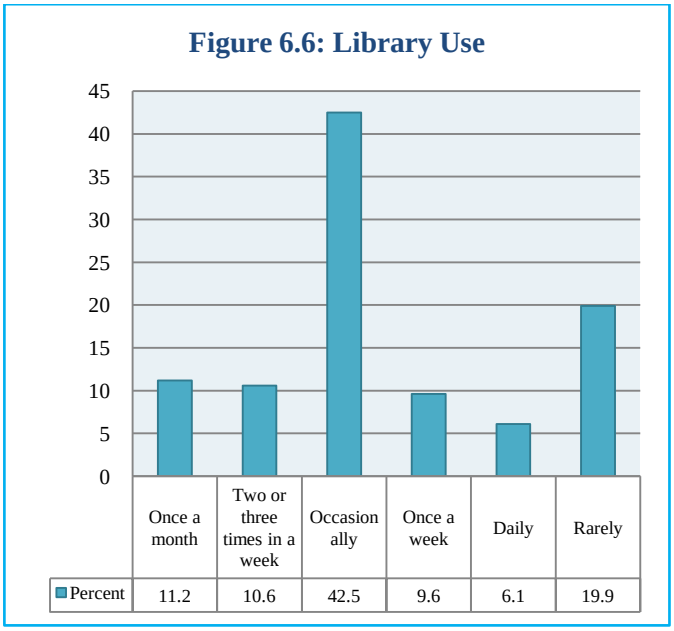
6.3 Status of Using Library by Faculty Members

Faculty members were asked about their frequency of library use. The responses of the survey indicated that out of the 757 of faculty members, 322(42.5%) used library occasionally. The library was rarely used by 151(19.9%) of the faculty members. Table 6.5 also reported that 85(11.2%) of the faculty members used library once a month,

followed by 80(10.6%) used the library two or three times a week and 73(9.6%) of the respondents used library once a week. Only 46(6.1%) of the faculty members used library on a daily basis.

Table 6.5: Status of Using Library

Library Use	Frequency	Percentage
Once a month	85	11.2%
Two or three times in a week	80	10.6%
Occasionally	322	42.5%
Once a week	73	9.6%
Daily	46	6.1%
Rarely	151	19.9%
Total	757	100.0%



6.4 Faculty Members' Computer Literacy and status of using Computer/Internet:

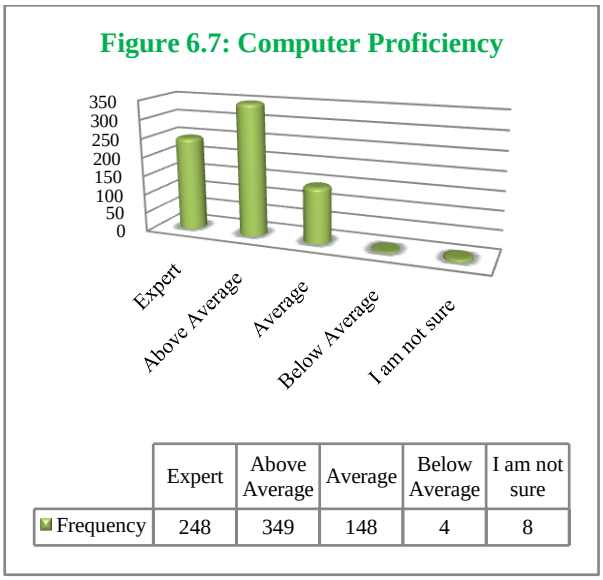
This section reports the results of the faculty members' computer literacy, use of computer and internet facilities.

6.4.1Computer Proficiency

Computer skills are crucial for all profession. From this view, the present study attempted to find out the computer proficiencies of participating faculty members. The participants were asked to rate their own level of computer proficiency. Table 6.6 shows that the largest group of academics had above average (349, 46.1%) computer proficiency level whereas 248(32.8%) of the faculty members responded that they are experts in this field. Moreover, it was found that 148(19.6%) respondents had average level of skills followed by 4(.5%) of the faculty members with below average skills. Interestingly, some faculty members (8, 1.1%) reported that they were not sure about their computer proficiency levels (see the visual presentation in Figure 6.7).

Table 6.6: Level of Computer Proficiency

Computer Proficiency	Frequency	Percentage
Expert	248	32.8%
Above Average	349	46.1%
Average	148	19.6%
Below Average	4	.5%
I am not sure	8	1.1%
Total	**757**	**100.0%**

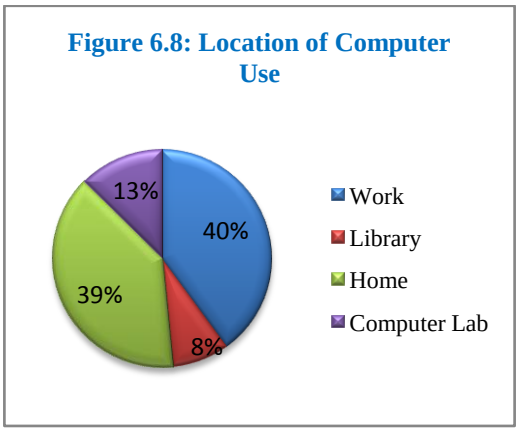


6.4.2 Location of Computer Use

Faculty members were asked about the location(s) where they use computers. From Table 6.7, it was found that majority of the respondents used computer at their workplaces 706(93.3%) as well as at home 689(91.0%). On the other hand, 221(29.2%) of the respondents used computer at the computer lab and followed by 149(19.7%) of them used computer at the library.

Table 6.7: Location of Computer Use (Multiple Answers)

Location	Frequency	Percentage
Work	706	93.3%
Library	149	19.7%
Home	689	91.0%
Computer Lab	221	29.2%



6.4.3 Location of Internet Use by Academics

Internet can be utilized in different places according to the suitability of the user and accessibility of the facility. The present study attempted to find out the location of internet use by faculty members (see Table 6.8 and Figure 6.9). It was found that most respondents 703(92.2%) used internet at their workplaces as well as from their homes 697(92.1%). Comparatively, 178(23.5%) of respondents used internet at computer lab and 147(19.4%) accessed internet from the library.

Location of the Internet Use	Frequency	Percentage
Work	703	92.9%
Library	147	19.4%
Home	697	92.1%
Computer Lab	178	23.5%

Figure 6.9:Location of the Internet Use

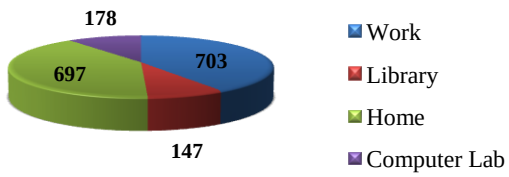


Table 6.8: Location of Internet Use (Multiple Answers)

6.4.4 Access to Internet

Internet has become an indispensable tool for teaching, research and updating knowledge. From the survey, it was found that majority of the respondents (748, 98.8%) accessed internet several times each day. This is a good sign that the faculty members are aware about keeping themselves updated with daily access to internet. Moreover, only a few faculty members reported that they had accessed internet several times in a week (see Table 6.9).

Table 6.9: Access to Internet

Access Internet	University Type		
	Public	**Private**	**Total**
Several times a day	597	151	748(98.8%)
Once a week	1	0	1(.1%)
Several times in a week	7	0	7(.9%)
Rarely	0	1	1(.1%)
Total	**605**	**152**	**757**

6.5 Status of Awareness, Purpose of Using, Access and Evaluation of Digital Resources by Faculty Members

This section presents the status of the faculty members' awareness, use, access and evaluation of digital resources.

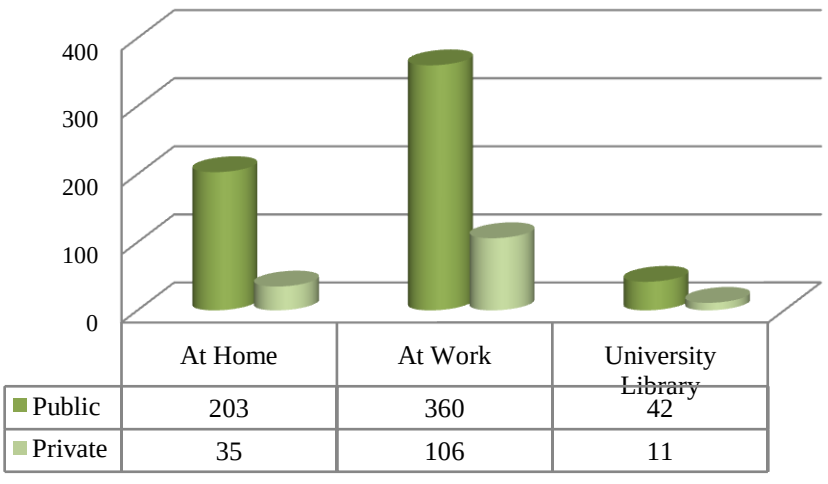
6.5.1 Location of Accessing Digital Resources

Table 6.10 depicted the location from where the digital resources were mostly accessed by the faculty members. A vast majority of the respondents 466(61.6%) at both public (n=360) and private (n=106) universities accessed digital resources at their workplaces, while 238(31.5%) faculties accessed them at home. Moreover, it was found that 53(7.0%) accessed e-resources at their university library.

Table 6.10: Location of Access Digital Resources

University Type	Access Digital Resources			Total
	At Home	At Work	University Library	
Public	203	360	42	**605**
Private	35	106	11	**152**
Total	238(31.4%)	466(61.6%)	53(7.0%)	757

Figure 6.10: Location of Accessing Digital Resources



6.5.2 Access to Digital Resources

Faculty members were also asked regarding their frequency of digital resources use (see Table 6.11). It was found that a significant number of respondents 578(76.4%) at both public and private universities accessed digital resources daily, and the second largest group of the respondents 102(13.5%) accessed e-resources a few times every week. Moreover, 29(3.8%) of the respondents used them occasionally, whereas 24(3.2%) used them at least once a week. This study also found that only a handful of respondents used digital resources irregularly, i.e. at least once a month, fortnightly and rarely.

Table 6.11: Access Digital Resources

Access Digital Resources	Public	Private	Frequency and Percentage
Most days	467	111	578(76.4%)
A few times every week	83	19	102(13.5%)
At least once a week	18	6	24(3.2%)
At least once a fortnight	4	2	6(.8%)
At least once a month	8	4	12(1.6%)
Occasionally	20	9	29(3.8%)
Rarely	5	1	6(.8%)
Total	605	152	757(100.0%)

6.5.3 Faculty Members' Awareness of E-Resources

Electronic resources or digital resources along with print resources have become a fundamental part of any library collection. Faculty members were asked about their awareness of e-resources. The main purpose of this question was to find out the extent to which the faculty members were familiar with the e-resources. Table 6.12 showed that in the case of e-journals, the largest number of the respondents 482(63.7%) were well-aware whereas second largest group 200(26.4%) was moderately aware. Regarding e-book, a significant number of the respondents 425(56.1%) were well-aware, whereas 229(30.3%) of the participants were moderately aware. Additionally, 235(31.0%) of the respondents indicated that they were moderately aware regarding bibliographic databases whereas 231(30.5%) were well-aware about this type of e-resource.

Table 6.12: Awareness of E-Resources

E-Resources	Not at all aware	Slightly Aware	Somewhat Aware	Moderately Aware	Well-Aware	Total
E- Journals	8(1.1%)	29(3.8%)	38(5.0%)	200(26.4%)	482(63.7%)	**757**
E-Books	6(.8%)	35(4.6%)	62(8.2%)	229(30.3%)	425(56.1%)	**757**
Bibliographic databases	65(8.6%)	88(11.6%)	138(18.2%)	235(31.0%)	231(30.5%)	**757**
Electronic and Theses Dissertations (ETD)	61(8.1%)	84(11.1%)	126(16.6%)	209(27.6%)	277(36.6%)	**757**
E-Magazines	46(6.1%)	90(11.9%)	152(20.1%)	200(26.4%)	269(35.5%)	**757**
E-Newspapers	13(1.7%)	56(7.4%)	69(9.1%)	184(24.3%)	435(57.5%)	**757**
Indexing and Abstracting Databases	80(10.6%)	80(10.6%)	134(17.7%)	204(26.9%)	259(34.2%)	**757**
Full-text database	73(9.6%)	81(10.7%)	153(20.2%)	196(25.9%)	254(33.6%)	**757**
Reference database/ Citation Databases	46(6.1%)	84(11.1%)	114(15.1%)	235(31.0%)	278(36.7%)	**757**
Library Catalogues/Union catalogue (OPAC, WorldCat, etc.)	133(17.6%)	148(19.6%)	188(24.8%)	155(20.5%)	133(17.6%)	**757**
CD/DVD	114(15.1%)	125(16.5%)	145(19.2%)	146(19.3%)	227(30.0%)	**757**
Discovery tools (such as, federated search tools, EBSCO Discovery Services, Summon, etc.)	218(28.8%)	150(19.8%)	157(20.7%)	119(15.7%)	113(14.9%)	**757**
Subject Gateways	198(26.2%)	140(18.5%)	174(23.0%)	148(19.6%)	97(12.8%)	**757**
Institutional Repository	134(17.7%)	125(16.5%)	171(22.6%)	165(21.8%)	162(21.4%)	**757**

Furthermore, in case of Electronic and Theses Dissertations (ETD), e-magazines, e-newspapers, indexing and abstracting Databases, full-text database, reference database/ citation databases and CD/DVD, the faculty members of the public and private universities mentioned that they were well-aware about these resources. This study further reported that 188(24.8%) of the respondents were somewhat aware about library catalogues/union catalogue (OPAC, WorldCat, etc.).

The findings also reported a lower level of awareness regarding discovery tools (such as, federated search tools, EBSCO discovery services, summon, etc.) by 218(28.8%) and subject gateways 198(26.2%). Additionally, faculty members also mentioned that they were somewhat aware 171(22.6%) about institutional repositories.

6.5.4 Seeking Relevant E-resources

Table 6.13 represents a clear understanding of how faculty members at public and private universities sought their relevant e-resources and which search tools they used to get their desired resources.

Table 6.13: Seeking Relevant E-resources by Using-

Seeking Relevant E-Resources	Strongly Disagreed	Disagreed	Undecided	Agreed	Strongly Agreed	Total
University/library websites	35(4.6%)	61(8.1%)	61(8.1%)	262(34.6%)	338(44.6%)	**757**
Web search engines	6(.8%)	9(1.2%)	17(2.2%)	199(26.3%)	526(69.5%)	**757**
Subject guides/portals on the internet	10(1.3%)	24(3.2%)	82(10.8%)	330(43.6%)	311(41.1%)	**757**
Online databases with links to full text	9(1.2%)	19(2.5%)	77(10.2%)	289(38.2%)	363(48.0%)	**757**
Discovery tools provided by university library (such as, federated search tools, EBSCO discovery services, summon, etc.)	50(6.6%)	77(10.2%)	193(25.5%)	258(34.1%)	179(23.6%)	**757**

It was found that almost half of the respondents 338(44.6%) used university/library websites for seeking relevant information whereas the largest groups of faculty members 526(69.5%) used web search engines as their preferred search tool.

Moreover, faculty members had used subject guides/portals on the internet 330(43.6%), online databases with links to full-text 363(48.0%) and discovery tools 258(34.1%) provided by their university library such as federated search tools, EBSCO discovery services, Summon, etc.

6.5.5 Purpose of Using E-Resources

Table 6.14: Purpose of Using E-Resources

Purpose of Using E-Resources	Strongly Disagreed	Disagreed	Undecided	Agreed	Strongly Agreed	Total
Professional research activities	5(.7%)	4(.5%)	10(1.3%)	165(21.8%)	573(75.5%)	757
Getting support in teaching activities (prepare class materials, designing curriculum, etc.)	4(.5%)	6(.8%)	15(2.0%)	198(26.2%)	534(70.5%)	757
Personal research	6(.8%)	2(.3%)	11(1.5%)	178(23.5%)	560(74.0%)	757
Updating of subject knowledge	4(.5%)	4(.5%)	26(3.4%)	221(29.2%)	502(66.3%)	757
Learning	5(.7%)	6(.8%)	15(2.0%)	255(33.7%)	476(62.9%)	757
Recreation	34(4.5%)	49(6.5%)	144(19.0%)	316(41.7%)	214(28.3%)	757
Communication	16(2.1%)	32(4.2%)	100(13.2%)	271(35.8%)	338(44.6%)	757

Table 6.14 indicates the purposes of using e-resources by the university faculty members in the universities of Bangladesh. The findings showed that the main purposes of using e-resources according to the largest group of the respondents 573(75.5%) were professional research activities, followed by 560(74.0%) used for personal research, 534 (70.5%) of the respondents used them for getting support in teaching activities (such as prepare class

lectures, designing curriculum, etc.), 502(66.3%) of participant used for updating their subject knowledge, 476(62.9%) of the respondents used e-resources for learning purposes respectively. This finding also reported that a significant portion of the respondents 316(41.7%) used e-resources for recreation purposes.

6.5.6 University Librarians performance in Satisfying the Information Needs via Electronic Resources

Table 6.15: Performance of the Libraries and their Staff

Performance of the Library	***Strongly Disagreed***	***Disagreed***	***Undecided***	***Agreed***	***Strongly Agreed***	***Total***
Library staff are very knowledgeable in electronic resources	70(9.2%)	166(21.9%)	214(28.3%)	228(30.1%)	79(10.4%)	757
University library has conducted adequate promotional activities to encourage the usage of electronic resources	79(10.4%)	184(24.3%)	154(20.3%)	253(33.4%)	87(11.5%)	757
Library provide adequate infrastructure that offers support on the usage of the electronic resources	60(7.9%)	179(23.6%)	176(23.2%)	260(34.3%)	82(10.8%)	757
The library provides satisfactory access to electronic resources	58(7.7%)	180(23.8%)	181(23.9%)	257(33.9%)	81(10.7%)	757

Table 6.15 *Continued*

Library staff keep faculty members well informed about new sources and services	82(10.8%)	206(27.2%)	170(22.5%)	201(26.6%)	98(12.9%)	757
The library staff offers sufficient bibliographic instructions and assistance to use the electronic resources effectively	89(11.8%)	211(27.9%)	211(27.9%)	191(25.2%)	55(7.3%)	757
The library provides adequate training programs on how to use electronic resources	124(16.4%)	225(29.7%)	184(24.3%)	165(21.8%)	59(7.8%)	757
Library personnel helps to examine the quality of e-resources	109(14.4%)	199(26.3%)	228(30.1%)	171(22.6%)	50(6.6%)	757
Overall, I am satisfied with the electronic resources and services provided in the library.	107(14.1%)	182(24.0%)	174(23.0%)	226(29.9%)	68(9.0%)	757

Faculty members were requested to evaluate the performance of their libraries in satisfying their information needs via electronic resources. The findings (see Table 6.15) showed that only one-third of the respondents 228(30.1%) mentioned library staff were very knowledgeable about electronic resources. Moreover, almost the same percentage of respondents 253(33.4%) felt that the university library conducted adequate promotional activities to encourage the use of electronic resources. Similarly, only about one-third of the respondents 260(34.3%) considered that their library had an adequate infrastructure to access electronic resources.

In the case of access to electronic resources which the library provided, approximately one in every three respondents (257, 33.9%) reported positive responses regarding them. The findings also reported that only 98(12.9%) respondents agreed that the library staff informed them about new information sources and services.

In case of providing sufficient bibliographic instructions and assistance for using digital resources effectively, faculty members' negative perceptions were recorded. Additionally, most of the faculty members explained that the library did not provide adequate training programs on how to use electronic resources. Although the performance of the library staff reported some negative outputs, one-third faculty members confirmed their satisfaction with the electronic resources and services provided by the library.

6.6 Users Satisfaction with the University Paid E-resources

Table 6.16: Level of Satisfaction with the University Paid E-resources

Satisfaction with the University paid e-resources	***Low***	***Below Average***	***Average***	***High***	***Very High***	***NA***	***Total***
The level of materials available	100(13.2%)	115(15.2%)	310(41.0%)	122(16.1%)	35(4.6%)	75(9.9%)	757
The coverage of my subject/work	106(14.0%)	160(21.1%)	290(38.3%)	100(13.2%)	28(3.7%)	73(9.6%)	757
Ease of access	97(12.8%)	126(16.6%)	269(35.5%)	144(19.0%)	49(6.5%)	72(9.5%)	757
Ease of use	81(10.7%)	120(15.9%)	288(38.0%)	144(19.0%)	47(6.2%)	77(10.2%)	757
University library provide adequate and latest computers to access the electronic resources	128(16.9%)	156(20.6%)	234(30.9%)	109(14.4%)	48(6.3%)	82(10.8%)	757

Table 6.16 *Continued*

Technological equipment's support to access online databases	118(15.6%)	150(19.8%)	253(33.4%)	112(14.8%)	44(5.8%)	80(10.6%)	757
Adequate bandwidth to access the resources	100(13.2%)	123(16.2%)	251(33.2%)	142(18.8%)	66(8.7%)	75(9.9%)	757
Easy navigation to resources from library websites	104(13.7%)	155(20.5%)	256(33.8%)	116(15.3%)	50(6.6%)	76(10.0%)	757
Overall satisfaction	103(13.6%)	144(19.0%)	275(36.3%)	121(16.0%)	43(5.7%)	71(9.4%)	757

Table 6.16 presents the results of the faculty members' level of satisfaction with the university paid e-resources. In case of the level of materials available in the universities, 310(41.0%) of the respondents considered it in average level while the maximum number of the respondents 115(15.2%) described their level of satisfaction in below average. Besides, 290(38.3%) of the participants both public and private universities remarked the coverage of their subject/work as an average. Moreover, for accessing and using of e-resources, most of the respondents considered the positive answer. Moreover, faculty members also indicated their level of satisfaction concerning to the extent the university library provides adequate and latest computers for their users to access the electronic resources, most of the faculty members 234(30.9%) declared that they were satisfied with these services.

In case of technological pieces of equipment that support to access online databases, the majority of the respondents 253(33.4%) reported that they were satisfied with this service and 251(33.2%) of the respondents confirmed positive responses regarding adequate bandwidth to access the resources. For easy navigation to resources from library websites the response rate was also positive and as a final point, i.e., overall satisfaction of the

faculty members, 275(36.3%) of the respondents replied in average level and 121(16.0%) of the respondents mentioned it as high level.

6.7 Difficulties Faculty Members Encountered while using E-resources

Table 6.17: Difficulties that's the Faculty Members Encountered

Difficulties	**Public**		**Private**		**Percentage**	**Total**
	Yes	**No**	**Yes**	**No**		
Lack of knowledge regarding the use of e-resources	232	373	47	105	Yes-279(36.9%) No-478(63.1%)	757
Difficulty in finding relevant information	298	307	58	94	Yes-356(47.0%) No-401(53.0%)	757
Overload of information on the Internet	108	497	59	93	Yes-167(22.1%) No-590(77.9%)	757
It takes too long to view/download pages	196	409	29	123	Yes-225(29.7%) No-532(70.3%)	757
Only a limited number of titles available	283	322	53	99	Yes-336(44.4%) No-421(55.6%)	757
Limited access to back issues	232	373	40	112	Yes-272(35.9%) No-485(64.1%)	757
Do not have access from home	279	326	61	91	Yes-340(44.9%) No-417(55.1%)	757
Limited access to computers	176	429	27	125	Yes-203(26.8%) No-554(73.2%)	757
Slow download speed	237	368	38	114	Yes-275(36.3%) No-482(63.7%)	757

The study investigated the difficulties that the faculty members encountered while using e-resources. From Table 6.17, it was showed that public university faculty members were faced the above stated problems more in compared to private university faculties. Results also indicated that the majority of the respondents 356(47.0%) faced difficulties in finding relevant information followed by 340(44.9%) of the faculties stated that they did not have access in e-resources from home, 336(44.4%) of respondents mentioned that only a limited numbers of titles available. Furthermore, findings also stated that 279(36.9%) of the participants had lack of knowledge regarding the use of e-resources, 275(36.3%) of the respondents encountered difficulties regarding slow download speed, limited access to back issues were reported by 272(35.9%) of the faculty members respectively.

6.8 Reasons for not using these Digital Resources

Table 6.18: Reasons for not using these Digital Resources

Reasons for not Using Digital Resources	Public	Private	Frequency and Percentage	Total
	Frequency	Frequency		
I do not know how to use them	12	2	14(1.8%)	757
I do not know where to find them	39	11	50(6.6%)	757
I do not have any interest	19	5	24(3.2%)	757
I do not find them useful	44	6	50(6.6%)	757

Faculty members were also requested to indicate the reasons for not using the e-resources. Though in this era of Information and Communication Technology environment, it was surprising matter for not using e-resources by faculty members, but this study found limited numbers of respondents who not using e-resources. For investigating this query, this study employed some closed-ended questions which displayed in Table 6.18 indicated that 50(6.6%) of the respondents did not know where to get them as well as they did not find them useful. Furthermore, 24(3.2%) of them reported that they did not have any interest and 14(1.8%) of faculties did not know how to use e-resources.

6.9 Statistical Test Results

6.9.1 Chi-Square and Mann-Whitney U test for Computer Literacy

Chi-Square and Mann-Whitney U test were carried out to observe the associations and differences between male and female faculty members in terms of the level of computer literacy.

Table 6.19: Level of Computer Literacy (Chi-Square and Mann-Whitney test)

Gender	Mean Rank	Computer Literacy					Total	Chi-Square	Mann-Whitney U	Wilcoxon W	Z	*df*	Asymp. Sig. (2-tailed)
		Expert	Above Average	Average	Below Average	I am not sure							
Male	363.53	222	273	107	4	6	612	21.697	34901.500	222479.50	-4.314	4	.000*
Female	444.30	26	76	41	0	2	145						
Total		248	349	148	4	8	757						

The results indicated that the significant relations were shown between male and female, i.e. female faculty members (Mean Rank= 444.30) were more computer literate compared to male faculties (Mean Rank= 363.53). The results of the tests are revealed as (x^2=21.69, n= 757, *df*= 4, *p*< .000, U= 34901.500, W= 222479.500, Z= -4.314). See Table 6.19

6.9.2 Chi-Square Test for Access to Digital Resources

The chi-square test for independence also called Pearson's chi-square test or the chi-square test of association is used to discover whether there is a relationship between two categorical variables. A chi-square test of independence was performed to examine the association between the public and private universities in terms of frequency of digital resources access.

Table 6.20: Frequency of Access Digital Resources (Chi-Square)

University Types	Access Digital Resources							Total	Chi-Square	*df*	Asymp. Sig. (2-sided)
	Most days	*A few times every week*	*At least once a week*	*At least once a fortnight*	*At least once a month*	*Occasionally*	*Rarely*				
Public	467	83	18	4	8	20	5	605	4.955	6	.550
Private	111	19	6	2	4	9	1	152			
Total	578	102	24	6	12	29	6	757			

The statistical test indicated that there were no significant associations between the types of universities and the frequency of accessing digital resources. The association between these variables was not significant, x^2(*df*=6, N = 757) = 4.95, *p*> .05, i.e., *p*>.550).

6.9.3 Kruskal-Wallis Test for Awareness of Digital Resources in Terms of the Faculty Members Designations

Table 6.21: Awareness of Digital Resources (Kruskal-Wallis)

E-Resources	Faculty Designations	N	Mean Rank	Chi-Square	*df*	Asymp. Sig.
E- Journals	*Lecturer*	226	337.19			
	Assistant Professor	312	389.53			
	Associate Professor	102	435.10	21.752	3	.000*
	Professor	117	382.76			
E-Books	*Lecturer*	226	353.37			
	Assistant Professor	312	383.34			
	Associate Professor	102	408.31	6.842	3	.077
	Professor	117	391.38			
Bibliographic databases	*Lecturer*	226	316.50			
	Assistant Professor	312	385.21	35.467	3	.000*
	Associate Professor	102	441.82			
	Professor	117	428.41			

Table 6.21 *Continued*

Electronic and Theses Dissertations (ETD)	*Lecturer*	226	330.81	22.624	3	.000*
	Assistant Professor	312	381.32			
	Associate Professor	102	424.13			
	Professor	117	426.56			
E-Magazines	*Lecturer*	226	356.14	5.452	3	.142
	Assistant Professor	312	379.55			
	Associate Professor	102	408.88			
	Professor	117	395.62			
E-Newspapers	*Lecturer*	226	351.18	8.821	3	.032*
	Assistant Professor	312	383.04			
	Associate Professor	102	416.40			
	Professor	117	389.35			
Indexing and Abstracting Databases	Lecturer	226	324.19	27.745	3	.000*
	Assistant Professor	312	388.01			
	Associate Professor	102	447.17			
	Professor	117	401.41			
Full-text database	*Lecturer*	226	324.51	26.788	3	.000*
	Assistant Professor	312	387.28			
	Associate Professor	102	442.88			
	Professor	117	406.48			
Reference database/ Citation Databases	*Lecturer*	226	338.26	14.153	3	.003*
	Assistant Professor	312	395.30			
	Associate Professor	102	418.80			
	Professor	117	379.52			
Library Catalogues/Union catalogue (OPAC, WorldCat, etc.)	*Lecturer*	226	346.29	10.068	3	.018*
	Assistant Professor	312	382.93			
	Associate Professor	102	421.79			
	Professor	117	394.39			
CD/DVD	*Lecturer*	226	374.77	1.040	3	.792
	Assistant Professor	312	373.64			
	Associate Professor	102	387.20			
	Professor	117	394.31			

Table 6.21 *Continued*

Discovery tools (such as, federated search tools, EBSCO Discovery Services, Summon, etc.)	*Lecturer*	226	345.04	8.406	3	.038*
	Assistant Professor	312	395.40			
	Associate Professor	102	397.28			
	Professor	117	384.93			
Subject Gateways	*Lecturer*	226	333.01	15.924	3	.001*
	Assistant Professor	312	391.20			
	Associate Professor	102	404.64			
	Professor	117	412.95			
Institutional Repository	*Lecturer*	226	341.73	11.182	3	.011*
	Assistant Professor	312	385.86			
	Associate Professor	102	411.91			
	Professor	117	404.02			

Notes: * Significant at p < .05

The results of the Kruskal-Wallis test showed that there were significant differences among faculty members in case of faculty designations with regard to their awareness of e-resources. Alternatively, this test also found very little differences among faculty designations regarding awareness that, there were no significant differences among faculty designation about the following e-resources, e-books - $x^2(df=3, N = 757) = 6.84$, $p>.05$, i.e., $p= .077$; e-magazines - $x^2(df\ 3, N = 757) = 5.45$, $p>.05$, i.e., $p= .142$, and followed by CD/DVD- $x^2(df\ 3, N = 757) = 5.45$, $p>.05$, i.e., $p= .792$.

6.9.4 Mann-Whitney U Test for Awareness of Digital Resources in Terms of the Types of Universities and Gender

To find out the differences between the types of universities and gender regarding awareness of digital resources, the Mann-Whitney U Test was also conducted.

Table 6.22: Awareness of Digital Resources in Terms of the Types of Universities and Gender (Mann-Whitney U test)

Mean Rank:

E-Resources	*University Types*	*N*	*Mean Rank*	*Gender*	*N*	*Mean Rank*
E- Journals	*Public*	605	376.23	*Male*	612	392.71
	Private	152	390.03	*Female*	145	321.13
E-Books	*Public*	605	368.67	*Male*	612	390.19
	Private	152	420.12	*Female*	145	331.77
Bibliographic databases	*Public*	605	378.39	*Male*	612	389.64
	Private	152	381.43	*Female*	145	334.08
Electronic and Theses Dissertations (ETD)	*Public*	605	374.56	*Male*	612	388.88
	Private	152	396.68	*Female*	145	337.28
E-Magazines	*Public*	605	373.51	*Male*	612	386.95
	Private	152	400.84	*Female*	145	345.43
E-Newspapers	*Public*	605	371.12	*Male*	612	387.87
	Private	152	410.38	*Female*	145	341.55
Indexing and Abstracting Databases	*Public*	605	377.26	*Male*	612	390.68
	Private	152	385.94	*Female*	145	329.69
Full-text database	*Public*	605	379.88	*Male*	612	388.79
	Private	152	375.49	*Female*	145	337.68
Reference database/ Citation Databases	*Public*	605	377.24	*Male*	612	387.26
	Private	152	385.99	*Female*	145	344.15
Library Catalogues/Union catalogue (OPAC, WorldCat, etc.)	*Public*	605	372.29	*Male*	612	386.02
	Private	152	405.72	*Female*	145	349.39
CD/DVD	*Public*	605	372.30	*Male*	612	381.73
	Private	152	405.65	*Female*	145	367.46
Discovery tools	*Public*	605	371.68	*Male*	612	383.43

Table 6.22 *Continued*

(such as, federated search tools, EBSCO Discovery Services, Summon, etc.)	*Private*	152	408.14	*Female*	145	360.31
Subject Gateways	*Public*	605	376.13	*Male*	612	385.10
	Private	152	390.42	*Female*	145	353.27
Institutional Repository	*Public*	605	366.96	*Male*	612	390.24
	Private	152	426.92	*Female*	145	331.54

Mann-Whitney U Test:

Table 6.22 *Continued*

Digital Resources	Types of universities (Public and Private)				Gender (Male and Female)			
	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
E- Journals	44303.000	227618.000	-.818	.413	35979.500	46564.500	-4.167	.000*
E-Books	39729.500	223044.500	-2.909	.004*	37522.000	48107.000	-3.245	.001*
Bibliographic databases	45610.500	228925.500	-.159	.874	37856.000	48441.000	-2.848	.004*
Electronic and Theses Dissertations (ETD)	43292.000	226607.000	-1.161	.246	38321.000	48906.000	-2.659	.008*
E-Magazines	42660.000	225975.000	-1.431	.152	39503.000	50088.000	-2.135	.033*
E-Newspapers	41211.000	224526.000	-2.220	.026*	38939.500	49524.500	-2.573	.010*
Indexing and Abstracting Databases	44925.000	228240.000	-.453	.650	37219.500	47804.500	-3.128	.002*
Full text	45446.000	57074.000	-.229	.819	38378.000	48963.000	-2.618	.009*

Table 6.22 *Continued*

database								
Reference database/ Citation Databases	44917.500	228232.500	-.461	.645	39317.000	49902.000	-2.231	.026*
Library Catalogues/Union catalogue (OPAC, WorldCat, etc.)	41918.500	225233.500	-1.722	.085	40076.500	50661.500	-1.853	.064
CD/DVD	41929.500	225244.500	-1.723	.085	42697.000	53282.000	-.725	.469
Discovery tools (such as, federated search tools, EBSCO Discovery Services, Summon, etc.)	41550.000	224865.000	-1.884	.060	41659.500	52244.500	-1.173	.241
Subject Gateways	44244.500	227559.500	-.737	.461	40639.500	51224.500	-1.613	.107
Institutional Repository	38695.500	222010.500	-3.088	.002*	37488.500	48073.500	-2.969	.003*
Notes: * Significant at p < .05								

The results of the Mann-Whitney U test found that in the case of awareness of e-journals, male participants' score (Mean Rank= 392.71, n= 612) significantly exceeded those of the female participants (Mean Rank= 321.13, n=145), U= 35979.500, W= 46564.500, Z= -4.167, *p*= .000 (two-tailed). The Mann-Whitney U test result also showed that male faculty members (Mean Rank= 390.19, n=612) also significantly conscious about e-books than the female faculties (Mean Rank= 331.77, n=145), U= 37522.000, W=48107.000, Z=-3.245 and *p*=.001.

Moreover, in case of bibliographic databases, Electronic and Theses Dissertations (ETD), e-magazines, e-newspapers, and institutional repository, Mann-Whitney test also revealed

that there was a significant difference between male and female, as male faculties were more aware than the female faculties.

Similarly, Mann-Whitney U test was also found that the differences of awareness of e-resources between the public and private university libraries. The test conceded that there was no significant difference of awareness of e-resources among the types of university libraries except three resources such as e-books (Public, Mean Rank= 368.67, n=605 ; Private, Mean Rank= 420.12, n= 152), U=39729.500, W= 223044.500, Z=-2.909,*p*= .004, and followed by e-newspapers (Public, Men Rank=371.12, n= 605; Private, n= 152, Men Rank= 410.38, U= 41211.000, W=224526.000, Z= -2.220, *p*= .026 and institutional repository (Public, Mean Rank= 366.96, n=605; Private, Mean Rank= 426.92, n= 152, U= 38695.500, W= 222010.500, Z=-3.088, and *p*= .002.

6.9.5 Kruskal-Wallis Test for Performance of the Libraries and their Staff in Satisfying the Information Needs via Electronic Resources in terms of Faculty Designations

Table 6.23: Performance of the Libraries and their Staff via Electronic Resources in terms of Faculty Designations (Kruskal-Wallis Test)

Performance of Library and their Staff	Designation	N	Mean Rank	Chi-Square	*df*	Asymp. Sig.
Library staff are very knowledgeable in electronic resources	*Lecturer*	226	407.44	8.293	3	.040*
	Assistant Professor	312	358.66			
	Associate Professor	102	360.92			
	Professor	117	394.06			
University library has conducted adequate promotional activities to encourage the usage of electronic resources	*Lecturer*	226	398.00	3.577	3	.311
	Assistant Professor	312	363.41			
	Associate Professor	102	384.36			
	Professor	117	379.19			

Table 6.23 *Continued*

Library provide adequate infrastructure that offers support on the usage of the electronic resources	*Lecturer*	226	403.68	5.820	3	.121
	Assistant Professor	312	359.67			
	Associate Professor	102	385.72			
	Professor	117	377.03			
The library provides satisfactory access to electronic resources	*Lecturer*	226	379.16	3.442	3	.328
	Assistant Professor	312	376.92			
	Associate Professor	102	353.74			
	Professor	117	406.26			
Library staff keep faculty members well informed about new sources and services	*Lecturer*	226	397.17	5.065	3	.167
	Assistant Professor	312	361.81			
	Associate Professor	102	367.75			
	Professor	117	399.56			
The library staff offers sufficient bibliographic instructions and assistance to use the electronic resources effectively	*Lecturer*	226	394.65	4.322	3	.229
	Assistant Professor	312	372.31			
	Associate Professor	102	347.82			
	Professor	117	393.79			
The library provides adequate training programs on how to use electronic resources	*Lecturer*	226	407.48	7.940	3	.047*
	Assistant Professor	312	361.43			
	Associate Professor	102	354.88			
	Professor	117	391.87			
Library personnel helps to examine the quality of e-resources	*Lecturer*	226	391.69	4.393	3	.222
	Assistant Professor	312	374.30			
	Associate Professor	102	345.03			
	Professor	117	396.64			
Overall, I am satisfied with the electronic resources and services	*Lecturer*	226	387.95	2.381	3	.497
	Assistant Professor	312	370.03			
	Associate Professor	102	364.61			

Table 6.23 *Continued*

provided in the library	*Professor*	117	398.20			
Notes: * Significant at P< .05						

Kruskal-Wallis test was also conducted to see the differences among the faculty positions concerning the performance of the library and their staff. From the above table, the significant differences were found among faculty designations such as the library staff were very knowledgeable in electronic resources (x^2=8.293, n= 757, *df*= 3, *p*< .040) and the library provides adequate training programs on how to use electronic resources (x^2=7.940, n= 757, *df*= 3, *p*< .047).

6.9.6 Kruskal-Wallis Test for Seeking Relevant E-resources in terms of Age Groups

Table 6.24: Seeking Relevant E-resources in terms of Age Groups

Seeking Relevant E-Resources	Age	N	Mean Rank	Chi-Square	*df*	Asymp. Sig.
University/library websites	*Below 25*	13	396.00	7.267	8	.508
	26-30	228	358.91			
	31-35	190	378.73			
	36-40	153	398.36			
	41-45	87	367.31			
	46-50	35	392.73			
	51-55	23	402.24			
	56-60	14	469.82			
	Above 60	14	391.75			

Table 6.24 *Continued*

Web search engines	*Below 25*	13	374.65	10.006	8	.265
	26-30	228	381.33			
	31-35	190	382.09			
	36-40	153	368.42			
	41-45	87	370.92			
	46-50	35	428.90			
	51-55	23	336.89			
	56-60	14	323.71			
	Above 60	14	468.61			
Subject guides/portals on the internet	*Below 25*	13	487.54	19.917	8	.011*
	26-30	228	372.67			
	31-35	190	357.83			
	36-40	153	374.68			
	41-45	87	373.48			
	46-50	35	407.33			
	51-55	23	434.78			
	56-60	14	410.50			
	Above 60	14	556.21			
Online databases with links to full text	*Below 25*	13	447.54	11.356	8	.182
	26-30	228	353.85			
	31-35	190	376.11			
	36-40	153	395.14			
	41-45	87	371.95			
	46-50	35	416.51			
	51-55	23	440.48			
	56-60	14	369.36			
	Above 60	14	446.50			
Discovery tools provided by university library (such as, federated search tools, EBSCO discovery services, summon, etc.)	*Below 25*	13	407.42	22.101	8	.005
	26-30	228	343.64			
	31-35	190	362.12			
	36-40	153	392.39			
	41-45	87	402.76			
	46-50	35	464.96			
	51-55	23	451.30			
	56-60	14	479.64			
	Above 60	14	429.14			

Notes: * Significant at p< .05

a. Kruskal-Wallis Test

b. Grouping Variable: Age in years

Kruskal-Wallis test was carried out to see the differences between age groups of the faculty members in terms of where they seek their relevant resources. The result showed that there were no significant differences among age groups in this regard except use of subject guides/portals on the internet (x^2=19.917, n= 757, *df* = 8, *p*< .011).

6.9.7Kruskal-Wallis Test for Level of Satisfaction with the University Paid E-resources in Terms of Areas of Specialization

The present study applied the Kruskal-Wallis test to see the differences with the level of satisfaction with the university paid e-resources in terms of areas of specialization.

Table 6.25: Level of Satisfaction with the University Paid E-resources in Terms of Areas of Specialization (Kruskal-Wallis test)

Satisfaction with the University Paid E-resources	Area of Specializations	N	Mean Rank	Chi-Square	*df*	Asymp. Sig.
The level of materials available	*Agriculture*	52	316.43	9.728	7	.205
	Arts and Humanities	60	371.37			
	Business	100	405.71			
	Engineering and Technology	207	379.68			
	Environmental Sciences	23	449.13			
	Life Sciences	129	380.25			
	Science	47	396.90			
	Social Sciences	139	366.65			
The coverage of my subject/work	*Agriculture*	52	323.37			
	Arts and Humanities	60	363.85			
	Business	100	398.45			
	Engineering and Technology	207	365.64			
	Environmental Sciences	23	450.52	10.19	7	.178
	Life Sciences	129	396.82	7		
	Science	47	408.50			

Table 6.25 *Continued*

	Social Sciences	139	373.91			
Ease of access	*Agriculture*	52	335.19			
	Arts and Humanities	60	360.72			
	Business	100	404.87			
	Engineering and Technology	207	377.88			
	Environmental Sciences	23	446.26	6.951	7	.434
	Life Sciences	129	382.17			
	Science	47	389.65			
	Social Sciences	139	368.66			
Ease of use	*Agriculture*	52	337.38			
	Arts and Humanities	60	352.52			
	Business	100	404.85			
	Engineering and Technology	207	383.62			
	Environmental Sciences	23	441.59	7.130	7	.416
	Life Sciences	129	366.69			
	Science	47	373.12			
	Social Sciences	139	383.58			
University library provide adequate and latest computers to access the electronic resources	*Agriculture*	52	327.49			
	Arts and Humanities	60	363.48			
	Business	100	391.87			
	Engineering and Technology	207	392.55			
	Environmental Sciences	23	462.17	8.557	7	.286
	Life Sciences	129	370.96			
	Science	47	380.93			
	Social Sciences	139	368.58			
Technological equipment supports to access online databases	*Agriculture*	52	324.41			
	Arts and Humanities	60	374.78			
	Business	100	408.35			
	Engineering and Technology	207	391.77			
	Environmental Sciences	23	444.78	9.485	7	.220
	Life Sciences	129	365.24			
	Science	47	373.73			
	Social Sciences	139	364.78			

Table 6.25 *Continued*

Adequate bandwidth to access the resources	*Agriculture*	52	353.47			
	Arts and Humanities	60	387.28			
	Business	100	390.20			
	Engineering and Technology	207	388.98			
	Environmental Sciences	23	413.15	3.673	7	.817
	Life Sciences	129	356.29			
	Science	47	372.46			
	Social Sciences	139	379.69			
Easy navigation to resources from library websites	*Agriculture*	52	326.26			
	Arts and Humanities	60	410.73			
	Business	100	393.65			
	Engineering and Technology	207	389.37			
	Environmental Sciences	23	421.83	7.551	7	.374
	Life Sciences	129	362.03			
	Science	47	370.94			
	Social Sciences	139	370.44			
Overall satisfaction	*Agriculture*	52	325.23			
	Arts and Humanities	60	383.93			
	Business	100	397.20			
	Engineering and Technology	207	383.49	5.919	7	.549
	Environmental Sciences	23	429.57			
	Life Sciences	129	368.62			
	Science	47	386.09			
	Social Sciences	139	376.08			
Notes: * Significant at p < .05						

Kruskal-Wallis test showed that there were no significant differences on the level of satisfaction with the university paid e-resources among the faculty members' areas of specialization.

6.9.8. Mann-Whitney U Test for the Level of Satisfaction with the University Paid E-resources in Terms of Gender

Table 6.26: The Level of Satisfaction with the University Paid E-resources (Mann-Whitney U Test)

Satisfaction with the University Paid E-resources	Gender	N	Mean Rank	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
The level of materials available	*Male*	612	377.27	43313.500	230891.500	-.465	.642
	Female	145	386.29				
The coverage of my subject/work	*Male*	612	379.44	44103.500	54688.500	-.117	.907
	Female	145	377.16				
Ease of access	*Male*	612	379.08	44319.500	54904.500	-.022	.982
	Female	145	378.65				
Ease of use	*Male*	612	381.39	42907.500	53492.500	-.640	.522
	Female	145	368.91				
University library provide adequate and latest computers to access the electronic resources	*Male*	612	375.64	42315.500	229893.500	-.889	.374
	Female	145	393.17				
Technological equipment supports to access online databases	*Male*	612	375.35	42134.500	229712.500	-.971	.332
	Female	145	394.42				
Adequate bandwidth to access the resources	*Male*	612	380.31	43570.500	54155.500	-.347	.729
	Female	145	373.49				
Easy navigation to resources from library websites	*Male*	612	382.50	42229.500	52814.500	-.930	.352
	Female	145	364.24				
Overall satisfaction	*Male*	612	381.63	42760.500	53345.500	-.702	.483
	Female	145	367.90				
a. Grouping Variable: Gender							

Mann-Whitney U test result also showed that there were no significant differences on the level of satisfaction with the university paid e-resources among the faculty members in terms of their gender.

6.9.9Kruskal-Wallis Test for Difficulties of Using E-Resources Faced by the Faculty Members in Terms of Faculty Designations

Table 6.27: Difficulties of Using E-Resources Faced by the Faculty Members (Kruskal-Wallis Test)

Difficulties in Using E-Resources	Designation	N	Mean Rank	Chi-Square	*df*	Asymp. Sig.
Lack of knowledge regarding the use of e-resources	*Lecturer*	226	357.72	6.660	3	.084
	Assistant Professor	312	378.99			
	Associate Professor	102	392.33			
	Professor	117	408.51			
Difficulty in finding relevant information	*Lecturer*	226	382.82	.980	3	.806
	Assistant Professor	312	371.39			
	Associate Professor	102	390.01			
	Professor	117	382.31			
Overload of information on the Internet	*Lecturer*	226	346.94	13.959	3	.003*
	Assistant Professor	312	388.50			
	Associate Professor	102	399.42			
	Professor	117	397.80			
It takes too long to view/download pages	*Lecturer*	226	394.36	10.570	3	.014*
	Assistant Professor	312	389.60			
	Associate Professor	102	357.91			
	Professor	117	339.45			
Only a limited number of titles available	*Lecturer*	226	386.22	1.613	3	.656
	Assistant Professor	312	383.23			
	Associate Professor	102	365.17			
	Professor	117	365.84			

Table 6.27 *Continued*

Limited access to back issues	*Lecturer*	226	396.09	3.923	3	.270
	Assistant Professor	312	376.70			
	Associate Professor	102	373.99			
	Professor	117	356.48			
Do not have access from home	*Lecturer*	226	386.55	.893	3	.827
	Assistant Professor	312	374.31			
	Associate Professor	102	385.73			
	Professor	117	371.07			
Limited access to computers	*Lecturer*	226	383.36	.510	3	.917
	Assistant Professor	312	378.60			
	Associate Professor	102	369.18			
	Professor	117	380.21			
Slow download speed	*Lecturer*	226	404.29	13.016	3	.005
	Assistant Professor	312	385.48			
	Associate Professor	102	345.80			
	Professor	117	341.81			
Notes: * Significant at p< .05						
a. Kruskal-Wallis Test						
b. Grouping Variable: Designation						

The constraints faced by the faculty members were tested in relation to their opinions on overall satisfaction with the electronic resources and services provided in the library. The Kruskal-Wallis test indicated that there were significant differences among faculty designations with the following problem statements, i.e. overload of information on the internet (x^2= 13.95, *df*= 3, n= 757, *p*<.003), took too long time to view/download pages (x^2= 10.57, *df*= 3, n= 757, *p*<.014).See Table 6.27.

6.9.10Mann-Whitney U Test for the Difficulties of Using E-Resources that are Faced by the Faculty Members in Terms of University Types

Table 6.28: Difficulties of Using E-Resources that are faced by the faculty Members (Mann-Whitney U Test

Difficulties in Using E-Resources	University Types	N	Mean Rank	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Lack of knowledge regarding the use of e-resources	*Public*	605	373.36	42565.500	225880.500	-1.696	.090
	Private	152	401.46				
Difficulty in finding relevant information	*Public*	605	370.57	40877.000	224192.000	-2.449	.014*
	Private	152	412.57				
Overload of information on the Internet	*Public*	605	394.93	36340.500	47968.500	-5.569	.000*
	Private	152	315.58				
It takes too long to view/download pages	*Public*	605	368.88	39856.500	223171.500	-3.210	.001*
	Private	152	419.29				
Only a limited number of titles available	*Public*	605	369.95	40504.500	223819.500	-2.640	.008
	Private	152	415.02				
Limited access to back issues	*Public*	605	369.86	40448.000	223763.000	-2.762	.006
	Private	152	415.39				
Do not have access from home	*Public*	605	374.45	43228.500	226543.500	-1.325	.185
	Private	152	397.10				
Limited access to computers	*Public*	605	370.39	40771.500	224086.500	-2.816	.005
	Private	152	413.27				
Slow download speed	*Public*	605	368.23	39463.000	222778.000	-3.246	.001*
	Private	152	421.88				

Similarly, Mann-Whitney U Test was also carried out to see the differences among university types regarding the difficulties faced by university faculty members. Results

of this test indicated that there were significant differences between public and private universities with regard to difficulty in finding relevant information (Public, Mean Rank= 370.57, n= 605; Private, mean Rank= 412.57, n= 152, U= 40877.000, W= 224192.000, Z= -2.449, *p*= .014), overload of information on the Internet (Public, Mean rank= 394.93, n= 605; Private, Mean Rank= 315.58, n= 152, U= 36340.500, W= 47968.500, Z= -5.569, *p*= .000) followed by it also took too long time to view/download pages (Public, Mean Rank= 368.88, n= 652,; Private, Mean Rank= 419.29, n= 152, U= 39856.500, W= 223171.500, Z= -3.210, *p*=.001)and slow download speed (Public, Mean Rank= 368.23, n= 605; Private, Mean Rank= 421.88, U= 39463.000, W= 222778.000, Z= -3.246, *p*= .001).

6.10 Conclusion

From the above results, it was found that the largest groups of the faculty members were aware of digital resources and they accessed digital resources in most days mainly for research work, for learning, for updating themselves. Although the performance of the library staff reported some negative outputs, faculty members in general were satisfied with the electronic resources and services provided in the library. Additionally, as a final point, i.e., overall satisfaction of the faculty members was found to be on an average level. This survey identifies some difficulties that were faced by the faculty members while accessing digital resources, such as, lack of knowledge regarding the use of e-resources, only limited numbers of titles available, limited access to back issues, do not have access from home, etc.

Chapter 7

Summary of the Findings

7.1 Introduction:

This Chapter compiles the key findings that were examined and presented in the light of survey responses from university librarians and faculty members. It reports the results of the current situations concerning library resources, IT infrastructure and digitization activities in both public and private universities of Bangladesh and summarizes the use of digital resources by university faculty members.

This research identified the problems that hinder the development of digital library and the use of digital resources by the faculty members. This Chapter combines the findings and discusses them further according to research objectives and research questions set out for this research in Chapter 1.

7.2 Findings Related to the Objectives of the Study

7.2.1 Status of Library Resources and IT-Infrastructure in the Public and Private Universities

7.2.1.1 Findings: Library Survey

The survey findings showed that all universities including public and private universities and their libraries had computers and out of 51 universities, only a few libraries did not have LAN connections at the time of the survey. Additionally, the libraries were also requested to answer regarding the number of computers connected to their LAN and it was pointed out that most of the libraries had enough computers connected to LAN.

Some of the university libraries did not use any library automation software. Most of the university libraries used Koha for library automation. In the case of institutional repositories, only 15 private university libraries used their own digital library/institutional repository whereas only 9 public university libraries had digital libraries/institutional repositories at the time of the survey.

With regard to the use of discovery tools, the survey found that a large group of university libraries (both public and private) used discovery tools for their users. Most of the libraries participated in the survey had LAN connections, used integrated library management software, institutional repositories and had been affiliated with LiCoB.

7.2.1.2 Findings: Internet Connectivity and its Speed

The status of internet connectivity showed that all of the participant university libraries had internet connection and many found their internet connections to be adequate. Moreover, the result also indicated that out of 51 universities, almost 70% of public and private universities had BdREN connections.

7.2.1.3 Findings: Library Automation Status and Activities

The findings indicated that almost half of the participating university libraries were partially automated whereas one-third of the university libraries declared that they are fully automated. A significant portion of university libraries (9, 17.6%) claimed that they had yet to start their library automation.

7.2.1.4 Findings: Subscriptions to E-resources and Web –based Services that the University Libraries Provide

In response to the e-resources subscription for library users, most of the participating libraries indicated that they subscribed to various e-resources. Moreover, the findings also showed that the majority of the libraries had access to full-text documents in digital format and used web access to in-house library databases/OPACs.

7.2.2 Status of Training on Recent Technologies that the University Authorities Allowed for their Library Staff to Attend

7.2.2.1 Findings: Status of Training on Recent Technologies

The results indicated that both public and private university authorities allowed library staff to participate various training programs.

7.2.2.2 Findings: Status of Training that is Available or Needed for Library Staff

The result showed that almost half of the participating university libraries provided training on development and administration of databases whereas they require further trainings on digital content management, web programming and website/portal development.

The findings further indicated that there is a lack of training and trained manpower in university libraries that may create problems for building and managing digital libraries. According to Ahmed (2014), trained manpower is not available in all the university libraries for handling IT-based services. He also affirmed that there is a vital need for training in all areas of IT-based library services in the public universities of Bangladesh to implement IT-based library services successfully.

7.2.3 Constraints in Establishing and Managing Digital Libraries

The respondent libraries reported that most of the libraries had problems with digital infrastructures, limited financial/budgetary support from authorities and limited number of trained manpower. Rahman, Rahman & Chowdhury (2015) identified similar problems for effective digital resource management, e.g. administrative non-cooperation, absence of organizational policy, human resources and training, infrastructure and technical support, budget constraints, etc. Rafiq, Ameen, & Jabeen (2018) also stated that the inadequacy of trained IT professionals is a significant issue associated with digitization activities and practices.

7.3 The Contemporary use of Digital Resources by the Faculty Members and Level of Satisfaction with University Paid E-resources

7.3.1 Findings: User Survey

This section presents the summary of findings regarding the use of digital resources by university faculty members.

7.3.1.1 Findings: Computer Literacy

The findings of the study reported that the faculty members in general had good computer knowledge. Moreover, Chi-Square and Mann-Whitney U test results found significant relationship between male and female faculty members in terms of their proficiency levels with computers. Ahmad & Panda (2013) stated that the effective use of e-resources depends on basic computer skills, understanding of what is available and how to use it.

7.3.1.2 Findings: Awareness of E-resources

The finding showed that most faculty members were aware of e-journals, e-book and bibliographic databases. However, there were lack of knowledge with regard to library catalogs/union catalog (OPAC, WorldCat, etc.), discovery tools, subject gateways and institutional repositories. Similar results were found by Ekere, Omekwu & Nwoha (2016) that the respondents had very high levels of awareness with the availability of the World Wide Web followed by high levels of awareness with the availability of Wi-Fi and search engines. Notwithstanding, lower levels of awareness were perceived with the availability of online indexes and abstracts and other resources such as Video CDs, online library catalog, online databases, etc.

The Kruskal-Wallis test results showed that there were significant differences among faculty members with regard to their awareness of e-resources. In contrast, the results of the Mann-Whitney U test indicated that the male faculty members were more concerned and updated than the female faculties. Alternatively, in the case of types of libraries (public vs. private), there was no significant difference in awareness of e-resources between these libraries.

7.3.1.3 Findings: Access Digital Resources

Garg, Kumar & Vandana (2017) recognized that faculty members, library staff, seniors and peers as the key influencers for the usage of e-resources. The present study revealed that the vast majority of respondents at both public and private universities accessed digital resources daily. The Chi-square test results indicated that there were no significant associations between the types of libraries (public vs. private) and the frequency of accessing digital resources. A similar study by Islam & Habiba (2015) also found that the

majority of the respondents, i.e. faculty members and students accessed e-resources most days, followed by few times every week or at least once a week.

7.3.1.4 Findings: Seeking Relevant E-resources

The findings reported that most of respondents used web search engines as their preferred search tools, followed by university/library websites, subject guides/portals and online databases with links to full text as preferred search tools. Kruskal-Wallis test showed that there were no significant differences among age groups while exploring their desired information except the use of subject guides/portals on the internet. Thangavel & Jayaprakash (2017) in their study similarly noted that most of the faculty members used Google search engines for seeking their desired information.

7.3.1.5 Findings: Purpose of Using E-Resources

The findings of the study showed that the main purposes of using e-resources by faculty members included professional research activities, followed by personal research and to support their teaching activities. Besides, many faculty members accessed e-resources for updating their subject knowledge.

Thangavel & Jayaprakash (2017) showed that 36.6% of the faculty members were using the internet for accessing electronic information resources for their study purposes, 21.67% of them used for utilizing e-mail for information communication. Additionally, Mathivanan & Vijayakumar (2017) study found that 41.05 % of faculty members were using e-resources for gathering general knowledge, 26.12% of them used for searching exam notes and 11.9% of the respondents used for reading the newspaper and academic improvement.

7.3.2 Performance of the Libraries and their Staff in Satisfying the Information Needs via Electronic Resources

Findings:

The findings showed that a significant percentage of respondents mentioned that library staff was very knowledgeable about electronic resources whereas a large proportion of respondents were unsure about library staff's ability with regard to handling e-resources.

Only about one-third of the faculty responses considered that their libraries provide adequate infrastructure to support the use of electronic resources. Kruskal-Wallis tests showed that significant differences existed among faculty designations with regard to their opinions on knowledgeable library staff and training programs on how to use electronic resources. Moreover, the chi-square test result indicated that there is no association between the age of the respondents and their level of satisfaction.

7.3.3 Level of Satisfaction with the University Paid E-resources

In case of the level of materials available in the universities, many faculty members considered it to be inadequate. Similarly, only about one-third of the respondents indicated that the university library provided adequate number of computers for their users to access the electronic resources. Kruskal-Wallis test showed that there were no significant differences on the level of satisfaction with the university paid e-resources among the faculty members in terms of their areas of specialization.

Ahmed (2013) found that the faculty users were not satisfied with university-paid resources as most ratings fell below the average score. Mann-Whitney test results for gender difference among faculty users, according to this study, showed that there were no significant differences between male and female respondents in terms of their opinions on overall satisfaction with electronic resources in public universities of Bangladesh.

7.3.4 Difficulties that the Faculty Members Encountered while using E-resources

Findings:

The study investigated the difficulties that the faculty members encountered while using e-resources and the results showed that the many respondents had difficulties finding relevant information. Kruskal-Wallis test result indicated that there were significant differences among faculty designations with regard to following problems, i.e. overload of information on the internet and view/download time.

Ahmed (2013a) study also found the major constraints in using university-paid resources such as, limited number of title available, limited access to back issues, difficulty in finding relevant information, inability to access from home followed by limited access to

computers and slow download speed. Additionally, Thangavel & Jayaprakash (2017) noticed that the majorities of the faculty members found it hard to access the needed e-resources due to the lack of training.

7.5 Conclusion

The results of this research found that the initiatives towards the establishment of full-fledged digital libraries in Bangladesh are yet in the growing stage. Many of the university libraries could not take the proper initiative for building digital library due to difficulties, such as lack of infrastructural facilities, lack of skilled manpower, inadequate bandwidth, lack of training on practical digital library system development, etc. Additionally, the survey results found that the faculty members were also faced with some difficulties while accessing digital resources like problems in finding relevant information, limited numbers of resources available in the libraries, slow download speed and limited access to back issues.

Chapter 8

Problems, Recommendations and Conclusion

8.1 Introduction:

The prime objective of academic libraries is to build a digital learning environment in which faculty members, research scholars and students are provided with a diverse range of library resources (Korobili, Tilikidou & Delistavrou, 2006). Digital library has become a practical requirement in today's world to provide enhanced access to information sources, storage and distribution as required, at any time; anywhere and any place as it were. Furthermore, digital library could limit the "Digital Divide" between the country, populations in developing and developed countries (Islam, 2013).

In a developing country perspective, easy and instant access to digital resources is not completely possible due to some problems. This study identified some impediments faced by the librarians and faculty members in case of managing and accessing online resources in Bangladesh. It provides recommendations for overcoming the problems that hinder digital library development and faculty members' access to digital resources.

8.2 Problems

8.2.1 Major problems that Hinder for Building a Digital Library and Faculty Members Access to Digital Resources

Some of the major constraints hindering digital library development and accessing digital resources in Bangladesh are:

Lack of understanding

Many university libraries, specifically the newer ones, in Bangladesh do not encourage the use of digital resources. They lack initiatives to take digital library development program seriously and many of them preferred traditional system by every means. In this situation, it is not possible to understand the value of digital library. Moreover, some faculty members lack knowledge of how to use digital resources.

Financial impediments

Financial restraint is one of the major difficulties for digital library activities in Bangladesh. At the moment, the main funding source for the public universities is the Government of Bangladesh.

In Bangladesh, only a few academic libraries have separate budget for library digitization projects. It is, therefore, difficult for the libraries to undertake any sort of digitization due to lack of fund. Moreover, due to poor budget allocations, the university authority cannot allocate separate fund to enrich its e-resources and arrange workshop or training programs for the faculty member and library staff on how to use and maintain the e-resources.

Lack of skilled manpower

Skilled manpower is the necessity for the library digitization activities. Without trained and qualified staff, it is not possible to build a digital library system and maintain its digital resources. For any digital library project, intelligent, knowledgeable personnel with technical and ICT skills is a must. Moreover, if the library staff is not skilled then they cannot train their users on how to use digital resources. Most of the academic libraries do not have that kind of skilled employees.

Inadequate infrastructural facilities

Inadequate infrastructural facility is another major barrier that hinders developing digital library projects in Bangladesh. The IT infrastructural facilities in the libraries are not generally at the satisfactory level. Additionally, libraries in and around Dhaka are in a better position in terms of IT facilities while the libraries outside Dhaka do not get such opportunities. This imbalance in IT facilities decreases the rate of digitization activities outside Dhaka.

Lack of standard and uniformity

In Bangladesh, libraries do not maintain standard and uniformity in terms of their operations and services. Many libraries still believe and follow the traditional library practices on their own.

Backward mentality and preference to provide traditional library services

Many library professionals in Bangladesh are nervous about the use of advanced technologies which are required for library digitization. They are still comfortable with traditional library systems and services.

Copyright issues

Copyright is another issue which sometime limits the libraries from initiating new digitization project.

8.2.2 Difficulties Faced by Faculty Members While Accessing Digital Resources

This study found some problems that are hindering faculty members from accessing digital resources:

- Lack of knowledge regarding the use of e-resources
- Difficulty in finding relevant information
- Overload of information on the Internet
- It takes too long to view/download pages
- Only a limited number of titles available
- Limited access to back issues
- Do not have access from home
- Limited access to computers
- Slow download speed

8.3Recommendations

8.3.1 Recommendations on the Building and Maintaining Digital library

The following recommendations are made to overcome the difficulties in developing digital libraries in Bangladesh:

- **Firstly, the library staff should have the following competencies for building and sustaining digital library**

-Should have information literacy skills and arrange literacy and workshops programs continually which will improve the digital skills of library staff members as well as faculty members;

-Library staff also should have website development and maintenance skills;

-Library professionals should have IT-based knowledge concerning developing, delivering and evaluating information facilities, services, sources, and delivering information immediately by using web-based technologies in response to the library user needs; and

-Library staff should understand the ethical, legal and policy issues that are relevant to the web-based sources and services and also should inform their user regarding this issue.

- **Secondly, for building a digital library for the university effectively**

Libraries were asked to give recommendations on how to efficiently develop and maintain a digital library for their university. A list of recommendations based on the survey findings are as follows:

-University authorities should be more concerned about developing digital library;

-A project-based work can help to get better performance for building and maintaining a digital library;

-The library should have trained library personnel for library digitization work;

-The library should provide support for IT-related training (i.e., library management software, networking, web programming, web content management for developing and maintaining modern library websites, digital resources usage for users, etc.) for their library staff;

-University or library authority should allocate adequate funds for digitization activities; and

-UGC should take initiatives to build digital library at every university in the country;

8.3.2 Recommendations Based on Faculty Members' Perceptions

The faculty members identified limited number of titles, limited access to back issues, difficulty in searching information, inability to access from home, limited access to computers and slow downloading speed as their major constraints. The following recommendations are made to overcome these barriers-

- The universities in Bangladesh should subscribe to a wide range of full-text and bibliographic databases with more rich content;
- University library should implement remote access of e-resources for library users;
- The University should spend adequate amount of its budget to enrich its e-resources and should arrange workshop or training for faculty member and library staff on how to use and maintain these e-resources;
- The library should provide web guide facilities for the faculty members as well as other library users so that they can use relevant and easily accessible e-resources by their personal computers from home besides workplace;
- Library management should arrange department wise training or workshop programs to make the faculty familiar with the techniques and usage of e-resources;
- For successful implementation of e-resources at the library, the university authority needs to establish proper infrastructure (computers, uninterruptible electricity and high speed reliable broadband internet);
- University library authority should appoint some expert persons for update the information in regular basis;
- University library should provide discovery tools like EBSCO, VuFind, ProQuest Ex Libris, etc. with which faculty members could search for all relevant materials in one click;
- University library should provide adequate promotional and encouraging activities to use e-resources;
- University library should create a consortium for university libraries that will ensure an affordable access to more digital resources and services.

Moreover, infrastructure development is also one sector that cannot be ignored in terms of expanding the number of computers, printers and increasing internet connectivity. It is a significant element in improving the use of e-resources, especially among students.

Finally, raising the number of computers for common access in the libraries, computing labs and residential halls and establishment of wireless internet network in the university campus will guarantee the excellent accessibility to technology and electronic resources (Ahmed, 2013).

8.4 Conclusions

This research presented the existing scenario of public and private universities in Bangladesh in terms of library automation, IT infrastructure and faculty members' use of university paid e-resources. This research also identifies impediments in managing and accessing e-resources and provides possible recommendations for overcoming the problems that hinder for building a digital library and faculty members' access to digital resources. A total of 51 public and private universities participated in this study regarding digital library establishment initiatives and faculty members from 48 universities responded about their use of digital resources. The results indicated that establishment of full-fledged digital library in both public and private universities in Bangladesh are yet to be implemented with adequate IT-based information sources and services.

The findings of the research work revealed that private university libraries are relatively better equipped with IT infrastructure most university faculty members are not satisfied with the level of university paid e-resources. There were no significant differences in the level of satisfaction with the university subscribed e-resources among faculty members in terms of their areas of specialization or gender.

The present study found problems like lack of funding by the government/universities, lack of trained staff, lack of interest among library staff, lack of standards and uniformity, etc. as major drawbacks for building and maintaining the digital library.

The present study further investigated the use of digital resources by faculty members in Bangladesh. A total of 757 faculty members from both public and private universities participated in this survey. Results of the survey reported that majority of faculty members were aware about digital resources and accessed them from their workplaces and homes. They used digital resources for professional research activities, getting support in teaching activities (such as, prepare class materials, designing curriculum, etc.), and updating of subject knowledge.

8.5 Scope and Limitations of the Study

As of June 2019, there are 103 private and 45 public universities in Bangladesh (UGC, 2019). The present study did not cover all the public and private university libraries in the country although the library survey questionnaire was sent to all major universities. Moreover, in the case of library users, the research only focused on faculty members rather than students, research scholars and other user groups. It would be more comprehensive if all types of users were taken into consideration. In spite of these limitations, this research is a worthy contribution towards understanding of digital library development in Bangladesh.

8.6 Further Study

This study explored both the public and private university as research sites and focused on the current situation of digital library initiatives in Bangladesh. It would be perhaps more interesting if all public and private university libraries in the country are included and library users such as students and research scholars are accommodated in the surveys. Adding other public and private university libraries and user groups in future research works will improve the generalizability of the results. Furthermore, a comparative study between public and private university libraries in terms of DL could be helpful to find out where each category stands and to identify the gaps where the improvement are required.

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Appendix 1:

Questionnaire for Librarians

[Please tick as many options as you consider are applicable]

1. **About your University:**

   a. Name of your University:

   .....

   b. Type: Public☐ Private☐

   c. Year of establishment:

   d. How many computers do you have in your University?

   .....

   e. Do you have internet connection in your university?

   If yes, how much bandwidth are you using? Yes☐ No☐

   .....

   f. Do you have LAN in your university? Yes☐ No☐

   If yes, how many computers are connected to this LAN?

   .....

   g. Is your university connected to BdREN?

   Yes☐ No☐

   h. How would you describe the speed and status of the connectivity for the library?

   Excellent ☐

   Good ☐

   Adequate ☐

   Poor ☐

   i. Do you have a library website? Yes☐ No☐

2. **IT facilities in the University Library:**

   a. How many computers do you have in your library?

   .....

b. Is your library automated?

Fully automated ☐
Partially automated ☐
Not yet ☐

If fully/partially automated, mention the name of library automation software

.....

c. Which of the following activities are automated in your library?

(please select all that apply)

Acquisitions and budgets	☐	Cataloguing	☐
Circulation control	☐	Serials control	☐
Management	☐	Inter-library loans	☐

d. **es/ institutional repositories?** (such as, DSpace, Greenstone, Fedora) ☐

If yes, please mention the name of software.....

e. Does your library possess the following e-Resources?

SL.	E-Resources	Yes	No
1	E-Journals	☐	☐
2	E-Books	☐	☐
3	Electronic and Theses Dissertations (ETD)	☐	☐
4	Course Material	☐	☐
5	Subject Gateways	☐	☐
6	Reports	☐	☐
7	Archives	☐	☐
8	CD/DVD	☐	☐
9	Any other (Pl. Specify)	☐	☐

f. Are you providing the following information services in your library?

SL.	Information Services	Computerized	Manual	Not Provided
1.	Bibliographic Service	☐	☐	☐
2.	Current Awareness Service	☐	☐	☐
3.	Selective Dissemination of Service	☐	☐	☐
4.	Document Delivery Service	☐	☐	☐
5.	Indexing Service	☐	☐	☐
6.	Abstracting Service	☐	☐	☐
7.	Reference Service	☐	☐	☐
8.	Audio-visual Service	☐	☐	☐
9.	Bulletin Board Service	☐	☐	☐
10.	Newspaper clippings	☐	☐	☐
11.	Any other (Pl. Specify)	☐	☐	☐

g. Which of the following web services does your library provide? *(please select all that apply)s*

SL.	Web Services	Yes	No
1.	Access to full-text documents in digital format	☐	☐
2.	Web- based current awareness services	☐	☐
3.	Web access to in-house library databases/OPAC	☐	☐
4.	In-house online tutorials on how to use the information services	☐	☐
5.	Subscriptions to web-based e-resources, online journals, e-books, databases, etc.	☐	☐

6.	Organized access to free subject-based information gateways/ portals on the internet	☐	☐
7.	Access to donor sponsored resources, e.g. INASP-PERI, AGORA, HINARI, OARE, Research4life, etc.	☐	☐
8.	Others (please specify):	☐	☐

h. What e-resources do you subscribe to?

.....

i. Is your library a member of any library Consortium? Yes☐ No☐

If yes, please mention the name of library Consortiums.....

j. Does your library subscribe/use discovery tools (such as, federated search tools, EBSCO Discovery Services, Summon, etc.)?

Yes☐ No☐

If yes, please mention the name of your subscribed discovery tools**.....**

k. Are you registered for R4L (i.e. HINARI, AGORA, OARE, etc.)?

Yes☐ No☐

3. Training:

a. Does your university authority allow library staff to go for training on recent technologies in libraries?

Yes☐ No☐

b. Who funds the training?

.....

c. Which of the following areas are served by qualified personnel in your library? If adequate staff or skill is lacking in an area, please indicate if training is needed.

SL.	Type of Training	Available	Needed
1.	Development and administration of databases and library systems	☐	☐
2.	Hardware maintenance	☐	☐
3.	Digital content management, including digital libraries	☐	☐
4.	Development and management of bibliographic databases	☐	☐
5.	Network administration	☐	☐
6.	Metadata management	☐	☐
7.	Computer/ web programming	☐	☐
8.	Website/ portal development and maintenance	☐	☐

d. Additional information on IT-based library services that you would like to add:

.....

.....

4. Finance:

a.What approximate percentage (%) of ICT facilities (e.g. network, computers, etc.) have been purchased from your university funds?

.....

b. What approximate percentage (%) of e-resources (e-journals, e-books, etc.) has been purchased from your university funds?

.....

c.Is Internet access free or fee-based? Yes ☐ No ☐

5. Problems of launching digital library:

What according to you are the constraints in establishment and managing digital libraries? ***(Please select all that apply)***

SL.	Problem statements	Yes	No
1.	Digital infrastructures:		
	i. Procurement	☐	☐
	ii. Maintenance	☐	☐
	iii. Upgrading	☐	☐
2.	Availability/Procurement of Software	☐	☐
3.	Financial/Budgetary support by Management	☐	☐
4.	Absence of funding by Govt. agencies	☐	☐
5.	Lack of trained staff	☐	☐
6.	Lack of interest among staff	☐	☐
7.	Lack of standards and uniformity	☐	☐
8.	Unawareness of modern library trend	☐	☐
9.	Failed to understand the benefits of digitization	☐	☐
10.	Copyright issues	☐	☐
11.	Others (Please specify)	☐	☐

6. If you have any suggestion on how to effectively build a digital library for your university, please mention below:

1.
2.
3.
4.
5.
6.

Appendix 2:

Questionnaire for Faculty Members

Use of Digital Resources by Faculty Members at Public and Private Universities in Bangladesh

The main aim of this survey is to gather data about the use of e-resources by faculty members at selected public and private universities in Bangladesh. I would be grateful if you could take a few minutes to complete this survey. Your responses will be kept strictly confidential.

[Please first answer these background questions, and then complete the rest of the survey].

Section 1: Personal Information

1.1 Name of the University:

1.2 Area of specialization within the academic discipline:

☐ Social Sciences ☐ Business ☐ Arts and humanities

☐ Life sciences ☐ Agriculture ☐ Engineering and technology

☐ Other……

1.3 As a faculty member, what is your status?

Full-time ☐ Part-time ☐

1.4If you are working as a full-time faculty, please indicate your position:

☐ Lecturer ☐ Assistant Professor

☐ Professor ☐ Associate Professor

1.5Gender: Male ☐ **Female** ☐

1.6Age:

Below 25 ☐	36-40 ☐	51-55 ☐
26-30 ☐	41-45 ☐	56-60 ☐
31-35 ☐	46-50 ☐	Above 60 ☐

1.7 Teaching experiences (in years):

Less than 5 ☐	5-10 ☐	11-15 ☐
16-20 ☐	21-25 ☐	26 and above ☐

1.8 How often do you use the library?

☐ Once a month	☐ Once a week
☐ Two or three times in a week	☐ Daily
☐ Occasionally	☐ Rarely

Section 2: Computer Literacy and use of computer/internet:

2.1 Please indicate your level of computer proficiency

☐ Expert	☐ Above Average
☐ Average	☐ Below Average
☐ Beginner	☐ I am not sure

2.2 Please specify the location of your computer/internet use [check all that apply]

Computer	**Internet**
☐ Work	☐ Work
☐ Library	☐ Library
☐ Home	☐ Home
☐ Computer Lab	☐ Computer Lab
☐ Others	☐ Other

2.3How often do you access the Internet?

☐ Several times a day	☐ Once a week
☐ Several times in a week	☐ Occasionally
☐ Rarely	☐ Other

Section 3: Awareness, Use, Access and Evaluation of DigitalResources:

3.1 Where do you access digital resources most?

☐ **At home** ☐ **University library**

☐ **At work** ☐ **other**

3.2 How often do you access digital resources?

☐ Most days ☐ A few times every week

☐ At least once a week ☐ At least once a fortnight

☐ At least once a month ☐ Occasionally

rarely

3.4Are you aware about the following digital resources?

Digital Resources	**Not at all aware**	**Slightly Aware**	**Somewhat Aware**	**Moderately Aware**	**Well Aware**
E- Journals					
E- Books					
Bibliographic databases					
Library catalogues					
Electronic and Theses Dissertations (ETD)					
E-Magazines					
E-Newspapers					
Indexing and Abstracting Databases					
Full-text database					
Reference database/ Citation Databases					
Library Catalogues/Union catalogue (OPAC, WorldCat,					

etc.)					
CD/DVD					
Discovery tools (such as, federated search tools, EBSCO Discovery Services, Summon, etc.)					
Subject Gateways					
Institutional Repository					

3.5 I seek relevant digital resources by using-

Statements	Strongly agreed	Agreed	Undecided	Disagreed	Strongly disagreed
University/library websites					
Web search engines					
Subject guides/portals on the internet					
Online databases with links to full text					
Discovery tools provided by university library (such as, federated search tools, EBSCO Discovery Services, Summon, etc.)					

3.6 I use the following digital resources for-

Statements	Strongly agreed	Agreed	Undecided	Disagreed	Strongly disagreed
Professional research activities					
Getting support in teaching activities (prepare class materials, designing curriculum, etc.)					

Personal research					
Updating of subject knowledge					
Learning					
Recreation					
Communication					

3.7 Please evaluate the performance of your library in satisfying your information needs via electronic resources.

Statements	Strongly agreed	Agreed	Undecided	Disagreed	Strongly disagreed
Library staff are very knowledgeable in electronic resources					
University library has conducted adequate promotional activities to encourage the usage of electronic resources					
Library provide adequate infrastructure that offers support on the usage of the electronic resources					
The library provides satisfactory access to electronic resources					
Library staff keep faculty members well informed about new sources and services					
The library staff offers sufficient bibliographic instructions and assistance to use the electronic resources effectively					
The library provides adequate training programs on how to use electronic resources					
Library personnel helps to examine the quality of e-resources					
Overall, I am satisfied with the electronic					

resources provided in the library.					

3.8. If you use university paid e-resources, please indicate your level of satisfaction with the content and services provided.

Evaluation of content	**Low**	**Below average**	**Average**	**High**	**Very high**	**NA**
The level of materials available						
The coverage of my subject/work						
Ease of access						
Ease of use						
Technical evaluation of resources						
University library provide adequate and latest computers to access the electronic resources						
Technological equipment supports to access online databases						
Adequate bandwidth to access the resources						
Easy navigation to resources from library websites						
Overall satisfaction						

3.9 Please indicate the difficulties that you have encountered while using e-resources provided by your university library.

- ☐ Lack of knowledge regarding the use of e-resources
- ☐ Difficulty in finding relevant information
- ☐ Overload of information on the Internet
- ☐ It takes too long to view/download pages
- ☐ Only a limited number of titles available
- ☐ Limited access to back issues
- ☐ Difficulty in finding relevant information
- ☐ Do not have access from home
- ☐ Limited access to computers
- ☐ Slow download speed

3.10 Please indicate which additional e-resources your university should subscribe to for you

……

[3.11 Should be answered by those who do not use e-resources]

3.11 If you are not currently using e-resources, please indicate the reasons for not using these services.

- ☐ I do not know how to use them
- ☐ I do not know where to find them
- ☐ I do not have any interest
- ☐ I do not find them useful
- ☐ Other……

3.12 If you have any additional comments or suggestions about electronic resources, please write below.