

**CURRENT TRENDS IN INFORMATION
COMMUNICATION TECHNOLOGY APPLICATIONS IN
THE CENTRAL LIBRARIES OF INDIAN INSTITUTES
OF TECHNOLOGY IN INDIA: A COMPARATIVE
STUDY BETWEEN OLD AND NEW IITs**

Thesis

Submitted for the Award of the Degree of

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in

Library and Information Science

Under the Supervision of

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Submitted by

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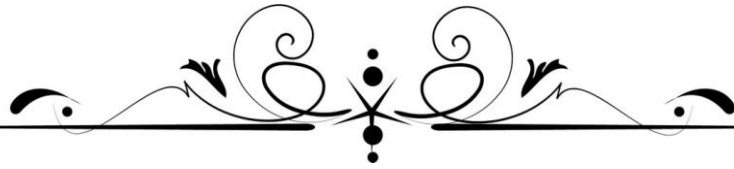
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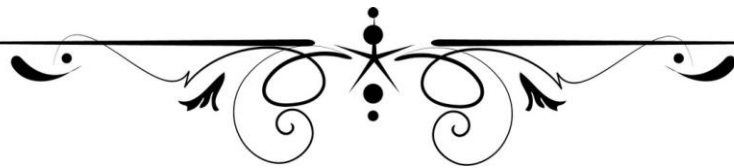
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Year 2018



Dedicated to
My Beloved Parents



DECLARATION

I hereby declare that this thesis entitled "**CURRENT TRENDS IN INFORMATION COMMUNICATION TECHNOLOGY APPLICATIONS IN THE CENTRAL LIBRARIES OF INDIAN INSTITUTES OF TECHNOLOGY IN INDIA: A COMPARATIVE STUDY BETWEEN OLD AND NEW IITs**" submitted by me for the award of the Degree of Doctor of Philosophy in Library and Information Science to the Department of Library and Information Science, Babasaheb Bhimrao Ambedkar University, Lucknow is an outcome of my own efforts and is an original work. The contents of this thesis did not form a basis for the award of any previous degree to anyone else. It is also undertaken that the thesis is essentially free from all kinds of plagiarism.

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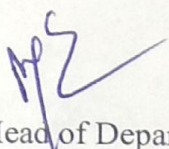
CERTIFICATE

This is to certify that the thesis titled “**CURRENT TRENDS IN INFORMATION COMMUNICATION TECHNOLOGY APPLICATIONS IN THE CENTRAL LIBRARIES OF INDIAN INSTITUTES OF TECHNOLOGY IN INDIA: A COMPARATIVE STUDY BETWEEN OLD AND NEW IITs**” submitted by **Ms. Anjali Verma** is an original research work and has not been previously submitted in part or full for the award of any other degree or diploma to this or any other university.

The thesis submitted to Babasaheb Bhimrao Ambedkar University Lucknow satisfies all the requirements as stipulated in the *Doctor of Philosophy (PhD) regulations – 1999 as amended in 2010* and it is fit for submission and evaluation for the award of the degree of Doctor of Philosophy of the University.

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Ph.D. Course Work Certificate

This is to certify that **Ms. Anjali Verma**, Enrollment No. 284/11 Ph.D. Research Scholar, Department of Library and Information Science of this University has successfully completed her Ph.D. Course work in the examination held during May, 2014.


(A.K. Maurya)

Deputy Registrar (Exam.)

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Date:

Place:

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PREFACE

Information communication technology has transformed the institutions or organizations. Libraries are also utilizing modern technology for improvement of existing library services and creation of new services which shows the impact on the shape and size of the existing libraries and proving the existence in the organizations. Information and Communication Technology (ICT) has also changed the trends of libraries and brought extraordinary transformation in academic library and information services, such as bibliographic services, inter-library loan, OPAC, reference services, current awareness services, document delivery and audio visual services etc. These can be provided more proficiently by using ICT, as they offer expedient time, place, cost effectiveness and up-to-date spreading of information to the users which facilitate the end users involvement in the library and information services.

The first chapter discusses about the background of the study, concept of information communication technology and their applications in the libraries. It also introduces about the Indian Institutes of Technology in India, emerging technologies etc. In the last, this chapter also states the objectives, hypotheses, scope, limitations, significance and research methodology of the study. Nature of collected data as well as statistical techniques were used within this chapter.

The second chapter, review of literature discusses recent studies on information communication technologies in library and services in different institutions of national and international level. It encompasses such as general studies on ICT, studies on ICT infrastructure, e-resources, library automation, web 2.0, software, internet, RFID, web OPAC, cloud computing, mobile devices and current trends in ICT applications.

Third chapter describes current trends in information communication technology applications in libraries. This chapter also discusses the use of ICT in library automation, library services, library collection, information retrieval, library security, promotional activities, library management and library networking.

Fourth chapter presents the brief introduction of Indian Institutes of Technology along with profile of their central libraries.

Fifth chapter presents the tabulation, statistical analysis, interpretation and graphical representation of the collected data from libraries.

Sixth chapter presents the findings, conclusion and suggestions of the study and concluded with suggestions in future to improve the information communication technology applications in the libraries.

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LIST OF ABBREVIATIONS

χ^2	Chi-square
CCTV	Closed Circuit Television
CCF	Common Communication Format
CD	Compact Disk
CD-ROM	Compact Disk-Read Only Memory
CAS	Current Awareness Service
DBMS	Database Management System
DF	Degrees of Freedom
DELNET	Developing Library Network
DOI	Digital Object Identifier
DVD	Digital Versatile Disk
DOAJ	Directory of Open Access Journals
DDS	Document Delivery Service
ETD	Electronic Thesis and Dissertation
FAQs	Frequently Asked Questions
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
IITBHU	Indian Institute of Technology (BHU-Banaras Hindu University)
IITBBS	Indian Institute of Technology Bhubaneswar
IITB	Indian Institute of Technology Bombay
IITD	Indian Institute of Technology Delhi
IITGN	Indian Institute of Technology Gandhinagar
IITG	Indian Institute of Technology Guwahati
IITH	Indian Institute of Technology Hyderabad
IITI	Indian Institute of Technology Indore
IITJ	Indian Institute of Technology Jodhpur
IITK	Indian Institute of Technology Kanpur
IITKGP	Indian Institute of Technology Kharagpur
IITM	Indian Institute of Technology Madras
IIT Mandi	Indian Institute of Technology Mandi
IITP	Indian Institute of Technology Patna

IITR	Indian Institute of Technology Roorkee
IITRPR	Indian Institute of Technology Ropar
IITs	Indian Institutes of Technology
ICT	Information Communication Technology
IT	Information Technology
IR	Institutional Repository
ISDN	Integrated Service Data Network
ILL	Inter Library Loan
ISO	International Standard Organization
JSTOR	Journal Storage
LCD	Liquid Crystal Display
LAN	Local Area Network
MARC	Machine Readable Catalogue
MAN	Metropolitan Area Network
OCLC	Online Computer Library Centre
OPAC	Online Public Access Catalogue
OAJSE	Open Access Journal Search Engine
PDF	Portable Document File
RFID	Radio Frequency Identification
RAM	Random Access Memory
RDA	Resource Description Access
RSS	Rich Site Summary
SDI	Selective Dissemination of Information
TCP/IP	Transmission Control Protocol/Internet Protocol
URL	Uniform Resource Locator
UPS	Uninterruptible Power Supply
VSAT	Very Small Aperture Terminal
VTLS	Virginia Tech Library Systems
WAN	Wide Area Network
WWW	World Wide Web

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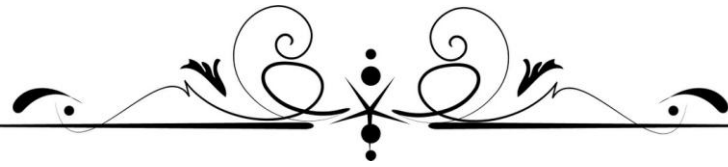
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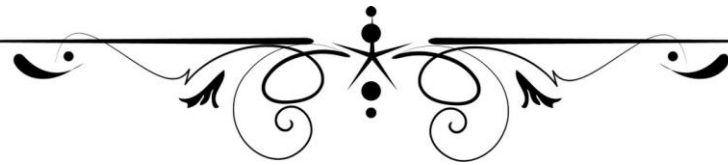
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Chapter- 1
Introduction



CHAPTER- 1

INTRODUCTION

1.1 Background

The development and growth of modern society is based on Information communication technology. It has now become vital part of our day to day activities in the working environment which has changed the face of academic institutions or organizations. In these institutions, Library is playing vital role to support the aims and objectives of the parent organisations. The libraries store, organise various kinds of collection of resources for their users. Library is a collection of written, printed, or digital reading material organised to provide different services to the users with the help of trained staff.

Different types of libraries exist to serve different user needs. National libraries are used to preserve the cultural heritage of a nation. Public library is a free informational and recreational organization to provide all reading material to all public without any charge. Academic libraries are those libraries which are attached with educational institutions to support the students, research scholars and faculty members in their study and research. Special libraries are those libraries which are based on a particular subject like medical field, architecture based, industrial firm, insurance company, judicial etc. A library which is retained by an individual, or members of family is a personal library. A library where reading documents are collected, preserved and intended to be used by a single person or members of the family and relatives is called as the personal library. An archive is also like a library in which documents of an institution, government, organization or corporate body or

the personal papers of an individual or family conserve in a repository for their ancient value. (Barman, 2012; Kundishora, n. d.)

Now day's technology is transforming the traditional library into digital library, automated library, electronic library, virtual library and hybrid library etc. The collection of the traditional library is mostly print material, manuscript etc. Automated library is a library which has machine readable catalogues, computerised acquisition, circulation, and OPAC but the holdings of this library is same as the traditional library. Electronic library is a library in which electronic media are used for storage, retrieval and delivery of information. Digital library is a library where e-journals and other type of publications are accessed over the web. Virtual library is a library where collection of information resources and services are managed onsite as well as off side and accessible electronically through the internet at anytime and anywhere. Hybrid libraries are those libraries which are working in both (electronic and print) environment (Barman, 2012; Gururaj & Arun Kumar, n. d.).

The Indian Institutes of Technology (IITs) are autonomous institutes of higher education. These are governed by the Institutes of Technology Act, 1961 which has been declared as institutions of national importance and lays down their powers, duties, and framework for governance etc. The Institutes of Technology Act, 1961 lists twenty-three institutes located at Bhilai, Chennai, Delhi, Dhanbad, Dharwad, Goa, Guwahati, Jammu, Kanpur, Kharagpur, Mumbai, Roorkee, Gandhinagar, Hyderabad, Indore, Jodhpur, Mandi, Palghat, Patna, Ropar, Tirupati and Varanasi. Each IIT is an autonomous institution linked to the others through a common IIT Council, which oversees their administration (University Application Guide, n. d.; University Application Guide IIT, 2012; Association of Scientist of Indian origin in America Inc.).

The Central Libraries of IITs are one of the central support services. The duty of central libraries of IITs is to provide information services and access to bibliographic and full text digital and printed resources to support the scholarly and informational needs of the students, faculty and staff. The library offers books, book bank of textbooks for those users who cannot afford the expenses of books. The library sustains inter-library loan relations with member of institutions and libraries.

The IITs also provide institutional repository which is an electronic collection of research produced, including full-text book chapters, conference/proceeding papers, technical reports, journal pre-prints & post-prints, working papers, patents and annual reports. The Library supports the electronic submission of theses and dissertations by postgraduate and doctoral students (Negi, 2015).

1.2 Information Communication Technology

The technology involves with the transmission and storage of information especially in the development, installation and management of universities and other organizations. Information technology is the use of computer and telecommunication equipment to store, retrieve, transmit and manipulate the data. The term is commonly used as the synonyms for the computer and computer network. It encompasses other information distribution technologies such as television and telephone.

Information communication technology has transformed the institutions or organizations. Libraries are also utilising modern technology for improvement of existing library services and creation of new services which shows the impact on the shape and size of the existing libraries and proving the existence in the organisations.

Information communication technology is used in various sectors like education, transportation, health, business, industries etc. Advancement of information communication technology and electronic publishing has ample

opportunities in libraries for information science professionals to modernize library activities and services to fulfil the diverse information needs of the users. Many libraries are utilizing information communication technology to provide efficient and effective library services to their users.

Information and Communication Technology (ICT) has also changed the trends of libraries and brought extraordinary transformation in academic library and information services, such as bibliographic services, users services, interlibrary loan, OPAC, reference services, current awareness services, document delivery and audio visual services can be provided more proficiently by using ICT, as they offer expedient time, place, cost effectiveness and up-to-date spreading of information to the users which facilitate the end users involvement in the library and information services.

1.3 Emerging Technology

1.3.1 Cloud computing

The concept of cloud computing was started in 1950s, when people feel to share infrastructure in the large scale like mainframe computers. Cloud computing is a new term in the field of computer and information science. It means computing through the internet. It is based on the hardware, software and internet infrastructure to appropriate implementation of services. It helps users to use the application at any computer with the help of internet connection. Due to the advent of cloud computing, users can access any software, platform, infrastructure at anywhere and anytime to perform the computing applications. Cloud computing makes services to easy like information retrieval system, storage of large amount of data, which may be available in the personal computers, mobile phones and other equipments. It means that only

central remote server is required to maintain data. Yahoo mail, Gmail etc. are the examples of cloud computing (Mayank Yuvraj, 2013).

1.3.2 RFID

Radio Frequency Identification (RFIDs) are small chip based devices which store data, used to identify objects uniquely in the library circulation operations and theft detection system. RFID is not a new technique, it was established in 1940s. The credit goes to commercial or business organizations like industries and academic world that have discovered and applied RFID to obtain, manage and provide security to their products or items. RFID technology is similar in concept to a cell phone. It is a broad term for technologies that use radio waves to automatically detect people or objects (Sumi & Kumar, 2007; Vasishta, n. d.; Narayanan, Singh, & Somasekharan, n. d.; Pandey & Mahajan, n. d.).

There are some RFID tags that can be active, semi-passive and passive. Passive tags don't have internal batteries. Active and semi-passive RFID tags are higher in cost that why these are used for valuable asset tracking. The passive RFID tags are being used in RFID library management systems. Using these tags, RFID library management system is easy and convenient. A RFID library management system consists of books, each attached with an RFID tag, RFID reader, computer network and software. The chip and the antenna together are called RFID transponder or RFID tag where antenna enables the chip to transmit the identification information to a reader. The reader converts the radio waves into digital information that can be passed on to computers that can make use of it (FAQ, 2004).

1.3.3 Smart card

Smart card was first introduced in Europe nearly three decades ago. A smart card, typically a type of card is of plastic that contains an embedded computer chip. All the

central libraries provide multi-purpose RFID smart card to their users. These RFID smart card are of some specifications like memory, these card may be of 1024 bytes or more than 1024 bytes. RFID Smart card stores Individual Demography, Official and Contact Details. Maps Data from Database to Identify on card. Smart cards are printed with logo and photograph with demographic details. It has full colour ribbons and cleaning kit (Smart Cards Basics, n. d.).

1.3.4 Barcode Technology

Barcode is also called as Automatic Identification, it was developed in 1970s. It is like a series of stripes on a bright context, may be white that is scanned and delivered into computer. It is produced to support many stores of goods and library documents. Today, barcode has become very essential for the library products. With the help of barcode, users work have been very faster. Data entry speed has been improved from earlier due to barcodes. On the documents, barcodes labels are fixed and it can be printed on envelopes, boxes, packets, books or documents etc. (Electronic Document on Barcode Technology; All about Barcode, n. d.; American Barcode Concepts, n. d.)

1.3.5 QR Codes

Quick Response Code is abbreviated as QR Code. These codes are used to acquire instantaneous information about the product or material. QR codes were obtained by the Japanese industrialists for the endorsement of automobile goods. In the QR codes, information is fixed vertically and horizontally. It provides benefits to encode text, numeric and other characters in the form of pixels. QR codes are being scanned by smart phones and scanners. Earlier QR codes are in Black & white in square size but now days printed in multi colours. It can encode URL of any website, SMS etc. The most excellent thing about the QR Codes is that it may be read out from any angle i.e. 360 degree. Once QR-Code generated and printed either in traditional paper or

electronic environment, they may be easily accessed and used for retrieving information. (Bajpai, 2015)

1.3.6 Mobile based services

Mobile based library services are offered by the various libraries to their users. The libraries are sending targeted messages, overdue information, reservation etc. The libraries are targeting the users and providing specialized and personalized information services which are achieved using the wireless technologies. In mobile based library services, notifications are sent to users regarding due or overdue of books. Mobile websites offer free SMS to mobile phone services on the Internet (Fasae & Iwari, 2015; Kunbar & Pawar, 2014).

1.3.7 Online Public Access Catalogue (OPAC/Web-OPAC)

OPAC is a very useful tool for finding location of library resources. It is a replacement of traditional card catalogue cabinet and time saving tool for users as well as Library staff. IIT Libraries having OPAC terminals for their users to check the availability of documents in the Library. By using OPAC, user can see the availability of books, no. of copies, reservation of book, virtual shelf, and list of borrowed book in their name. OPAC has simple and advanced search facility. User can search the books through title, name of the author, ISBN No., Publisher, publication year and keywords etc. the another version of OPAC is called Web-OPAC. It is used for finding location of library resources with the help of web or intranet. In web-OPAC, users can search library resources or documents by connecting to Uniform Resource Locator (URL) of Web OPAC at anytime, from anywhere in the world (Kulkarni, 2004).

1.3.8 Internet

The concept of Internet was started in 1969 by the US Department of Defence. Concept of internet came from inter-networking which means interaction between

networks of computers. “It is a vast collection of large and small inter-connected networks extending all the way across the world. The internet World Wide Web is, therefore a vast electronic library made-up of millions of pages of information stored in hundreds of thousands of linked computer around the globe” (Kumar, 2000).

1.4 Objectives of the Study

Study set up the following objectives-

1. To identify best practices based on Information Communication Technology Applications in the central libraries of old and new IITs in India.
2. To find out the use of emerging ICT applications in development of library collection, activities and services.
3. To find out the infrastructure required for the implementation of ICT applications in the libraries.
4. To find out the usage of open and commercial software for library management.
5. To investigate the usage of social networking sites for sharing and communicating information.
6. To find out the major problems and issues in implementation of ICT in libraries.

1.5 Scope and Limitations of the Study

The term scope refers to limitations or extent of the study. It mainly involves the coverage area of the study. The study is confined to the central libraries of Indian Institutes of Technology in India. In this study, IITs established from 1952 to 2012 have been taken. These are as follows:

Old Indian Institutes of Technology

1. Central Library, Indian Institute of Technology, Kharagpur (IITKGP), West Bengal.
2. Central Library, Indian Institute of Technology, Bombay (IITB), Maharashtra.
3. Central Library, Indian Institute of Technology, Kanpur (IITK), Uttar Pradesh.
4. Central Library, Indian Institute of Technology, Madras (IITM), Tamil Nadu.
5. Central Library, Indian Institute of Technology, New Delhi (IITD), Delhi.
6. Central Library, Indian Institute of Technology, Guwahati (IITG), Assam.
7. Central Library, Indian Institute of Technology, Rorkee (IITR), Uttarakhand.

New Indian Institutes of Technology

1. Central Library, Indian Institute of Technology, Hyderabad (IITH), Andhra Pradesh.
2. Central Library, Indian Institute of Technology, Patna (IITP), Bihar.
3. Central Library, Indian Institute of Technology, Gandhinagar (IITGN), Gujarat.
4. Central Library, Indian Institute of Technology, Bhubneswar (IITBBS), Odisha.
5. Central Library, Indian Institute of Technology, Ropar (IITRPR), Punjab.
6. Central Library, Indian Institute of Technology, Jodhpur (IITJ), Rajasthan.
7. Central Library, Indian Institute of Technology, Indore (IITI), Madhya Pradesh.

8. Central Library, Indian Institute of Technology, Mandi (IIT Mandi), Himachal Pradesh.
9. Central Library, Indian Institute of Technology, (BHU) Varanasi (IITBHU), Uttar Pradesh.

1.6 Hypotheses of the Study

A hypothesis is an assumption or some supposition to be proved or disproved. It can be an uncertain generalization of the problem under the study. Following are the probable hypothesis of the study:

- Old Central Libraries of IITs have state-of-art infrastructure and resources to support modern library services based on ICT.
- Most of Central Libraries of IITs are utilizing ICT in development and management of library collection.
- Some of the Central Libraries are utilizing open source software for various purpose like Institutional repositories, content management etc.
- Most of the old Central Libraries are utilizing emerging technology for the library activities and services.

1.7 Methodology

The present study focuses on Current Trends in Information Communication Technology Applications in the Central Libraries of Indian Institutes of Technology in India: A Comparative Study between Old and New IITs. The survey research method has been adopted for the collection of data. Questionnaires were used as a tool for data collection. Two questionnaires were prepared, one for librarians of the IITs and other for the users of IITs. Before sending questionnaire to all the librarians of Indian Institutes of Technology, pilot study was conducted. For pilot study, questionnaires were sent to the Librarian of Indian Institute of Technology Madras

and Indian Institute of Technology Hyderabad. After getting questionnaire from there, suggestions and modifications were incorporated. After that, one questionnaire was distributed to each respective librarian of the 16 Indian Institutes of Technology by personal visit, E-mail as well as speed posts. All the 16 questionnaires were received from there. After receiving questionnaires, simply data were analysed and findings and conclusion were written.

1.7.1 Questionnaire Survey

Two questionnaires were prepared, one for librarians of the IITs and other for the users of IITs. Structured questionnaires were prepared and distributed to librarians or library in-charge of the libraries. The purpose of questionnaire was to obtain the data regarding the state-of-the-art information and communication technology infrastructure and contemporary applications of ICT, to identify and analyse the specific factors that promoted or hindered application of information and communication technologies.

1.7.2 Observation of Libraries

Observation is a technique of collecting data by observing behaviour or activities, events, etc. of the respondents. For the present study, observations were also conducted in a library to collect information about current state-of-the-art infrastructure, ICT facilities, resources, and functions and examined its application in information handling process.

1.7.3 Sample Size

The present study was conducted on sixteen librarians and nine hundred sixty users of the Indian Institutes of Technology. A random sample was drawn for the selection of the respondents (users of libraries) from each of the sixteen IITs. The purpose of

drawing a random sample was to take a representative population of users per IIT. Sixteen filled questionnaires were received from librarians of IITs.

Sixty questionnaires were distributed to users of the library of each IITs for collecting some basic information for doing broad comparison between the users opinions regarding what libraries having and what do users think about these library services. That's why some basic questions were prepared and data were collected through structured questionnaire. In this study, simple random sampling was adopted for taking sample size of the users. On the basis of this, 60 questionnaires were circulated to the 60 users of each IITs. The sixteen librarian's questionnaire and eight hundred ninety nine questionnaires were received from there via personal visit as well as online questionnaire.

1.8 Statistical Tools and Techniques

The present study is designed to assess the contemporary Application of Information and Communication Technologies in the Central Libraries of IITs and to plot future direction for implementation Information and Communication Technologies. To meet the specific objective and quantitative and qualitative research methodologies along with a comprehensive literature has been employed. The citation and references have been presented in accordance with the American Psychological Association (APA) style, 6th edition.

1.8.1. Percentage Analysis and Chi square Test

Simple percentage analysis was carried out to study the current state-of-art infrastructure, application of information and communication technologies in central libraries of IITs. This was done for the libraries and library users in different categories as well as for relevant sub-samples formed on the basis of sex, age,

designation etc. For the user analysis, chi-square test has been used to analyse the data. Graphs, pi-charts, histograms etc. have been generated to encapsulate the data.

1.9 Significance of the Study

The present study is useful for the working as well as budding Library and Information Science Professionals for awareness about Current Trends in Information Communication Technology Applications in the Libraries. This study highlights the implementation of information communication technology applications among the old and newly established IITs. It explores the weak and strong area of their libraries by which librarian can re-change their ICT applications policy for the betterment of libraries. It also helps to other institutions those who want to apply ICT in their libraries. It may be used as a road map for the other institutions to implement information technology in their libraries.

1.10 Structure of the Thesis

Present study is divided into following chapters:

Chapter- 1: Introduction

In the first chapter, following points have been discussed such as background of the study, libraries and information technology, information communication technology, applications of information communication technology, emerging technologies, objectives of the study, scope of the study, hypotheses, research methodology, sample size, statistical tools and techniques and significance of the study.

Chapter- 2: Review of literature

Second chapter, review of literature discusses all recent study on information communication technologies in library and services in different institutions or universities of national and international level. It encompasses such as general studies on ICT, studies on ICT infrastructure, studies on e-resources, studies on library

automation, studies on web 2.0, studied on software, studies on internet, studies on RFID, studies on web OPAC, studies on cloud computing, studies on mobile devices and studies on current trends.

Chapter-3: Current Trends in ICT Applications in Libraries: A Theoretical Framework

This chapter describes Current Trends in Information Communication Technology Applications in Libraries. This chapter also discusses the use of ICT in library automation, library services, library collection, information retrieval, library security, promotional activities, library management and library networking.

Chapter-4: Profile of the Central Libraries of Indian Institutes of Technology

This chapter presents the brief introduction of Indian Institutes of Technology along with profile of their central libraries are used as scope of the study.

Chapter-5 Analysis and Interpretation of Data

This chapter presents the tabulation, statistical analysis, interpretation and graphical representation of the collected data from libraries.

Chapter-6 Findings, Suggestions and Conclusion

This chapter presents the findings and suggestions of the study and concluded with suggestions in future to improve the information communication technologies applications and uses in the university libraries. It offers conclusion based on findings.

1.11 Conclusion

Information technology playing vital role in all the branches of the knowledge. The library and information science is not exceptional. Information technology (IT) entered into libraries, especially academic and research libraries, during the 1960s. Libraries employed Information Technology to speed up their daily actions and reduce their functioning costs. In digital era, bulk of reading material is available in

the electronic form which can be accessed through internet as well as intranet. The libraries are utilising information technology for the modernisation of housekeeping operations as well as library resources and services. Advancement in the information technology has changed the scenario of the libraries in the digital environment. The library professional should use information technology as a tools to facilitate library services for their users.

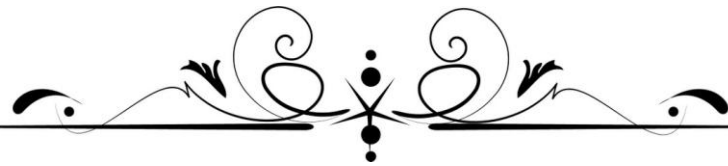
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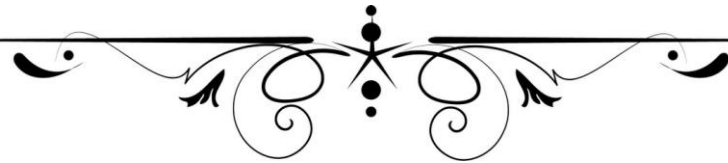
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Chapter- 2
Review of Literature



CHAPTER-2

REVIEW OF LITERATURE

2.1 Introduction

Review of Literature is an important part of the research. It gives an idea about the related studies conducted on Current Trends in Information Communication Technology Application in the Libraries in India as well as abroad. It allows to avoid the duplication of research work and develops the understanding of the research complications. For review, articles on Information Communication Technology Application in the Libraries have been taken from print as well as e-resources such as Emerald, Elsevier, JSTOR, Open Access e-journal, Directory of Open Access Journal, Directory of Open Access Repository, Institutional repositories, Google Scholar, etc. The reviews of this study are chronologically arranged in each section.

1. General Studies on ICT

2. Studies on ICT infrastructure

3. Studies on E-resources

4. Studies on Library Automation and Lib. Software

5. Studies on Social Networking Sites

6. Studies on RFID and Internet

7. Studies on web OPAC and Open Access Resources

8. Studies on Current Trends, Mobile Devices and Cloud Computing

2.2 General Studies on ICT

Patience Emefa Dzandza (2017) studied on “ICT services to students in the greater Accra region of Ghana: An initiative of the Ghana Library Board towards the development agenda”. It is revealed that the ICT corner is operated by two qualified staff. The centre has 30 working desktop computers, 29 are available for use of the public and 1 is used by the staff, a projector and screen, 2 routers with 24 ports, each securely stored in a cabinet, a photocopier, scanner, a colour printer and internet connectivity is also available in the library. The study brought to face the contribution Ghana Library Board is making to achieve agenda 2023 and 2030 by helping students to acquire basic ICT skills.

According to **Vincent Anayochukwu Ani et al. (2016)**, there are many challenges faced by postgraduate researchers’ related ICT applications such as lack of access to ICT resources, lack of ICT skills by users, lack of fund, high cost of internet, incompetence of library staff and lack of awareness of ICT-based library resources.

The work of **Khan & Jafar Iqbal (2016)** revealed that majority of respondents visit library daily, 38.12% respondents are frequently using online journal lab, 86.87% respondents are using online journal lab for research purpose, 93.12% respondents are aware about ICT based services. They also explore that lab facility for online journals are most used service, 74.37% consult e-journals, 50% agreed that the application of ICTs and services have raised the usage level of library’s resources, 64% rated that ICT based library operations and services as very good, 61.25% agreed that OPAC is user friendly, 28.12% preferred simple search method in OPAC and 56.25% opined that they are satisfied with the help provided by the staff.

Konwar (2015) found that college libraries are facing with various problems in and growing day by day with chasing the challenges. UGC’s autonomous centre

INFLIBNET are continuously doing their best effort to support the automation of libraries with software SOUL and other helping hand. They mainly discussed about the basic problems of the college libraries with reference to implementing and digitizing ICT applications.

The study of **Kaur (2015)** depicted that respondents use a variety of information communication technology products and services for their research work. He also found that there were many obstructions such as lack of training and lack of technical knowledge to use information communication technology by the research scholars of GNDU.

Chisita & Miranda (2015) examined the various projects initiated to promote resource sharing probed and how ICT has altered academic libraries in the form of digital technology. They also explored the extent to which academic libraries are creating the use of technology to donate the research program.

Saxena & Dubey (2014) explored many problems faced by the academic libraries in implementation of digital technology. Study also reveals that number of digital resources were originated in the academic libraries of different states of India like Tamil Nadu, Karnataka, Rajasthan, Kerala and Uttar Pradesh. According to them there is need to increase the collection.

Seena & Sudhier Pillai (2014) did a study on ICT skills and observed that Libsys software was mostly used by the libraries and many professionals indicated that the inadequate training in information communication technology applications is the main constraint in the libraries. All the professionals express positive attitude towards the application of information communication technology in libraries.

According to **Nebeolise (2013)**, there are many reasons that are hindering the effective use of ICT in library, these are like access and easy retrieval of information,

quick delivery of information services, inadequate provision of ICT training programs, inadequate ICT skilled professional librarians, inadequate power supply and inadequate ICT infrastructures etc.

Khademizadeh (2012) observed that users become aware of modern information technologies used by the most important source internet or intranet in their library and majority of the respondents say that electronic sources make it easier to gather and use information. He found significant relationship between e-environment and collection development. Findings also revealed that librarians feel information communication technology applications affect the collection development of library System.

The work of **Olanrewaju et al. (2011)** revealed many problems were identified like inadequate funding, insufficient facilities etc. They also found many problems like constant power failure, hindering the maximization of its anticipated benefits.

The study of **Sivakumaren, Geetha & Jeyaprakash (2011)** explore that libraries have 11 to 20 computers. Libraries also provides printers, scanners, and photocopiers. 50% government university libraries had more than 31 computers and 50% deemed university libraries had 11 to 20 computers. All libraries from government universities and 5 of those from deemed university libraries had scanners. 90% libraries have implemented library automation and digital library software. Technologies such as barcode, smart card, RFID, videoconferencing, and internet technology were identified.

Kumar & Biradar (2010) did survey on “Use of ICT in college libraries in Karnataka, India: A Survey” and found that lack of budget, lack of manpower, lack of skilled staff and lack of training are the main constraints for not

automating library activities. Library professionals expressed a positive attitude towards the use of ICT applications and library automation.

Antherjanam & Sheeja (2008) studied on “Impact of ICT on Library and Information Science: Major Shifts and Practices in CUSAT Central Library”, they found that about 90% of the users search OPAC for getting information. 65% use internet searching facility and online journals etc. Issue & return of books, book selection, price checking are used very efficiently with the help of ICT.

Chisenga (2006) studied on “Information and Communication Technologies: Opportunities and Challenges for National and University Libraries in Eastern, Central and Southern Africa”. He perceived from the study that in university libraries, there is lack of funds to sustain ICT infrastructure, there is inadequate ICT facilities. Applications of ICT are very limited, most libraries are depending on donor support for ICT infrastructure.

Lan Anh Tran & Gorman (1999) did work on the “Implementation of Information Technology in Vietnamese Libraries” and they discussed the library and information sector’s growth in the implementation of IT. They found that many libraries of Vietnamese have basic Information Technology hardware and software.

2.3 Studies on ICT infrastructure

Saxena (2017) did study on “Enhancing ICT infrastructure in public services: Factors influencing mobile government adoption in India”. It is carried out usefulness, ease of use, trust and attitude have significant influence on the adoption of mobile government services. It is also found that the demographic variables like age, marital status, occupation, educational qualification and frequency of using m-government services were not found to be significant predictors for the adoption of m-government services in India.

The study of **Kumar (2015)** carried out on “Information and Communication Technology Facilities and Services among Engineering College Libraries in Rayalaseema Region of Andhra Pradesh”. He addressed current status of institutions providing library services such as traditional, electronic, document delivery services like hardware, software and communication resources. He showed that 87.65% library provide windows XP and 72.84% Pentium IV workstation. DELNET seems to be the most preferred information network service and VSAT is found to be mostly used communication service. About 60% libraries are partially automated and barcode technique is most frequently opted for circulation. He concluded that automation is still an ongoing process in libraries of Rayalaseem Region.

According to **Konwar & Sinha (2014)**, most of the college libraries are not providing appropriate infrastructure related to ICT application. Only Gurucharan College library and Silchar College library have a computer laboratory for browsing internet and access of e-resources. Most of the colleges are providing the facility of UPS, Generators, and Inverters but the functionality of power back up are not sufficient to accomplish the requirement. They also revealed that library housekeeping operations were not fully operated. Internet connectivity of few colleges are providing for librarians not for students.

Bandyopadhyay & Mondal (2014) did survey on “Availability of ICT infrastructure in the University Libraries of West Bengal, India” and found that maximum libraries are providing basic infrastructure. They also found that university libraries are giving less importance to the implementation of information communication technology. The open access library facility is provided by University of North Bengal and closed/mixed access facility is provided by other university libraries. Calcutta University, Jadhavpur University, University of North Bengal and Vidyasagar University have good numbers of computers. It is also found that WAN

and Internet facility are provided by all the libraries and all libraries are linked with national or international library network.

Mirza & Mahmood (2014) carried out study on “IT Infrastructure in Pakistani University Libraries”. They explore that most of the university libraries have computers and peripheral devices. It is found that few library use standard integrated library management software. Majority of university libraries use Internet Explorer and fixed line telephone facility. Fax is used in some of the university libraries. Many of the libraries use local area network (LAN) while some of them use wireless network.

Fidelis et al. (2014) studied on “An Evaluation of ICT Infrastructure and Application in Nigeria Universities” and exposed that most Nigerian universities use computers, internet and telephone. They found that importance is given to computers and internet. It was found that internet facilities are utilized oftentimes. ICT infrastructure is not being sufficiently provided.

Amara Malik & Khalid Mahmood (2013) surveyed on “Infrastructure needed for digital reference service (DRS) in university libraries: An exploratory survey in the Punjab, Pakistan”. They distributed the questionnaire via post and e-mail and received back from 38 universities. They found that information communication technology infrastructure desired in libraries is better than before. And they further added that some improvement is necessary. Most of libraries have collection of general and reference in e-form and some of libraries are using Digital reference Service.

Dhanavandan, Esmail & Nagarajan (2011) analyzed the “ICT infrastructure facilities with reference to self-financing engineering college libraries in Tamil Nadu”. The study traced out that the library application software are being used in

most of the engineering colleges in Tamil Nadu. They suggest that the establishment of ICT infrastructure facilities can improve information support, information retrieval and excellence of education.

Dhanavandan & Nagarajan (2011) did survey on “Information Communication Technology (ICT) Infrastructure Facilities in Self-Financing Engineering College Libraries in Tamil Nadu”. The findings reveal that 87.14% of the libraries are providing client and work station facility. Majority of the libraries have CD Tower facility but don’t have CD ROM servers. Windows is the mostly used operating system followed by Linux, Novel NT and Sun solar. In most of the self-financing engineering college libraries, Autolib is widely used library management software followed by Libsoft and in-house prepared software. Half of libraries are using digital library software. Most of the libraries are using Photoshop followed by Adobe and Ventura software. CD writer facility is available in majority of the libraries and have 2-5 CD writers in libraries. Majority of the libraries have LCD projector. Most of the library use BSNL connection. Internet is being used by more than half of the libraries for bibliography, SDI and CAS services. Some libraries subscribe e-journals. Online database (Inspec, Compendex and Chemical Engineering) and CD ROM are available in very few libraries.

Walmiki & Ramkrishnagowde (2009) surveyed on “ICT Infrastructure in six selected University Libraries of Karnataka” and got results that the most of the libraries are lacking with the sufficient hardware and software facility, these libraries don’t have adequate internet and bandwidth. Study also reveals that the libraries are vary one to another in ICT Infrastructure and LANs are not fully used.

VKJ Jeevan & Padhi (2008) studied on “Infrastructure, Resources and Services in IIT Libraries: Results of a Questionnaire Survey”. They found that IITs,

IIMs, and Central Universities are well organised and providing better services and fully efficient infrastructure.

2.4 Studies on E-resources

Narender Kumar & Lalita (2017) did survey on “Usage of electronic resources at University of Delhi: A case study”. They found that in case of foreign databases, the cost per use has increased in the past 10 years and the cumulative average cost per use has been less. In case of subject, the cheapest cost per use has been from the databases providing statistical data and the costliest cost per use has been from discipline social science followed by management, general databases, science, humanities, technology and computer science. It has also been found that the Britannica Online has been the most economical database costing and World Intellectual Property Search as most expensive costing. University of Delhi has saved substantial amount by subscribing these databases instead of purchasing these article from open market.

Munusamy Natarajan (2017) did survey on “Use and Impact of Electronic Resources by Information Science Students at Jimma University, Jimma, Ethiopia”. It is explored that the usage of e-journals is increasing due to awareness of e-resources and services among the students, e-journals have been increased in numbers and these are accessed from the hostels and departments in comparison to the library.

Akpojotor (2016) surveyed on “Awareness and Usage of Electronic Information Resources among Postgraduate Students of Library and Information Science in Southern Nigeria”. It is depicted that electronic information resources are highly used by postgraduate students so they are quite aware of these.

Akporhonor & Akpojotor (2016) studied on “Challenges Confronting Postgraduate Library and Information Science Student in the Use of Electronic Resources in Southern Nigeria”. They found that postgraduate students are facing

many problems like poor internet connectivity, high cost of access, information overload, irregular power supply, download delay and difficulty in accessing some websites.

Egberongbe (2016) did survey on “Digital Resources Utilization by Social Science Researchers in Nigerian Universities” and analysed that the main sources of electronic information in the social sciences are not available in university libraries and faculties are also unaware of this. Effective utilisation of available resources was also not there because of lack of information technology (IT) knowledge.

Ekere, Omekwu & Nwoha (2016) studied on “Users’ Perception of the Facilities, Resources and Services of the MTN Digital Library at the University of Nigeria, Nsukka”. They found that the users were satisfied with the collection of e-resources (video CDs, CD-ROMs, online databases and portals) of the library. They are also satisfied with online indexes and abstracts services. Services like online internet, search, e-mail services and online reference services were used at wide range.

Claire Leduc & Joachim Schopfel (2015) observed subscribed journals are requested and accessed by most of business schools. 54,751 full-text article requests have been performed in 2010. 245 different journals have been accessed by the business schools. The average of per student article request is 1.24. Topics like European Journal of Marketing, Journal of Consumer Marketing, Management Decision, the Journal of Product & Brand Management and the International Journal of Retail & Distribution Management were most requested.

According to the work of **Sujatha (2015)**, the academic community is aware of e-resources and internet. Electronic information sources are used by majority of the academic community and printed general are offered among the respondents

followed by EIS. Students are facing difficulties in retrieval of irrelevant information, poor connectivity, poor database searching skills etc.

Krishna & Singh (2015) studied on “Library e-resource services and its impacts on research scholars of university of Allahabad”. They used statistical method, present study implicates that the values of chi square on different attributes are very high and significant rejecting null hypotheses. The significant of relationship on different attributes are effective among research scholars and coefficient correlation value for study of time spent is -1 which means the variables have a negative correlation and positive correlation for OPAC study.

Ukwattage & Ramanan (2015) conducted study on “Importance and Usage of Electronic Information Resources at the Library of Kotelawala Defence University” and found that HINARI and Britannica Online databases are accessed by the university library and these are accessed by the majority of the users from their residence and workplaces. Undergraduates use library during assigned period. They prefer searching information through printed materials to electronic resources. They also revealed that the space of library is not sufficient for providing better services.

Muhammad Tariq, Mahmood & Hameed-ur-Rehman (2015) surveyed on “Use, Purpose and Usage Ranking of Online Information Resources by University Research Students of Public and Private Sector Universities of Lahore, Pakistan” and investigated that research students are using social networking sites frequently while PhD students are using journal and magazines for their informational needs. They also explored that research informational needs are widely preferred function to use online information resources by research scholars.

Ukachi (2015) studied on “Information Literacy of Students as a correlate of their use of Electronic Resources in University Libraries in Nigeria” and explore that

electronic resources are not being adequately utilized; UG students don't have adequate information literacy skills for prime utilization of electronic resources.

Singh & Kataria (2015) conducted a study on “Awareness and Use of E-Journals among the Research Scholars & Faculty Members of Banasthali University, Rajasthan: A Comparative Case Study” and found that majority of research scholars and faculty members aware about e-journals from library professionals and other faculty of the university respectively. They also investigated that both feel convenient to employ with print and electronic journals for research and development, some respondents are saying that they are using journals for updating their subject knowledge. 4 hours or more than 4 hours, internet is accessed by the most of the scholars and faculty members. Most of research scholars and faculty members access e-journals from central library or computer lab. Research scholars and faculty members are facing problem because library is providing very less numbers of e-journals of their subjects and they are lacking to orientation and training about accessing of e-journals and there is low internet speed.

According to **Sinha & Deb (2015)**, conceived the status of “Usage of E-Resources available under INDEST-AICTE consortium by library users of NIT, Silchar, Assam”. They found that majority of the users are aware about the INDEST-Consortium and they utilized e-journals, frequently. They also revealed that printed and electronic resources are used equally by the majority of the respondents for the study and research. It is suggested by the most of the respondents that there should sufficient numbers of internet terminal. Authority should provide adequate internet terminals with high speed of bandwidth for the use of e-resources.

Jamal Qasim & Khan (2015) studied on “Use of e-journals by the scientists of CSIR-Institute of Genomics and Integrative Biology (IGIB), Delhi, India”. They

explored that scientists are being attracted towards e-journals provided by CSIR-NISCAIR Consortia. E-journals are consulted by majority of the scientists to their campus cabins to update their own knowledge study and research purposes. The infrastructure of the institute is good for using resources to use e-journals and scientists are not facing any type of technical problem related to hardware and software. Institute library is also providing high bandwidth of internet. Largest computing facility is also used by the CSIR-IGIB library.

2.5 Studies on Library Automation and Lib. Management Software

Bhat & Ganaie (2017) did survey on “Status of collection in agricultural libraries of Northern India with an overview of the trend in acquisition”. They reveal that most of the libraries are providing sound collection of print information resources. Agricultural libraries are not absolutely providing E-Books in their collection and at present additional e-journals are not being subscribed.

Akintomide (2016) did study on “A Study of Nigerian Librarians' Attitude to Open Source Software” and found that librarians are aware about open source software and proprietary software. Librarians are in the favour of open source software. It is also revealed that the android operating System is most popular operating system for mobile while windows operating system is the most popular operating system for desktop computers.

Bassey (2016) studied on “Adoption of Software Packages in University Libraries in Nigeria” and found that most widely adopted and used software package is KOHA. In Nigerian university libraries, the level of automation is very low.

Verma, Choudhary & Mamta Rani (2015) studied on “Use of Integrated Library Software in the Engineering College Libraries of Lucknow: A Survey”. They

found that the majority of libraries are using local software or customize software for management of libraries. Most installed and used software is Libsys among libraries.

Shah & Sonker (2014) conducted study on “Libsys Library Management Software used in Special Libraries of Lucknow: A User Survey” and investigated that in special libraries of Lucknow, Libsys is an economic software which satisfy all the modules and it is very satisfactory software. Some of the users are not satisfied to the installation of Libsys.

Satish Kumar & Singh (2014) surveyed on “Application and Use of Library Software: A Survey of Selected Central University Libraries of North India” and it is found that all the selected libraries are using automation software but Jamia Millia Islamia is using efficiently followed by Delhi University, three universities out of five are using Libsys.

Satish Kumar & Singh (2014) did survey on “Application and Use of Library Software in Central University Libraries: A Comparative Study” and most of the problems were faced during automation by Aligarh Muslim University library. It is observed that both libraries were having good IT infrastructure and other accessories. Staff strength of BHU library is better than AMU library system.

Lakpathi (2014) carried out survey on “Status of Library Automation in India” and found that most of users are using E-Granthalaya software which is free, highest number of LMS users are in Maharashtra (615), Tamilnadu (373), Karnataka (354), Delhi (279), Uttar Pradesh (167) and Telangana State (153). He also exhibits that the cataloguing and circulation modules and other functional modules are available in listed Library Management Systems, Online Public Access Catalogue (OPAC) is available only in 13 Library Management Software and city-wise automated libraries

in India, major cities are taking top five positions starting with Delhi, Bangalore, Mumbai, Chennai and Hyderabad city.

Krubu & Osawaru (2011) found that Harris University Library and Benson Idohaosa University library are using Strategic Library Automation Management software. It is also carried out that in both the libraries, only three sections that are Readers Service Division, Collection Development Division and Technical Service Division are automated.

2.6 Studies on Social Networking Sites

Mike Thelwall & Farida Vis (2017) conducted study on “Gender and image sharing on Facebook, Twitter, Instagram, Snapchat and WhatsApp in the UK: Hobbying alone or filtering for friends?” It is found that females share photos more than males and share images more frequently on Snapchat, but males share more images on Twitter for hobbies. Females tended to have more privacy related concerns and share pictures of their children. Females also interacted more through others’ images by liking and commenting. Both genders use supporting apps but in different ways. Males were more likely to be alone in their profile pictures.

Khan & Jia Tina Du (2017) did online survey on “Professional development through social media applications: a study of female librarians in Pakistan”. It is revealed that the majority of Pakistani female librarians are aware about the social networking sites and these are used frequently. They also found that social media is judged to be less helpful in obtaining technical skills. The study found a number of factors affecting the use of social media for professional development such as privacy, parent’s years of schooling, marital status and family support.

Eze (2016) studied on “Awareness and use of Web 2.0 tools by LIS Students at University of Nigeria, Nsukka, Enugu State, Nigeria”. It is explored that students are

moderately aware from some web 2.0 tools like instant messaging, blogs, Social networking sites and Wikis. They are not aware with tools like RSS feeds, podcasts, and social bookmarks. Facebook is the most regularly used web 2.0 tool followed by YouTube and wikis. To communicate with friends or family, exchanging opinions or news for their professional as well as personal life are the reasons for using social networking sites. It is also revealed that students learn to utilize these tools through friends followed by self-practice and from the help of library.

Fasae & Iwari (2016) conducted study on “Use of social media by science students in public universities in Southwest Nigeria”. They reveal that 93.5 percent respondents are using Facebook, 63.8 percent are using Google+ and 47.8 percent are using Twitter. 70.3 percent of them are using social media daily while 18.1 percent are using occasionally to update about trending events/news followed by communicate with friends or family. The results highlighted that social media distracts the respondents by unnecessary messages and pictures.

Naqvi (2015) conceived the study on “Use of Social Networking Sites: A study of the College of Medicine, Nursing and Health Sciences (CMNHS) students at Fiji National University”. They explore that most respondents were aware about social networking sites. They use the social networking sites to communicate with family and friends on weekly, daily and monthly basis. Facebook, YouTube and Wikipedia were very popular and used by the majority of students to their laptops and PCs. Majority of students never changed their profile privacy setting and they made their profile visible to well-known people as well. It was also revealed by majority of students those who were uncomfortable with unethical advertisements/photos/information posted to their webpage and their account did not hack and majority of students were satisfied with Facebook, YouTube and Wikipedia.

Bowman (2015) studied on “Differences in personal and professional tweets of scholars” and found that there were significant differences between professors that reported having a twitter account, significant differences found between types of twitter accounts (personal, professional, or both) and significant differences in the affordances used in personal and professional tweets. He also reveals that framing behaviours assist altmetric researchers in distinguishing between personal and professional tweets.

Mingle & Adams (2015) studied on “Social Media Network Participation and Academic Performance in Senior High Schools in Ghana”. Whatsapp and Facebook are used for making friends and chatting by most of the students. Due to the excessive use of social media, students feel that they are poor in grammar and spelling and they don't submit assignment on time, they have less time to study and they are in poor academic performance. They also found that students have improved their reading skills because of sharing ideas on social media.

Singh & Gill (2015) did survey on “Role and users’ approach to social networking sites (SNSs): a study of universities of North India”. All the users are knowing social media tools in their academic affairs. Most common social networking site is Facebook among all the respondents. Most of the respondents are aware to the security purpose of social networking sites.

Ali Al-Aufi & Fulton (2015) conducted study on “Impact of social networking tools on scholarly communication: across-institutional study”, they explore that 33% of the respondents did not use social networking tools for casual scholarly communication.

Sultan Al-Daihani & Suha AlAwadhi (2015) conducted study on “Exploring academic libraries use of Twitter: A content analysis”. They reveal that academic

libraries are using twitter as a multifaceted tool. News and announcements type of information is most often posted tweet by libraries followed by library collections and services, library marketing and news, referrals and books.

Mansour (2015) studied on the “Use of Social Networking Sites (SNSs) by the faculty members of the School of Library & Information Science, PAAET, and Kuwait”. Most of the faculty members were accessing social networking sites many times in a week from their office, residence and computer lab. Social networking sites are being used from last six years. YouTube, Twitter, Facebook and blogs are the interested social networking sites among the respondents. While famous social networking sites are Facebook, Twitter and YouTube for communicating with friends, family for sharing information.

Yalan Yan, Xianjin Zha & Ming Yan (2014) studied on “Exploring employee perceptions of web 2.0 virtual communities from the perspective of knowledge sharing”, they found that employees are more likely to seek knowledge from web 2.0 tools. There are positive correlations between contributing knowledge and seeking knowledge. Practical implications in Chinese organizations are encountered less frequently, compared with western countries. Study provides useful insights into the informal sharing in web 2.0 tools, which is helpful for guiding knowledge management practice in China.

Omekwu, Eke & Odoh (2014) did survey on the “Use of Social Networking Sites among the Undergraduate Students of University of Nigeria, Nsukka”. Social networking sites are used by most of the respondent to interact with friends, to connect with their classmates for doing online study. Students are also using social networking sites for chatting serious national issues and watching movies etc.

Boateng & Liu (2013) studied on “Web 2.0 Applications’ Usage and Trends in top US Academic Libraries”. They investigated, each and every academic libraries is using social networking sites that is Facebook and Twitter. In web 2.0 tool, social networking sites are used mostly and least used is Wiki. Blog was the second most popular tool, followed by RSS and IM/Chat with 97% and 91% respectively. The Participation in vodcast and podcast is 47% and 46% respectively by the respondents while 39% of academic libraries are using social bookmarking or tagging.

Bierman & Valentino (2011) studied on “Podcasting Initiatives in American Research Libraries” and found that around 33% of American research libraries have podcasting initiatives. With the help of social media, podcasts are promoted.

2.7 Studies on Internet and RFID

Vivekavardhan, Rao & Vishwa Mohan (2015) studied on “Perception of Engineering College Faculty and Students on Web Search Engines for Information Retrieval” and found that the respondents perceive Google as the most users friendly. Majority of the respondents use general search option and search engine ranking Google as number one search engine. The study also reveals that the majority (71.60%) of the students need training on web search engines to optimize the usage of the web search engines.

Sumi & Kumar (2007) studied on “Application of RFID Technology in Libraries” described that impression about the RFID. They also explained about uncertain budget to install RFID technology in the library. They concluded that manpower and money reduced and results get improved by the use of technology, this lead to safety as well as access control. The only barrier is uneconomical.

Shahid (2005) in the article entitled “Use of RFID Technology in Libraries: a New Approach to Circulation, Tracking, Inventorying, and Security of Library

Materials” described that brief idea about the features of RFID in Libraries, Disadvantages of RFID Systems, installations and recent developments. They found that security and material tracking are the needs of the library which is addressed by comprehensive system that is RFID.

Vasishta (n. d.) highlighted in article about the importance and working of Radio Frequency Identification (RFID) technology. It is also described about the basic components essential for smooth working of RFID system.

Narayanan, Singh & Somasekharan (n. d.) discussed the process of implementation, advantages and disadvantages of RFID system in Library. They found that RFID technology is popular and increasing among libraries and it is economic in sense.

Pandey & Mahajan (n. d.) discussed that the importance of library security, applications of Radio Frequency Identification technology in libraries, its components, benefits and role of librarian. They concluded that RFID technology is more effective, convenient and cost efficient for library security.

2.8 Studies on Web OPAC and Open Access Resources

Gabriel Bosah et al. (2017) did study on “Perceptions, preferences of scholarly publishing in open access journals: A survey of academic librarians in Africa”. They found that academic librarians are aware of the “green” and “gold” routes but not familiar with the “diamond” route. It is also revealed that most of the academic librarians publish only one paper in open access journals, reputation of journal and impact factor of journal were seen as very important. The majority of the respondents agreed that author fees, lack of stable internet connectivity are the major barriers to publish in open access journals.

Mohammadamin Erfanmanesh (2017) did study on the topic “Status and quality of open access journals in Scopus”. It is explored that open access journals are 17% out of the total journals of scopus in 2015. It is also revealed that an uneven spread of open access journals across disciplines, ranged from 5.5 to 28.7%. Non-open access journals get much higher mean worth than open access journals.

Jafar Iqbal & Naushad Ali (2017) studied on “Familiarity and utilization of open access resources: A study of library users of Cochin University of Science and Technology and Pondicherry University” and explore that most of the respondents of Cochin University of Science and Technology and Pondicherry University believe that they are aware of open access and they are using open access repository of their library. Among open access resources, electronic theses and dissertations are the most preferred resources. 56% respondents from Cochin University and 52.50% from Pondicherry University say that cited “screen reading” as a main barrier in accessing open access resources.

Roy, Biswas & Mukhopadhyay (2016) studied on “Status of Open Access Institutional Digital Repositories in Agricultural Sciences” and revealed that there are 29 Asian countries in Open DOAR and 26 Asian countries in Open ROAR records. It is open for listed operators only. There is a repository that provides link to DOAJ and DOAB is other repository which gives permission of free access to the e-books. Repositories are also available in different language such as Hindi, English, Arabic Thai, Chinese, Japanese and Persian etc.

Chintha (2013) carried out work on “Study of Web-Based OPAC Services in India”, he revealed that 47.3% libraries use open source software, 37.5% use commercial library management software, 14.5% use free library management software and 0.7% libraries use in-house library management software. He also found

that highest number (27.6%) of libraries in Tamil Nadu have implemented Web-based OPACs followed by 17.8% in Karnataka and Utarakhand. Most of the libraries don't have library web page.

Thanuskodi (2012) conducted survey on "Use of Online Public Access Catalogue at Annamalai University Library" and explores that 33% users are using OPAC regularly to know the availability and place of the essential documents. Half of the users are satisfied to use the OPAC while one-third are moderately satisfied and only one fifth of the users are fully satisfied. 58.33% are searching documents to use card catalogue while rest of them search from the library shelves.

2.9 Studies on Current Trends, Mobile Devices and Cloud Computing

Cibangu, Mark Hepworth & Donna Champion (2017) studied on "Mobile phones for development: An information case study of mobile phone kiosk vendors in the Congo". They found that mobile phones should be geared towards the liberation, not utilization or commodification of humans and their needs. They also explore that mobile phones are not a catalyst of human basic capabilities.

Fasae & Iwari (2015) studied on "Mobile devices for academic practices by students of college of sciences in selected Nigerian Private Universities". They revealed that mostly (83.7%) use smart phones than other mobile devices for the purpose of using educational applications and 72.50% use to chat with people. Students use the internet on their devices very often and mostly used for e-mails (71.25%), social media (68.75%) and search engines (60.50%). 81.25% students are facing challenge due to poor internet connectivity and 53.75% students face due to high cost of data subscription.

Partap Bhanu (2015) studied on the topic “Current trends in library and information Science research in India 2008–2013: A study” and examined that this study helps in making them (Library and Information Science research students) aware about the current development of information and communication technology applications.

Fintan Bracken et al. (2014) conducted study on “The potential use of online tools for scientific collaboration by biology researchers”. It is found that biology researchers are using online tools at the large extent while they are not using social networking sites. Researchers are sharing and talking with their associates via e-mail and phone calls. They also found that researchers do not use web 2.0 tools.

Susan Hurst (2013) studied on “Current trends in UK university libraries” found that total institutional spending on libraries from 3% in 2000-2001 fallen to 2.5%. To continue its serving in university income, the library is seeking to take help by many features of business philosophy and performance measurement. There is a crucial necessity to attain user hopes by giving immediate access to answers.

Mayank Yuvaraj (2013) studied on “Cloud Computing Applications in Indian Central University Libraries: A study of librarians use” and librarians in Indian central universities are very busy in various activities related to cloud computing and they are taking interest to adopt cloud computing in the libraries. Male professionals are more interested to use cloud computing than female. They also found that tools provided by OCLC, ExLibris, Duraspace & KB+ are used by librarians. Cloud computing technology is cheaper than the traditional computing methods.

Krishnamurthy & Rajashekara (2011) studied on “Current Trends in Wireless Technologies in Academic Libraries”. They found that Wi-Fi technology at ISI, Bengaluru libraries is comparatively decent. Information is accessed from the

departments, hostels and computer centres and also from the libraries. Due to Wi-Fi technology, databases and information products, hardware and software, input formats, processing, data exchange, output formats have highlighted the importance of achieving it capability.

2.10 Conclusion

The aforesaid review of the literature has been done with the help of research articles, review articles, conference proceeding articles and reports etc. It concludes that various research work have been carried out on the Information Communication Technology Applications in the libraries. This review of literature covered many related studies between 1999 and 2017.

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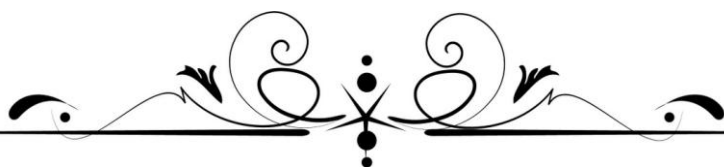
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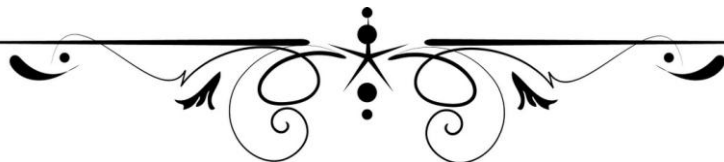
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Chapter- 3
Current Trends in ICT
Applications in libraries: A
Theoretical Framework



CHAPTER- 3

CURRENT TRENDS IN ICT APPLICATIONS IN LIBRARIES: A THEORETICAL FRAMEWORK

3.1 Introduction

The use of information communication technology in library is carrying out the manual activities and services with the help of computer networking and makes easier for the handling of information generation, processing and dissemination. The information technology application in the libraries can be categorized as computer, storage media and telecommunications. ICT is used in the libraries to automate services such as cataloguing and classification process etc. (Ebunuwele Eseohé et al., 2014; Shariful Islam & Nazmul Islam).

Information technology involves with the transmission and storage of information, installation, implementation and management of computer system within institutions, universities and other organizations. IT is the use of computer and telecommunication to store, retrieve, transmit and manipulate the data. The term is commonly used as the synonym for computer network but it also encompasses other information distribution technologies such as television and telephone etc.

3.2 Use of Information Communication Technology in library

There are many areas in library where Information Technology is used. These are:

1. Library Automation
2. Library Services
3. Library Collection
4. Information Retrieval

5. Library Security
6. Promotional Activities
7. Library Management
8. Library Networking

3.2.1 Library Automation

Automation is the process of handling the work with the help of machines. It is derived from Greek word 'automose' which means power of spontaneous motion. Automation word was first introduced by D.S. Harder in 1936.

According to Encyclopedia of Library and Information Science, "Automation is the technology concerned with the design and development of process and system that minimize the necessity of human intervention in operation" (Kent, 1997).

Automation of library has numerous developments that was divided into 3 phases. First phase is experimental phase which is from 1930 to 1960, second phase is local systems phase which is from 1960 to 1970 and third phase is co-operative system phase which is from 1970 to till date. There are many library management software to which hose keeping activities are done. These softwares' are KOHA, Libsys, Vertua and NewGenLib etc.

Koha is the first open source software for library automation that perform all library housekeeping activities. It was developed by Katipo Communication Ltd. for Horowhenua Library Trust in New Zealand 1999 and finally it was available for libraries in 2000. The basic purpose of this software is to enhance all library activities. This software uses Linux as an operating system and it was released under GNU General Public License and also it is available to download on the websites. PEARL is used as a programming language in the KOHA. The modules of KOHA are

Acquisition, Circulation, Cataloging, Serial control, Members, OPAC, Authorities, Report, and Administration (Baiju Joy, 2014).

Libsys was developed by LIBSYS Corporation, New Delhi. It is a fully integrated and multi user library and information management software. It offers full graphic user interface and runs on a wide spectrum of hardware and operating systems such as LINUX, UNIX and Windows NT. It supports almost all activities relating to acquisition, cataloging, circulation, serial system, readers service, article indexing system, OPAC System (Baiju Joy, 2014; Husain & Ansari, 2007). Libsys has following modules such as Acquisition, Cataloging, Circulation, Serial Control, Article Indexing, Web OPAC, and Customizable Report.

Virtua software is developed by Virginia-Tech Library System (VTLS) Incorporation. “Virtua Library software package is a windows based client/server application software. The Virtua software is based on six technologies: Relational Database Management Systems, Rapid Development Tools, Three Tier Client/Server Architecture, Database Warehousing, Unicode Support and ATM Network optimized application. These technologies facilitate handling data management, software development and network delivery” (Husain & Ansari, 2007). The modules of Virtua are Acquisition, Circulation, Cataloging, OPAC, Serial Control, Statistical and Reporting.

NewGenLib is an integrated library management system explored by Versus Solutions Pvt. Ltd. It is called as new generation library software. The Domain expertise of NewGenLib is provided by Kesavan Institute of Information and Knowledge Management. The NewGenlib version 1.0 has been released in the month of March 2005. NewGenLib was declared as an open source software on 9th January

2008 under GNU General Public License Versus Solutions. The latest version of NewGenlib is NewGenLib 3.0.3 U2 (Reddy & Kumar, 2013).

Library house-keeping activities comprise of activities that are required for acquiring, storing and organizing information with an objective to provide information services to the users. Due to increasing large collection and increasing number of users in academic library, the variety of factors are forced that automation is essential for all library operations. These factors such as users have less time, library always face inefficiency of staff, inaccuracy occur in circulation activities, new generation need, security problems etc. The most commonly used house-keeping activities are acquisition, classification, cataloguing, circulation, serial control and stock-taking.

Acquisition systems means books/documents ordering system. It is defined as the searching, selection, ordering and receiving all kind of documents in the library. With the help of acquisition system, library managers do pre-ordering search and prepare approval list of document through computer and type writers. Reminders are sent with the help of internet and telecommunication such as e-mail, telephone and fax. For inviting invoices, letters are sent through telecommunication technology. With the help of library management software, order file is maintained. The advantage of acquisition system such as helps to greatly reduce labor and paper work, allows effective and efficient control over acquisition activities, accurate and on time information can be retrieved.

In circulation section, ICT plays an important role. This is the largest section of the library. There are many activities which are involved such as preparation of description file for all circulation items, preparation of membership file, charging and discharging of documents, calculation of fine, calculation and printing of various

types of statistical reports, automatic generation of due date slip, Writing of letters for order and loss of books, reminder of overdue etc. There are many advantages to the users and staff of the library like, this system saves the library staff from drudgery of routine records, leads to fast charging and discharging which saves the time of user as well as staff and further leads to increase user satisfaction, allows maintenance of statistical record and use of bar-coding has further simplified and speedup the work of circulation (Era Shabana Tabusum et al.; Chauhan).

Library classification is the art of grouping of the documents on the basis of contents for the purpose of arranging them on the shelves in a proper way. Standard library management softwares' provide facility to store class numbers according to keywords. Now DDC is available online, if the document is represented by these keywords, the DDC-online automatically generates class number using Online Computer Library Center (Era Shabana Tabusum et al.; Chauhan). "Classification of documents involves three distinct major processes. The first two processes of defining a structure of categories and determining a basis for the classification decision are usually performed by a classificationist, while the third process of classifying documents into categories is performed by a classifier" (Kumar, 2000).

In a catalogue, multiple entries for documents are made to meet the various possible approaches that users may adopt to seeking the documents. There are many computerized cataloguing activities such as preparation of main entry, preparation of added entry, preparation of authority file and preparation of index files etc.

With the help of ICT, use of serial control leads to effective and efficient control over subscription, claiming reminders and cancelations. In present time, online publisher catalogue are used for periodical selections. Some serial control activities using information communication technology such as inputting of serial data,

ordering of new Journals, renewing of subscription, cancellations of subscription, accessing of individual issue, sending reminders such as emails, fax, phone etc., preparation of list of periodicals received, preparation of list of cancelled/replaced journals, preparation of list of holdings with their status, maintenance of accounts for subscription and binding etc. (Era Shabana Tabusum et al.).

3.2.2 Library Services

Now days', libraries are ICT based service oriented and these are known by their services. Librarians or library managers are undergoing dynamic changes to meet this demand. The most important changes are the acceptance of information communication technology for providing library services. These services are user leading to saving the users' time and with the help of ICT, it is possible to meet the varied demands of today's users. Many services like indexing, abstracting, translation etc. are the time saving, cost saving and skill staff intensive. There are many ICT based services which are used in the modern academic libraries by the users.

3.2.2.1 Document Delivery Service

In present era, the size of the document is being minimized with the help of electronic media like CDs, DVDs, microchips etc. Through email services, documents are also delivered to the demand users. In many libraries, through online subscription, document delivery service is provided by the library managers.

According to PSG Kumar, "Document Delivery Service will enable a library to request another library through for a copy of document to be transmitted via e-mail or fax. This service may be largely used for transmitting a few pages from documents say journal articles" (Kumar, 2004).

The library arrange to provide research articles from other academic institutions for study and research purpose. To avail the DDS services, faculty

members are requested to send a formal request to the library with complete bibliographic details of desired documents. In the electronic environment, document delivery service replaced and became e-DDS. It is a very fast service and serve to users within few minutes, if the document available in particular library.

3.2.2.2 Inter-Library Loan

Inter-Library Loan service is a service in which one library requests to another library (which will be rich in collection) for one or more books on the basis of loan to complete the demand of the users. This type of service is mostly provided by those libraries which are very rich in collection. This service provides the facility of reserving a book. The supply of book can be done by speed post, parcel or courier services.

3.2.2.3 Reference Services/E-Reference Service

Using computer and communication technology to provide right information to the right user in the right form in right way are known as reference service. Various term are associated with the virtual reference service such as Ask Librarian, virtual shelf, Frequently Ask Questions etc. This service is more important to establish personal relationship between library staff, user community and user communicate with library staff at anytime from anywhere.

E-reference service is initiated electronically where anybody communicate with librarian without being physically present. Channels (email communication, chat, videoconferencing, instant messaging, etc.) are used frequently in e-reference/virtual reference service.

3.2.2.4 CAS (Current Awareness Services)

CAS is the service which is intended to meet the current approach to the demand users. It provides nascent information about newly procured documents and current

activities of an institute. CAS can be provided manually as well as by mechanization. The periodicity of CAS bulletins are taken differently by the academic library, many libraries issue once a week or fortnight or sometimes once in a month. It covers different kind of services like as title announcement service, announcement of research in progress, notifications for forthcoming conferences and selective dissemination of information. Many current awareness services are like Bulletin Board Service, SMS Alerting Service, Newspaper Clipping, Email Alert Service, Monthly Book Addition, New Arrivals etc.

3.2.2.5 Selective Dissemination of Information (SDI)

SDI is the service in which librarian or library manager keep users informed with the new development of the areas of interest. H. Peter Luhn was first to give the concept of selective dissemination of information services. He defines SDI as: “The SDI is that service within an organization which concern itself with the channeling of new items of information, from whatever source, to those points within the organization where the probability of usefulness, in connection with current work or interests, is high” (Guha, 1983).

3.2.2.6 Indexing Services and Abstracting Services

Indexing and abstracting services are very important among users to fulfil user’s need. Indexing and abstracting services are excellent records of current published literature and analysis. The library has to create or update existing library services. These services are created from primary sources which fulfil the growth of publications. Indexing and abstracting services provides enormous growth of published literature and scatter the published information. These services are provided in the many subjects or disciplines.

3.2.2.7 Reprographic Services

Library provides network based photocopy facility to its user on nominal charge/payment basis. It serves user to make accessibility of any document at minimum cost. This in-house facility is very useful for user community and available all the week days in the libraries.

3.2.2.8 E-mail Alerts/SMS Alerts

Email alert is a type of notification service in which reminders are sent to the users when library items are due or overdue or reservation can be collected. We can also say that email alert is a reminder for users when anybody has requested for library items, it is reminded by the library staff that your item is ready to be collected. It is a courtesy service and it is users' responsibility to return items on time. There are four types of email alerts like return or renewal reminder, overdue alert, request collection and recall (Yale University Library, n.d; The University of Melbourne, n.d; West Sussex Country Council, n. d.). SMS Alert is also a type of notification service in which reminders are sent via mobiles. This service is mostly provided by the circulation division of the library to the users.

3.2.2.9 Instant messaging

Instant messaging is a type of conversation between two people on Internet. In this, there is a buddy list, is a listing of trusted friends, colleagues and family members. There is a chat window and status indicator, chat window is a window where chatters input text and press enter or send. It is used in social networking sites because of its participatory, social nature. Instant messaging close the librarian and information seeker (Stefens, 2006).

3.2.2.10 Listservs

Listserv is the software which sends and receives the list of e-mails to the users or vendors of any library or organization on the internet. We can also say that Listserv sends and receives the emails to the specific group which saves the time of the sender and receiver. In this process, there is an administrator, who handles the whole process. The main purpose of using Listservs is to create a community where common interest topics are discussed and common goals are achieved (Listserve, n. d.)

3.2.2.11 Online Access to Electronic Resources

E-resources are available in electronic format and on the networked base environment such as e-journals, e-books, e-databases etc. At present, most of the academic libraries are spending more than 90% of their total library budget on subscribing e-resources every year. IIT Libraries subscribe to major e-resources in basic sciences such as IEEE database, JSTOR, MathSciNet, Nature, Science Direct, Springer Link, American Chemical Society, American Physical Society, ProQuest, EBSCO, SCOPUS, J Gate Plus, Engineering Village, CMIE database, Capitaline, ProQuest Dissertation and Theses, SciFinder, Web of Science etc.

3.2.2.12 Remote Access

Remote login is a service in which user can access the e-resources of libraries from outside of the campus by using Virtual Private Network. Academic community or users' or members of the libraries can access the subscribed e-resources remotely. Approximate all the central library of IITs provide remote login facility to users for accessing library resources from outside of the campus.

3.2.2.13 Plagiarism Checking Service

Most of the central libraries of IITs provide anti-plagiarism software that allows faculty members and scholars to detect plagiarism of their project work, academic

research paper, article, theses or innovation related work. Library encourages academic community to use anti-plagiarism checker to find out the possible plagiarism before submitting for publication. It is the duty of the Librarian to make aware about the issue of plagiarism to faculties, students and other users of the library.

3.2.3 Library Collection

Information Technology has facilitated to convert print collection in the digital format which can be used for the development of the digital libraries. Digitized collection provides ample opportunity to the library to fulfill the diverse information need of the users. It also provides opportunities to subscribe various information resources like e-Journals, e-books, electronic databases etc. which help to develop library collection and optimum utilizations of the resources. Library can also prepare a list of open access resources like courseware, scholarly resources, journals, e-books etc. and include their library website which gives additional value to the library collection.

3.2.4 Information Retrieval

Information technology facilitates various kinds of information retrieval techniques which help to find out relevant information to their users. Users can access information within fraction of seconds from their desktop. It also assists to develop various databases that can be used information retrieval. Many libraries are developing institutional repositories and digital libraries to retrieve digital information resources through internet or intranet.

3.2.5 Library Management

Information technology offers variety of techniques to manage library collection, staff and services. It reduces the requirement of space of the library building, manpower, preservation etc. The technology can help in the tracking of the activities of the staff. It enhances the performances of the staff by reducing the duplication work. It also

helps to archive and preserve library resources in digital form which can be used for long life or perpetual access of the resources. The technology also helps to track the student's activities in the libraries.

3.2.6 Library Security

Libraries are providing RFID technology, smart cards and CCTV surveillance to the betterment of library. CCTV surveillance is a part of modern technology and is being implemented in many academic libraries in India. It facilitates to provide multi-purpose security like misuse of library resource, theft control of any library resources, tearing or damages of pages, security of personal belongings and helpful to stop unauthorized activities in library like misuse of other candidate identity card, misuse of password for accessing internet or other resources, misbehavior activities inside the library etc.

A smart card, typically a type of card is of plastic that contains an embedded computer chip. All the central libraries provide multi-purpose RFID smart card to their users. These RFID smart card are of some specifications like memory, these card may be of 1024 bytes or more than 1024 bytes. RFID smart card stores individual demography, official and contact details.

RFID Technology is being used rapidly in libraries for various purposes such as in providing prompt and efficient circulation services, providing security for in-house documents, quick identification of any document, quick and accurate library physical stock verification, shelf rectification etc. To save the time of the users, RFID technology is being implemented in academic libraries.

3.2.7 Promotional Activities

Library offers many promotional activities using information communicational technology for their users. User orientation programs are one of the activities of the

library which need to organize each and every year for their users. In this program, every new members of the library are familiarized with the resources, services and facilities offered by the library and its policies. Library offer training programs to assist users to develop the ability to locate, identify, use and interpret information effectively that helps in optimum utilization of library resources and services. Generally in user orientation program users gain knowledge how to use library services like how to use Web-OPAC, knowledge about e-resources subscribed by library, plagiarism checking through anti-plagiarism software, familiarity with library staff, library rules and regulation etc. Many libraries organize training program on regular basis for reference management tool like Mendeley, EndNote and Zotero. Library also include online demonstration related to electronic resource in their website which were provided by various publishers for various research databases such as SciFinder, Web of Science, Scopus, Grammarly, Turnitin etc. Library also make aware to the users about how to use the library website, what sources are being provided by the library etc.

3.2.8 Library Networking

Library networking allows sharing resources among member libraries. Networking facilitates member libraries to share expertise, resources and services among member libraries. It also works as a tool for the sharing data, information and resources from one location to another location.

3.3 Digital Library

Digital Libraries are playing vital role for the users of an academic library. These libraries are offering digital content and services to the end users through intranet or internet. The libraries store digital collection in many files, formats and languages. It includes contents in various subject filed like science, social science, education,

culture, development, health, governance and so on. Digital libraries are very much different from traditional library because digital library provides an access to multimedia content like audio, video, images etc. Digital libraries mainly store documents in digital formats and deploy large collections of those materials efficiently. It eliminates the barriers of information access and retrieval. Electronic resources can be organised, processed and transmitted to the end-users without any geographical boundaries. (Alhaji, n. d.; Seadle & Greifeneder, 2007; Trivedi, 2010).

The following definition given by the Digital Library Federation brings out the essence of this perception. “Digital Libraries are organization that provide the resources, including the specialized staff to select, structure, offer intellectual access to interpret, 3 distribute, preserve the integrity of and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities” (Alhaji, n. d.). There are many digital library software which help to create a digital library like Greenstone.

Greenstone is a software for building digital library collection. It is open-source, multilingual software, issued under the terms of the GNU General Public License developed by the New Zealand Digital Library Project, University of Waikato, and distributed in cooperation with UNESCO and the Human Info. NGO. Greenstone software empowers users of university libraries and other public service institutions to build their digital libraries. Greenstone is also capable of displaying the user interface in multiple languages and handling collections consisting of text, pictures, audio and video. Additionally, the Greenstone system support various file formats such as MS-Word, PDF, HTML, PostScript, JPEG, and GIF (Elaiess, 2012).

3.4 Institutional Repository

Repository provides the set of services to the academic community for the dissemination of digital material created by the institution. Institutional repository is helpful for long term preservation of digital documents. Institutional repository collects, preserves and provides free, unrestricted online access to all types of institutional research outputs. It includes theses and dissertations, research data, images, conference proceedings and other forms of literature. It may include a variety of research output of any organization. It provides common platform to the scholars, so that everyone in the institution can contribute scholarly material to promote cross-campus interdisciplinary research (Jain, Bentley & Oladiran, n. d.; Tedd, n. d.).

DSpace is a digital/institutional repository software which is developed in 2002 by the Massachusetts Institute of Technology and Hewlett-Packard. It is an open source software and anyone can download it freely. DSpace software is choice based software for academic, non-profit and commercial organizations which building up open digital repositories. It is free and easy to install by anyone from anywhere. It conserves and enables all types of digital content encompassing text, images, moving images and datasets (Biradar & Banateppanavar, 2013). There is one software that is E-Prints, it is a free software developed by the University of Southampton, England. E-Prints repository collects preserves and disseminates the research output created by a research community in digital format (Tramboo et al., 2012).

3.5 Social Networking Sites

The use of social networking sites are increasing day by day in the libraries to linking up with library users for the promotional activities like users education program, creating awareness about library collection and services, getting feedback or sharing the resources to the users etc. There are many social networking sites such as

Facebook, YouTube, Twitter, RSS Feed etc. which help to linking with the library users.

3.6 Internet Connectivity

Internet connectivity deals with the connection of internet. It can be connected through various media like broad band, Leased line, Wi-Fi, Li-Fi etc.

Broad Band offers high speed internet connection through various medium like coaxial cable, optical fiber, radio or twisted pair. It is more reliable and faster internet connection compare to the dial up which is earlier used in the many institutions and universities for the access of internet.

Wi-Fi is a technology for wireless local area networking with devices which includes personal computers, video-game consoles, phones and tablets, digital cameras, smart TVs, digital audio players and modern printers. Wi-Fi compatible devices can connect to the internet via a wireless access point.

The term Li-Fi was coined by Harald Haas. It is a bidirectional, high-speed and fully networked wireless communication technology like as Wi-Fi technology. It is a form of optical wireless communications which uses the visible spectrum as well as ultraviolet and infrared radiation. Li-Fi can be complement to Wi-Fi and broadband connectivity. This technology is being used by many organizations in the world.

3.7 Cloud Computing in Libraries

Cloud computing is very useful for libraries to share their data to each other. Many libraries can come under one umbrella and store their data only in a single library server without any separate server. Many libraries have also adopted the cloud computing in their libraries. For example, OCLC (Online computer library center) is doing work as a cloud computing. It means that it provides cataloguing tools on the internet and allows to every member institutions to share their centralized data.

Generally cloud computing will be beneficial for those libraries which are being digitized and subscribed the services like Google Docs, Flickr, etc.

3.8 Conclusion

The advancement of the information technology compelled to the society as well as libraries to modernize their activities and services. The technology had greater impact on each and every field of the knowledge. Libraries are utilizing various technologies for up gradation of infrastructure and services. The technology brings libraries to global network which provide many opportunities to the library professionals for their career and up-gradation of knowledge. It should be used as a tools for enhancement and expedite services of the library and information centers.

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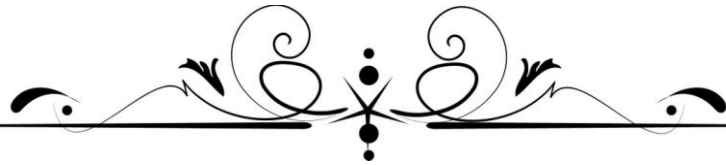
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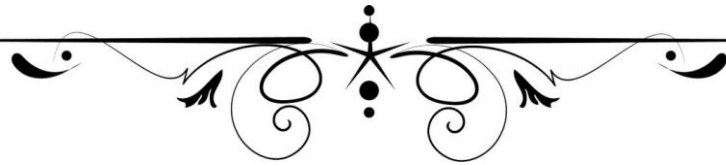
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Chapter- 4
Profile of the Central Libraries
of Indian Institutes of
Technology



CHAPTER- 4

PROFILE OF THE CENTRAL LIBRARIES OF INDIAN INSTITUTES OF TECHNOLOGY

4.1 Introduction

The Indian Institutes of Technology (IITs) are independent public institutes of education. These are administered by the Institutes of Technology Act, 1961 which was declared as institutions of national importance. In the act, there is twenty-three institutes located at Kharagpur, Bombay, Delhi, Kanpur, Chennai, Roorkee, Guwahati, Patna, Hyderabad, Bhubaneswar, Gandhinagar, Indore, Jodhpur, Mandi, Palghat, Patna, Ropar, Varanasi, Bhilai, Dhanbad, Goa, Jammu, Tirupati. These IITs are a self-governing institutions and these have been connected to the others with common IIT Council. The Central Libraries of IITs are one of the central support services for the users of library. The duty of all central libraries is to provide information services and access to bibliographic and full text digital and printed resources to support the scholarly and informational needs of the students, faculty and staff at the institute community. The library offers circulating books and also a book bank of textbooks for loan to students whose parent's income falls below the taxable limit. The library maintains Inter-library loan relations with a number of institutions and libraries (University Application Guide, n. d.; University Application Guide IIT, 2012; Association of Scientist of Indian origin in America Inc., n. d.).

4.2 Brief Introduction of Old and New Indian Institutes of Technology

S. No.	Name of IIT	Short Name	Founded	Establishment	Estab. of Lib.	State/UT
1	IIT Kharagpur	IITKGP	1951	1951	1951	West Bengal
2	IIT Bombay	IITB	1958	1958	1958	Maharashtra
3	IIT Kanpur	IITK	1959	1959	1960	Uttar Pradesh
4	IIT Madras	IITM	1959	1959	1959	Tamil Nadu
5	IIT Delhi	IITD	1961	1963	1961	Delhi
6	IIT Guwahati	IITG	1994	1994	1994	Assam
7	IIT Roorkee	IITR	1847	2001	1848	Uttarakhand
8	IIT Bhubaneswar	IITBBS	2008	2008	2009	Odisha
9	IIT Gandhinagar	IITGN	2009	2009	2008	Gujarat
10	IIT Hyderabad	IITH	2008	2008	2008	Telangana
11	IIT Jodhpur	IITJ	2008	2008	2008	Rajasthan
12	IIT Patna	IITP	2008	2008	2008	Bihar
13	IIT Ropar	IITRPR	2008	2008	2010	Punjab
14	IIT Indore	IITI	2009	2009	2009	Madhya Pradesh
15	IIT Mandi	IIT Mandi	2009	2009	2010	Himachal Pradesh
16	IIT (BHU)	IIT (BHU)	1919	2012	2012	Uttar Pradesh
17	IIT Palakkad	IITPKD	2015	2015	2015	Kerala
18	IIT Tirupati	IITTP	2015	2015	-	Andhra Pradesh
19	IIT (ISM) Dhanbad	IIT(ISM)	1926	2016	-	Jharkhand
20	IIT Bhilai	IITBh	2016	2016	-	Chhattisgarh
21	IIT Goa	IITGoa	2016	2016	-	Goa
22	IIT Jammu	IITJM	2016	2016	-	Jammu and Kashmir
23	IIT Dharwad	IITDH	2016	2016	-	Karnataka

Image: 4.1 Indian Institutes of Technology in India



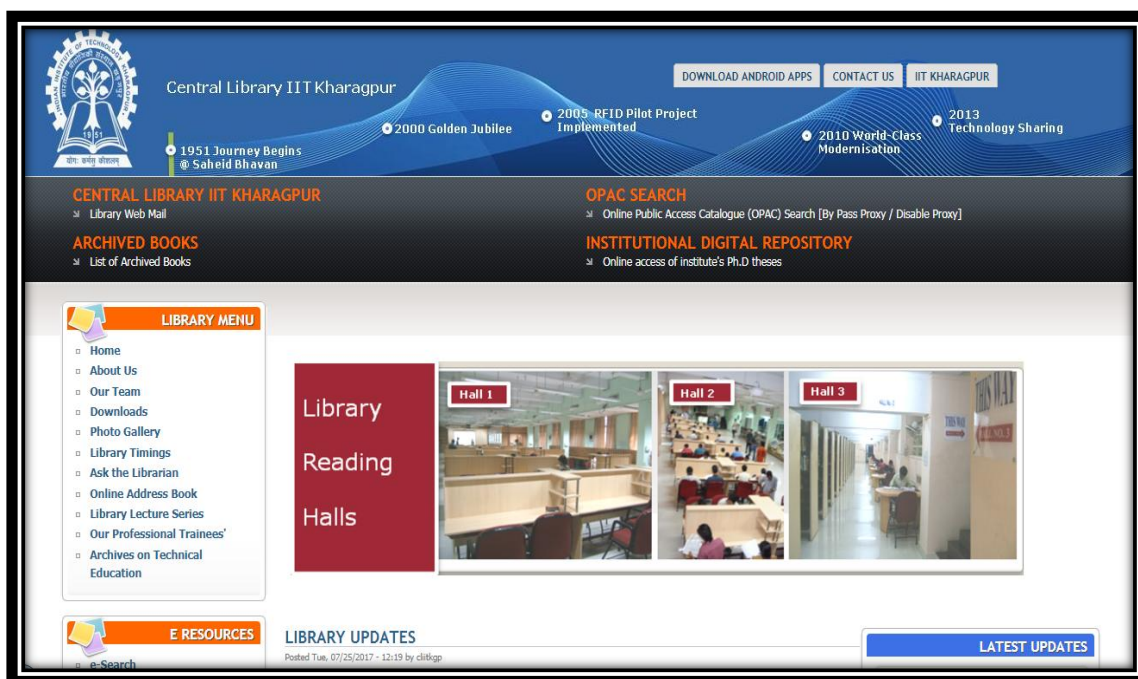
Source: <https://www.mapsofindia.com/education/iit-colleges-in-india.html>

4.3 Indian Institute of Technology Kharagpur (IITKGP)

IIT Kharagpur was started in August 1951. In first academic session, there were 224 students and 42 teachers with ten Departments. Indian Institute of Technology Kharagpur was declared as an institute of national importance on 15th September 1956 by the Parliament of India. Status of an autonomous university was given to IITKGP (Motto, Mission and Vission, 2017; History of IIT KGP, 2016).

4.3.1 Central Library of IIT Kharagpur

Image: 4.2 Central Library of IIT Kharagpur



Source: <http://www.library.iitkgp.ernet.in/index.php>

The central library of IIT Kharagpur is equipped with modern infrastructure. When it was established, it was in a small room called Shahid Bhavan and in 1956 library was moved to its another building. It is one of largest and finest technical libraries in Asia and this library is ISO 9001:2008 certified. The library is divided into two buildings. Collection of books, theses, standards and periodicals, bound journal, CDs, DVDs are

kept in main building of library and annexe building holds the lectures of various courses (About Central Library, IIT KGP, 2016).

The library provides 3.5 lakh documents and subscribing 300 journals. IIT Kharagpur also provides various types of resources such as online databases, books, patents, standards, theses, video cassettes, CD-ROMs, DVDs, documents, reports, etc. The library provides 263864 print books and 1 lakhs e-books for users. It also provides 80 print periodicals, 25262 electronics periodicals, 132916 bound volumes. For the research scholars and students library provides 5697 theses/dissertations, 58 full text databases and 3 bibliographic databases.

4.3.2 Brief Detail about Central Library, IIT Kharagpur

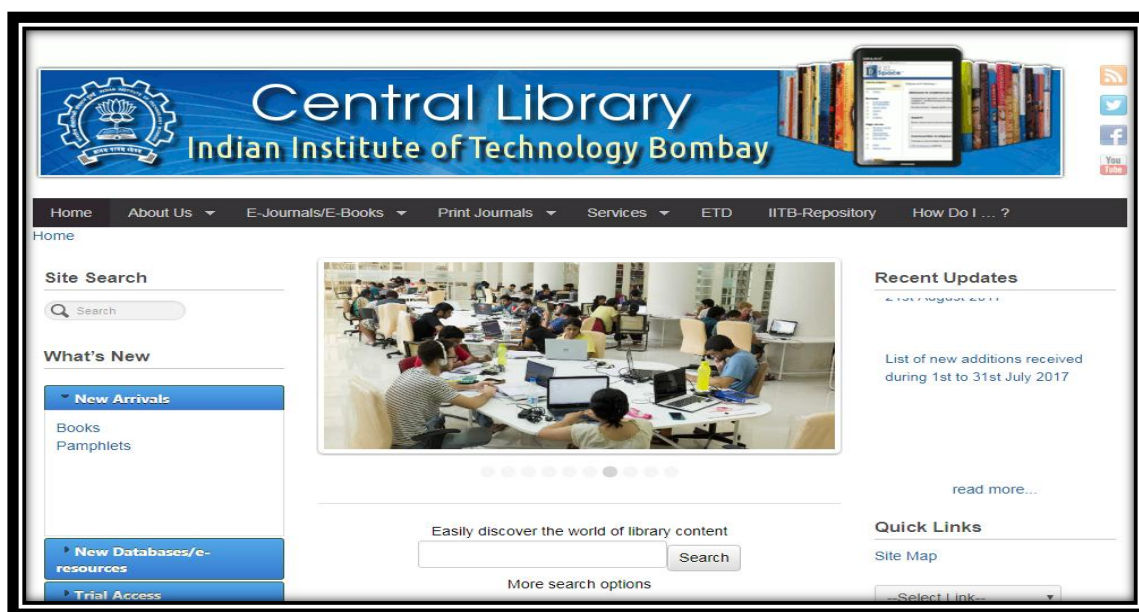
Name of the Library	Central library, IIT Kharagpur
Establishment year of Library	1951
Name of the Librarian/Library In-charge	Dr. B. Sutradhar
Total Registered Users of the Library	12000
Total Sitting Capacity for the Users	1500
Contact No.	91-03222-282432

4.4 Indian Institute of Technology Bombay (IITB)

Indian Institute of Technology Bombay was established in 1958 by an Act of Parliament. It was first institute which was established with the foreign assistance. UNESCO and Government of the USSR helped in establishment of IIT Bombay. The institute was one of the centre of academic brilliance in the country. IIT Bombay is one of the best institution in world and is progressing day by day in academic, research and infrastructural facilities (IIT Bombay, 2017).

4.4.1 Central Library of IIT Bombay

Image: 4.3 Central Library of IIT Bombay



Source: <http://www.library.iitb.ac.in/>

The facilities of central library of the IIT Bombay is based on user. The library is very rich in print and digital contents which are very useful for their faculty, students and staff. The library provides 233304 print books and 5120 e-books, 1370 CD-ROM for users. It also provides 96 print periodicals, 20029 electronics periodicals, 119265 bound volumes. For the research scholars and students library provides 37154 theses/dissertations, 200 full text databases and 7 bibliographic databases, 67835 patents/standards. The library is also using social media like blogs, Facebook, wiki and twitter for sharing the information and communicate to users.

4.4.2 Brief Detail about Central Library, IIT Bombay

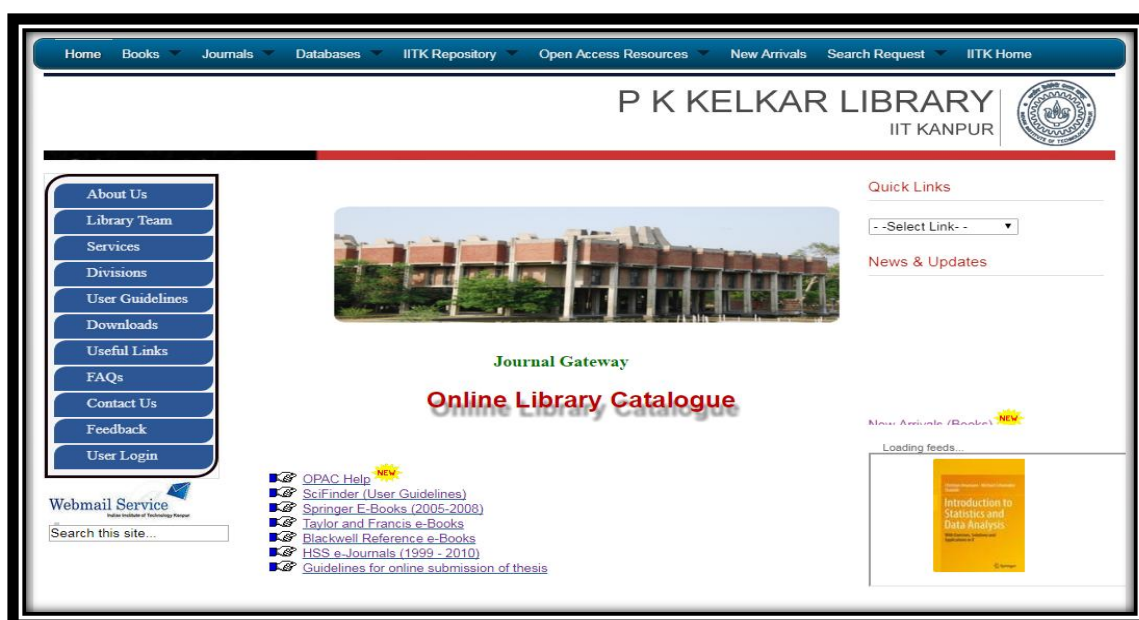
Name of the Library	Central Library, IIT Bombay
Establishment year of Library	1958
Name of the Librarian/Library In-charge	Dr. R. K. Das
Total Registered Users of the Library	16791
Total Sitting Capacity for the Users	500
Contact No.	022-25768920, 25768924

4.5 Indian Institute of Technology Kanpur (IITK)

The Indian Institute of Technology Kanpur was established on 2nd November, 1959. The institute aims to give meaningful education. When the institute was established, it began its functioning in the Harcourt Butler Technological Institute building in 1959. There were only 100 students and few faculties (Institute-overview, 2017).

4.5.1 P K Kelkar Library of Indian Institute of Technology Kanpur

Image: 4.4 P K Kelkar Library, Indian Institute of Technology Kanpur



Source: <http://pkklib.iitk.ac.in/>

The central library of the Indian Institute of Technology, Kanpur is renamed as the P K Kelkar Library. Library is furnished with modern infrastructure and facilities. The main objective of the library is to provide the informational and scholarly contents to the students, faculty and research scholars (P K Kelkar Library, Purushottam Kashinath Kelkar Library, 2017). The library provides 275000 print books and 16000 e-books, 2000 CD-ROM for users. It also provides 280000 bound volumes. For the research scholars and students, library provides 17000 theses/dissertations, 3000 patents/standards.

4.5.2 Brief Detail about P K Kelkar Library, IIT Kanpur

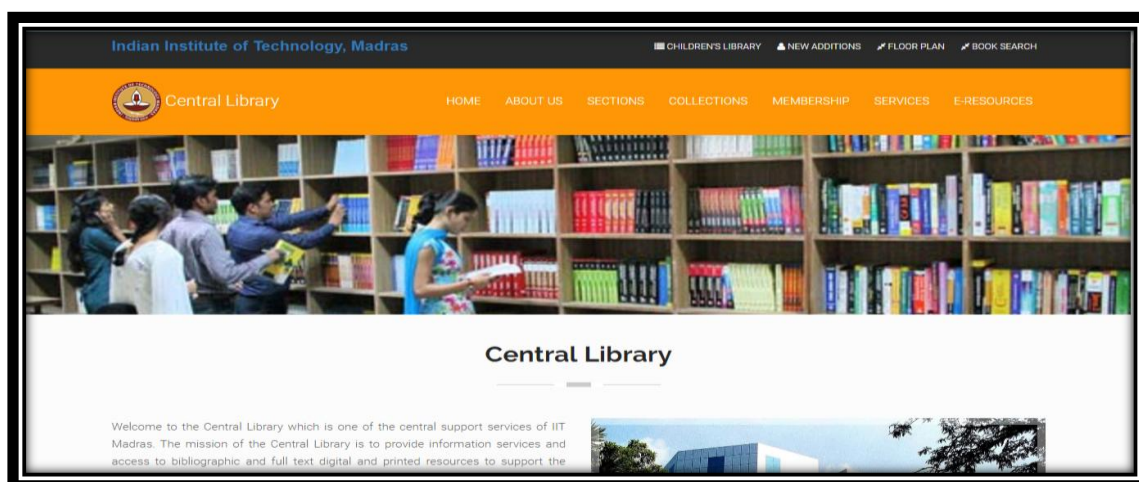
Name of the Library	P K Kelkar Library, IIT Kanpur
Establishment year of Library	1960
Name of the Librarian/Library In-charge	Prof. R. Gurunath
Total Registered Users of the Library	6000
Total Sitting Capacity for the Users	2000
Contact No.	0512-2597698

4.6 Indian Institute of Technology Madras (IITM)

Indian Institute of Technology Madras was established in 1956 by the Government of India with the partnership and technical assistance from the Government of West Germany. It was officially inaugurated by Prof. Humayun Kabir, Union Minister of Scientific Research and Cultural Affairs in 1959 (About IIT Madras, 2017).

4.6.1 Central Library of Indian Institute of Technology Madras

Image: 4.5 Central Library of Indian Institute of Technology Madras



Source: <http://www.cenlib.iitm.ac.in/>

The central library of IIT madras was recognised in 1959. The library provides 257208 print books and 6117 e-books, 356 CD-ROM for users. It also provides 30 print periodicals, 704 electronics periodicals, 113919 bound volumes. For the research scholars and students library provides 6689 theses/dissertations, 10 full text databases and 14 bibliographic databases, 1199 patents/standards. The central library also provides microforms, microfiches and library is renovated with modern technologies.

4.6.2 Brief Detail about Central Library, IIT Madras

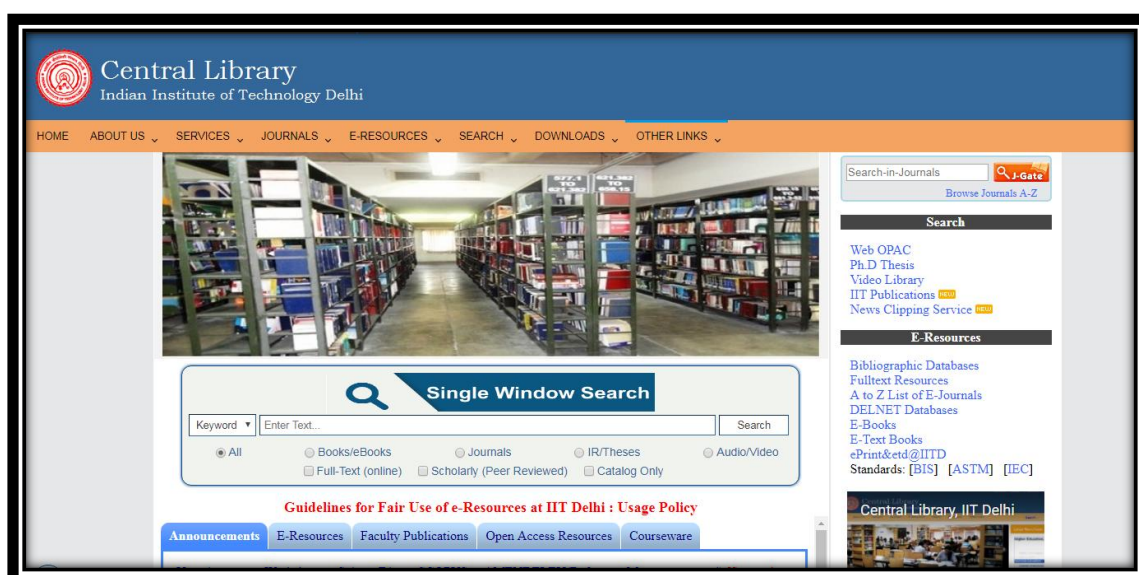
Name of the Library	Central Library, IIT Madras
Establishment year of Library	1959
Name of the Librarian/Library In-charge	Dr. Mahendra N. Jadhav
Total Registered Users of the Library	12000
Total Sitting Capacity for the Users	550
Contact No.	914422574962

4.7 Institute of Technology New Delhi (IITD)

The Institute of Technology Delhi was established in 1959 at Hauz Khas by Indian Government and British Government Co-operation in setting up Institute of Technology in India. The institute aims to provide advanced education to develop the social status of the country. The Institute of Technology Delhi was officially inaugurated in 1961 and it was acknowledged as Institutions of National Importance under the Institute of Technology Amendment act 1963 (Map and Location, IIT Delhi, 2017).

4.7.1 Central Library of Indian Institute of Technology New Delhi

Image: 4.6 Central Library of Indian Institute of Technology New Delhi



Source: <http://library.iitd.ac.in/>

The Central Library of IIT Delhi came into existence to fulfil the objectives and mission of parent institute. Teaching, research and extension programmes are supported by the system which includes a central library and eighteen departmental libraries. The central library has books, theses, journals, video cassettes and compact disc in the field of science, engineering, humanities, literature and management. The Library is using Libsys integrated library management software for the house-keeping activities of the library (Central Library, IIT Delhi, 2017). The library provides 2 lakhs print books and 1 lakhs e-books, 1 lakh bound volumes. For the research scholars and students, library provides 6000 theses/dissertations, 50 full text databases and 8 bibliographic databases.

4.7.2 Brief Detail about Central Library, IIT Delhi

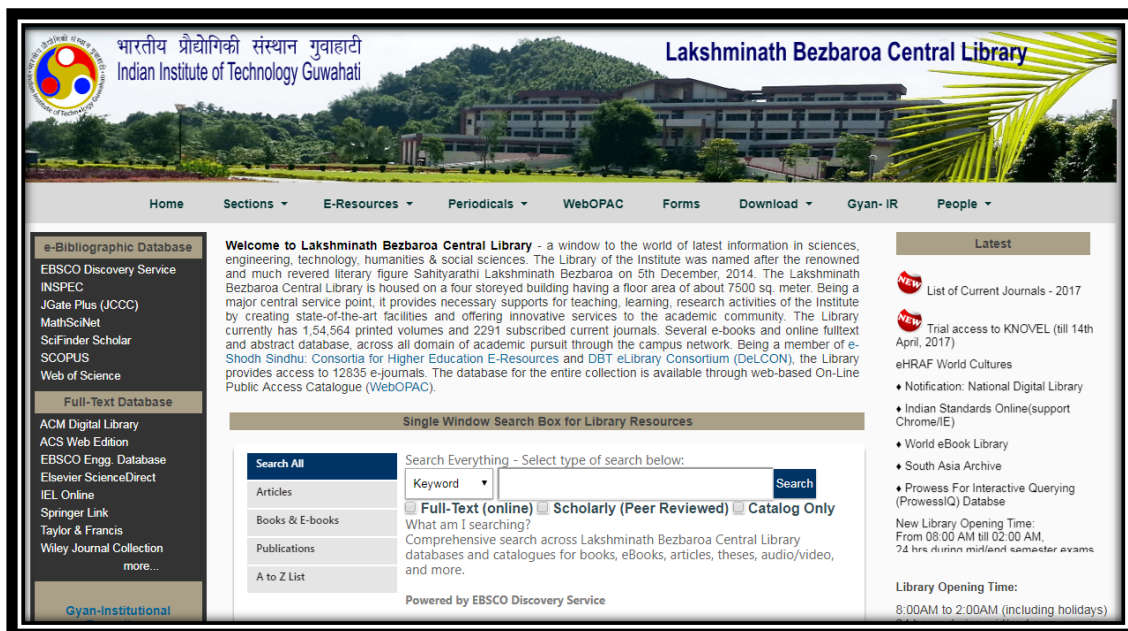
Name of the Library	Central Library, IIT Delhi
Establishment year of Library	1961
Name of the Librarian/Library In-charge	Dr. Neeraj Kumar Chaurasia
Total Registered Users of the Library	10000
Total Sitting Capacity for the Users	800
Contact No.	011-26596622

4.8 Indian Institute of Technology Guwahati (IITG)

Indian Institute of Technology Guwahati was sixth IIT, started in 1994 by an Act of Parliament. The academic session of the IIT Guwahati was started in 1995. There are 11 departments and 3 interdisciplinary academic centres in major advanced engineering, science and humanities disciplines. IIT Guwahati has built up world class infrastructure for carrying out advanced research within a short span of time. The library of institute is known as Lakshminath Bezbaroa Central Library. On 5th December 2014 central library was named after the renowned literary figure Sahityarthi Lakshminath Bezbaroa (IIT Guwahati, 2017).

4.8.1 Lakshminath Bezbaroa Central Library of Indian Institute of Technology Guwahati

Image: 4.7 Lakshminath Bezbaroa Central Library, IIT Guwahati



Source: <https://www.iitg.ernet.in/lib/>

The Lakshminath Bezbaroa Central Library of IIT Guwahati has very huge collection. Presently it has 154564 printed volumes which includes textbooks, conference proceedings, reference books, back volumes, standards. The central Library has subscribed several e-books and 2291 journals in different subject areas. Library provides campus access to full text and bibliographic databases viz. INSPEC, Scopus, SciFinder Scholar, Web of Science, MathSciNet, etc. Libsys, an integrated library software package is used for all housekeeping operations of the library. The database for the entire collection of library can be accessed through Web-OPAC. Library is a member of DELCON and INDEST consortium, through this library provides access to 12835 e-journals.

4.8.2 Brief Detail about Lakshminath Bezbaroa Central Library, IIT Guwahati

Name of the Library	Lakshminath Bezbaroa Central Library, IIT Guwahati
Establishment year of Library	1994
Name of the Librarian/Library In-charge	Dr. Tamal Kumar Guha
Total Registered Users of the Library	7892
Total Sitting Capacity for the Users	301
Contact No.	361-258-2112

4.9 Indian Institute of Technology Roorkee (IITR)

Indian Institute of Technology Roorkee was recognised in 1847 as the first engineering college, it is one of the Institutes of National Importance in higher technological education and research. The University of Roorkee has played an essential role in providing the technical manpower. It has contributed to all sectors of technological development and it ranks amongst the best technological institutions in the world. In October 1996 the central library of IITR renamed as Mahatma Gandhi Central Library on the occasion of 150th year of its emergence (IIT Roorkee, 2017).

4.9.1 Mahatma Gandhi Central Library of Indian Institute of Technology Roorkee

Image: 4.8 Mahatma Gandhi Central Library, Indian Institute of Technology Roorkee



Source: <http://mgcl.iitr.ac.in/>

The Mahatma Gandhi Central Library is equipped with modern technologies and infrastructure. The library has its roots as the college library which was started in 1848 with a few hundred donated books. Now its collection has grown to more than 3,50,000 documents in all media. The library provides 2 lakhs print books and 35000 e-books for users. It also provides 91 print periodicals, 15140 electronics periodicals, 60000 bound volumes. For the research scholars and students library provides 15000 theses/dissertations.

4.9.2 Brief Detail about Mahatma Gandhi Central Library, IIT Roorkee

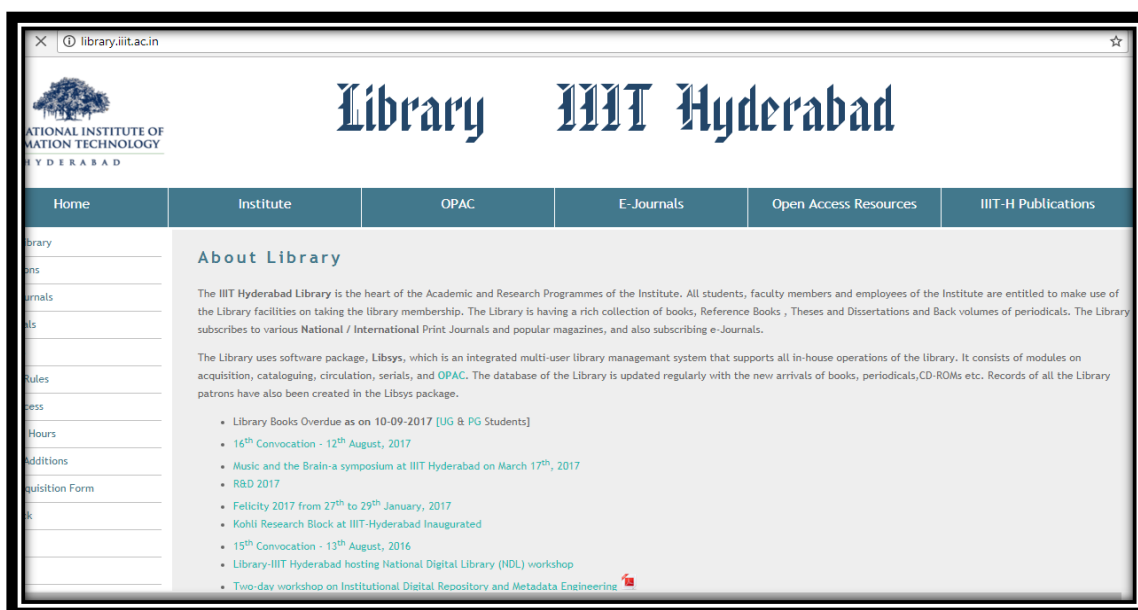
Name of the Library	Mahatma Gandhi Central Library, IIT Roorkee
Establishment year of Library	1848
Name of the Librarian/Library In-charge	Dr. C. Jayakumar
Total Registered Users of the Library	8000
Total Sitting Capacity for the Users	500
Contact No.	01332-285939, 285239

4.10 Indian Institute of Technology Hyderabad (IITH)

Indian Institute of Technology Hyderabad supports inventions and innovations. It aims to name as ideators and leaders in higher education and research and also to alter human power with creativity, technology and development of country. In the first academic session of IIT Hyderabad, there were 111 B.Tech students on 20th August 2008. In January 2009, IIT Hyderabad, 11 PhD. students were enrolled. In next session, IIT Hyderabad admitted 120 B. Tech students, 35 M. Tech. students and 10-15 Ph.D. students (IIT Hyderabad, 2017).

4.10.1 Central Library of Indian Institute of Technology Hyderabad

Image: 4.9 Central Library of Indian Institute of Technology Hyderabad



Source: <http://library.iith.ac.in/>

The Central Library of IIT Hyderabad was established in 2008 which provide facilities of users as well as faculty members. The Library is providing a rich collection of books, reference books, theses and dissertations and back volumes of periodicals. The Library subscribes many national and international journals and magazines. Library is also subscribing e-journals. The library uses integrated library management software that is Libsys. The library provides 16000 print books and 100 CD-ROM for users. It also provides 36 electronics periodicals, 2284 bound volumes. For the research scholars and students, library provides 4 patents/standards.

4.10.2 Brief Detail about Central Library, IIT Hyderabad

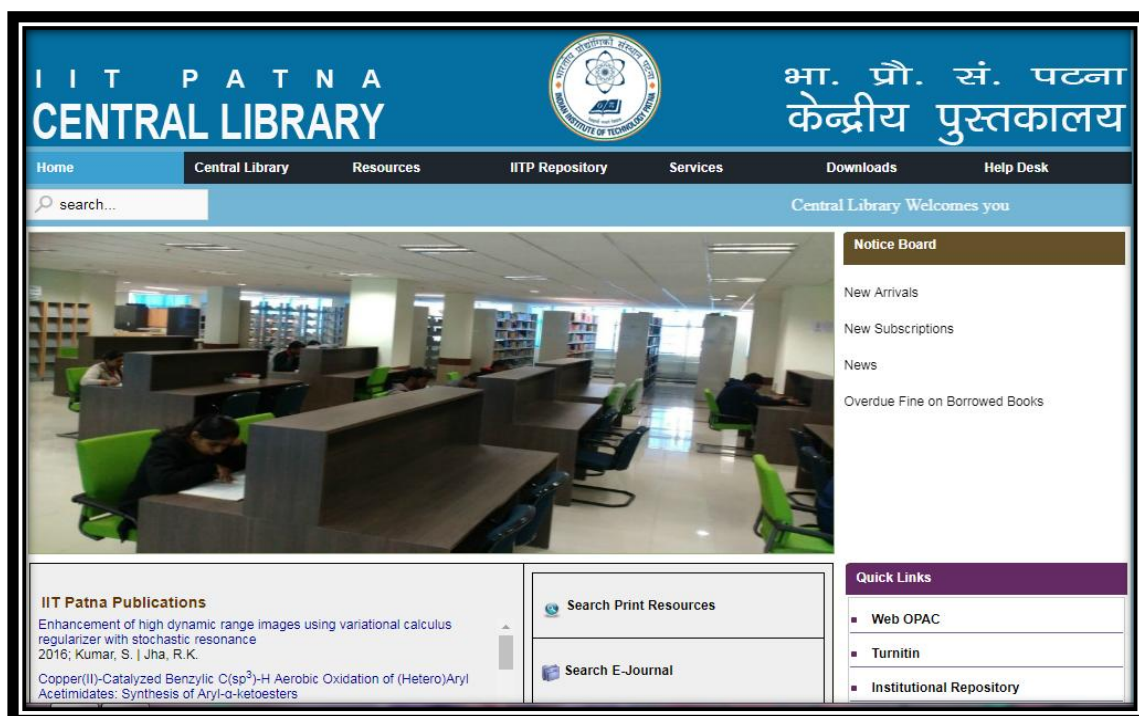
Name of the Library	Central Library, IIT Hyderabad
Establishment year of Library	2008
Name of the Librarian/Library In-charge	-
Total Registered Users of the Library	2000
Total Sitting Capacity for the Users	50
Contact No.	040-23016025

4.11 Institute of Technology Patna (IITP)

In the list of new Indian Institutes of Technology, IIT Patna is one of them which is established by an Act of the Indian Parliament on August 06, 2008. At present, ten departments are running that are Computer Science & Engineering, Electrical Engineering, Mechanical Engineering, Chemical and Biochemical Engineering, Civil & Environmental Engineering, Materials Science & Engineering, Chemistry, Physics, Mathematics and Humanities & Social Science departments. The Institute is fully equipped with modern infrastructure and facilities. Since inception in 2008 and till April 2016, more than four hundred students have been awarded B. Tech. degree, more than seventy five students have been awarded M. Tech. degree and more than 20 research scholars have been awarded PhD. degree. Research activity in IIT Patna has been published in high quality and peer-reviewed national and international journals (IIT Patna, 2017).

4.11.1 Central Library of Indian Institute of Technology Patna

Image: 4.10 Central Library of Indian Institute of Technology Patna



Source: <http://library.iitp.ac.in/>

The Central Library of IIT Patna is equipped with modern technologies and rich in collection and services. Central Library fulfils the demand of faculty members, students as well as research scholars to offer many information communication technology resources and services. When it was established, it had very limited print as well as electronic resources, but at present, it is very rich in collection and resource. At present library is providing the facility of OPAC, RFID, current awareness services, Wi-Fi services etc.

4.11.2 Brief Detail about Central Library, IIT Patna

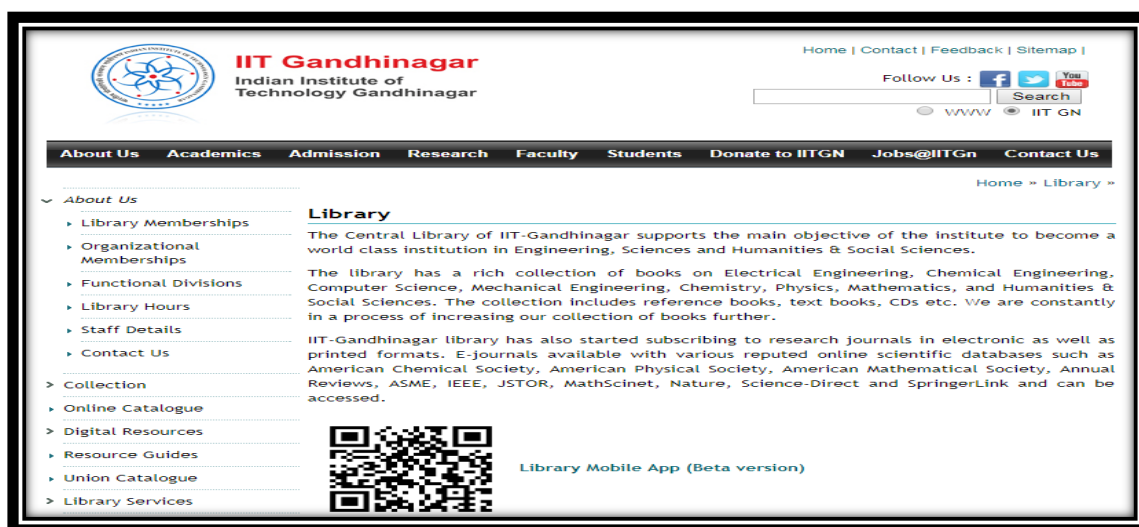
Name of the Library	Central Library, IIT Patna
Establishment year of Library	2008
Name of the Librarian/Library In-charge	Dr. Mritunjay Anand
Total Registered Users of the Library	1000
Total Sitting Capacity for the Users	100
Contact No.	91-612-3028052

4.12 Indian Institute of Technology Gandhinagar (IITGN)

In 2008, IIT Gandhinagar was established at Palaj, district Gandhinagar, Gujarat. The main objective of IIT Gandhinagar is to become a world class institution in engineering, sciences, humanities and social sciences. IIT Gandhinagar is rich in state of art of the infrastructure. It offers graduate and postgraduate and PhD. programs in different subjects like computer sciences, information technology, humanities, social sciences, engineering etc. (IIT Gandhinagar, 2017).

4.12.1 Central Library of Indian Institute of Technology Gandhinagar

Image: 4.11 Central Library of Indian Institute of Technology Gandhinagar



Source: <http://www.iitgn.ac.in/library.html>

The Central Library of IIT-Gandhinagar fulfils the aim of the institute to provide ICT related resources and services. The library provides the books on different engineering fields, Chemistry, Physics, Mathematics, and Humanities & Social Sciences. The assembly includes reference books, text books, CDs etc. and constantly increasing the collection of books. IIT-Gandhinagar library also subscribes many e-journals in both the formats. The library provides 25000 print books and 1 e-book, 1477 CD-ROM for users. It also provides 132 print periodicals. For the research scholars and students library provides 187 theses/dissertations, 50 full text databases and 10 bibliographic databases, 1707 patents/standards.

4.12.2 Brief Detail about Central Library, IIT Gandhinagar

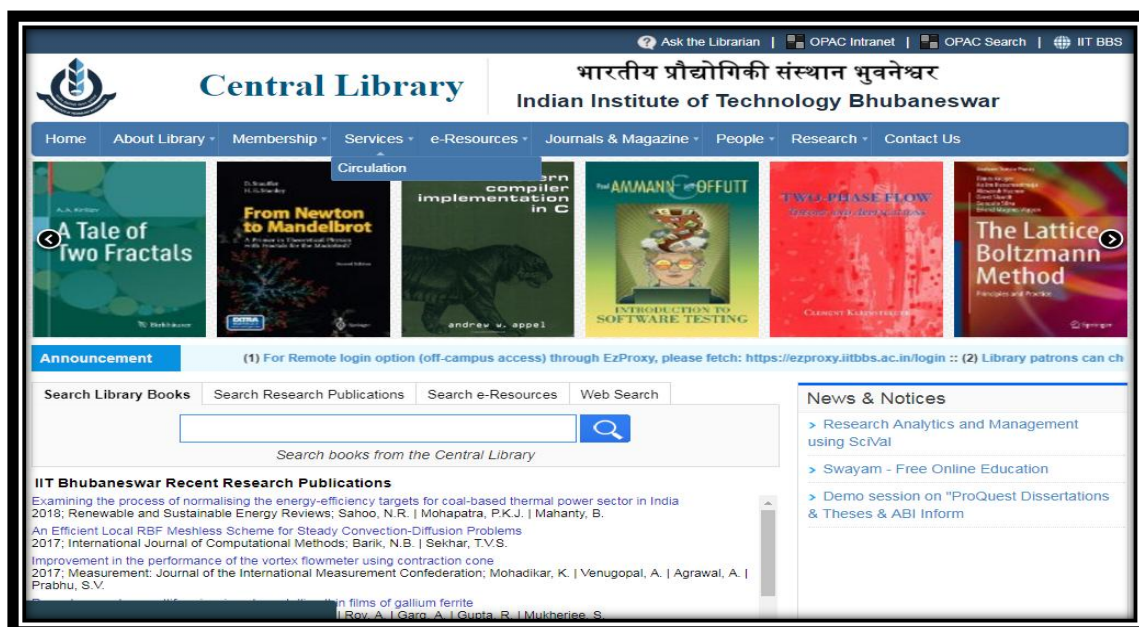
Name of the Library	Central Library, IIT Gandhinagar
Establishment year of Library	2008
Name of the Librarian/Library In-charge	Dr. T. S. Kumbar
Total Registered Users of the Library	1400
Total Sitting Capacity for the Users	100
Contact No.	91-79-32454368

4.13 Indian Institute of Technology Bhubaneswar (IITBBS)

Indian Institute of Technology Bhubaneswar was established on 22nd July 2008. The permanent campus of IIT Bhubaneswar is spreading over 936 acres of land. It is situated at the foot of Barunei Hill. The campus provide a unique serene and pollution free academic environment. The vision of IIT Bhubaneswar is “We will be a highly respected Institute in the world for our distinctive knowledge” (IIT Bhubaneswar, 2017).

4.13.1 Central Library of Indian Institute of Technology Bhubaneswar

Image: 4.12 Central Library of Indian Institute of Technology Bhubaneswar



Source: <http://library.iitbbs.ac.in/>

Central Library IIT Bhubaneswar was setup in 2009 to promote the institute’s mission and to discover, preserve and impart knowledge to the users. It delivers world-class physical and digital content and services significant to education, research, publication and outreach with latest technology. Central library has good collection of text books and reference books. It also offers popular magazines, selected journals, theses, reports, e-books, e-journals and online databases in Engineering & Technology, Sciences, Humanities, Social Sciences and Management. The library

provides 16000 print books and 2000 e-books for users. It also provides 26 print periodicals, 8500 electronics periodicals. Library provides 46 full text databases and 4 bibliographic databases.

4.13.2 Brief Detail about Central Library, IIT Bhubaneswar

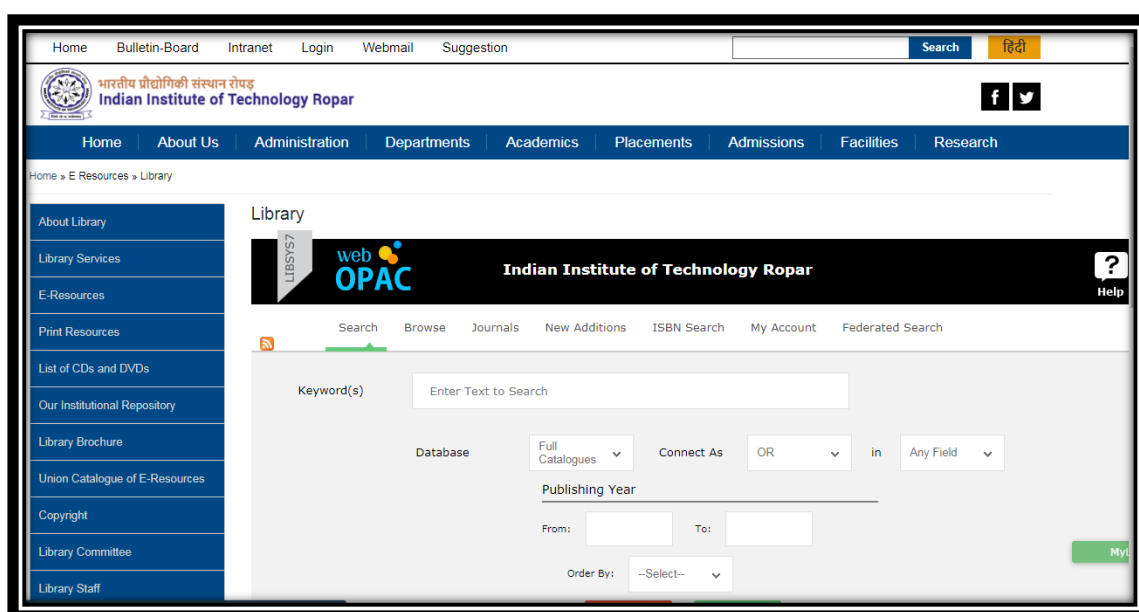
Name of the Library	Central Library, IIT Bhubaneswar
Establishment year of Library	2009
Name of the Librarian/Library In-charge	Dr. Bibhuti Bhusan Sahoo
Total Registered Users of the Library	1000
Total Sitting Capacity for the Users	100
Contact No.	0674-2576045

4.14 Indian Institute of Technology Ropar (IITRPR)

Indian Institute of Technology Ropar is one of the eight new IITs which was established in 2010 by the Ministry of Human Resource Development (MHRD), Government of India. It provides state-of-the-art technical education in a multiple fields of engineering and social science. The institute offers graduate, postgraduate and PhD. programs in many disciplines (IIT Ropar, 2017).

4.14.1 Central Library of Indian Institute of Technology Ropar

Image: 4.13 Central Library of Indian Institute of Technology Ropar



Source: <http://www.iitrpr.ac.in/library>

The central library of IIT Ropar works as the primary information resource hub and repository of printed and electronic resources for teaching and research activities at the institute. Library provides the facility of print books like dictionary, encyclopaedia, hand books, subject books etc. The library also offers access to electronic journals through its participation in consortia such as E-Shodh Sindhu. The library provides 14500 print books and 2000 e-books, 750 CD-ROM for users. It also provides 15 print periodicals, 7000 electronics periodicals. For the research scholars and students, library provides 50 theses/dissertations and 3 bibliographic databases. The library is using Turnitin plagiarism software to improve the quality of research.

4.14.2 Brief Detail about Central Library, IIT Ropar

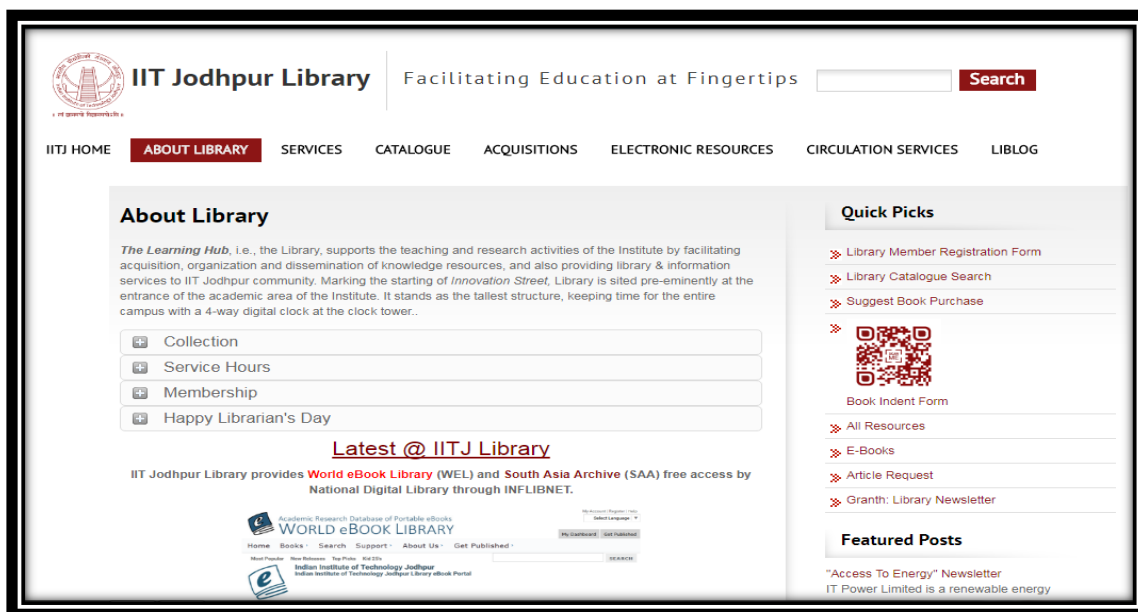
Name of the Library	Central Library, IIT Ropar
Establishment year of Library	2010
Name of the Librarian/Library In-charge	Dr. Dinesh K. S.
Total Registered Users of the Library	600
Total Sitting Capacity for the Users	130
Contact No.	91-01881-242134

4.15 Indian Institute of Technology Jodhpur (IITJ)

In 2008, Indian Institute of Technology Jodhpur was established to boost up technology education and research in India. Currently, it is working from its Impermanent Campus at MBM Engineering College in Jodhpur. Permanent Campus of IIT Jodhpur is extensive and 852 acres on National Highway 65, north-northwest of Jodhpur towards Nagaur. The Institute promises to give the multidisciplinary approach of technological development (IIT Jodhpur, 2017).

4.15.1 Central Library of Indian Institute of Technology Jodhpur

Image: 4.14 Central Library of Indian Institute of Technology Jodhpur



Source: <http://library.iitj.ac.in/>

Central Library of Indian Institute of Technology Jodhpur helps in teaching and research activities of the Institute by providing acquisition, organization and spreading knowledge resources and also gives library & information services to IIT Jodhpur community. The library provides 15000 print books and 50 e-books, 50 CD-ROM for users. It also provides 100 bound volumes. For the research scholars and students library provides 32 full text databases and 4 bibliographic databases.

4.15.2 Brief Detail about Central Library, IIT Jodhpur

Name of the Library	Central Library, IIT Jodhpur
Establishment year of Library	2008
Name of the Librarian/Library In-charge	Kshama Prakash
Total Registered Users of the Library	900
Total Sitting Capacity for the Users	60
Contact No.	291-2449038

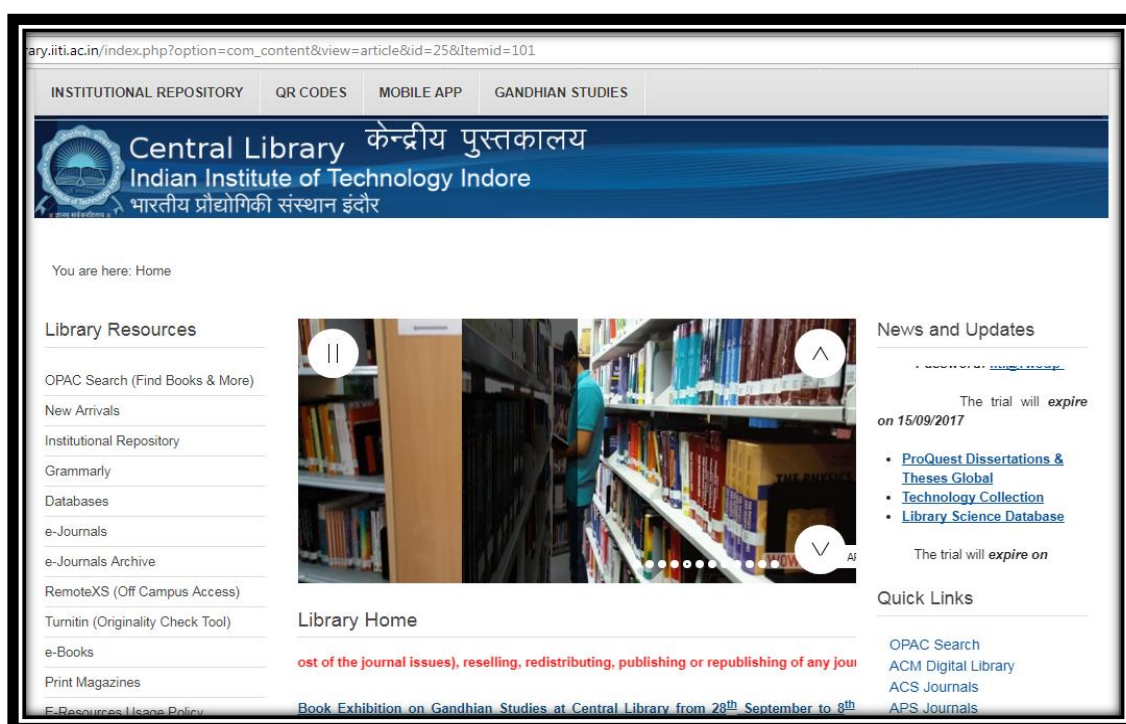
4.16 Indian Institute of Technology Indore (IITI)

Indian Institute of Technology Indore was established by the Government of India in 2009 which located in Madhya Pradesh. It is an institute of national importance. It is

one of the eight new IITs, started by the Ministry of Human Resource Development (India), Government of India. The institution started functioning from 2009-10 in a temporary campus at Institute of Engineering and Technology of Devi Ahilyabai University under mentorship of IIT Bombay from February 2016, IIT Indore has started its permanent campus (IIT Indore, 2017).

4.16.1 Central Library of Indian Institute of Technology Indore

Image: 4.15 Central Library of Indian Institute of Technology Indore



Source:http://library.iiti.ac.in/index.php?option=com_content&view=article&id=25&Itemid=101

The Central Library shows important support for current teaching programmes and research at IIT Indore. The library is developing its collection of books, reference books, periodicals and electronic resources etc. The library provides traditional as well as ICT related resources and services. The library provides 29000 print books and 728 e-books for users. It also provides 3 print periodicals, 6000 electronics periodicals. For the research scholars and students library provides 218

theses/dissertations, 17 full text databases and 5 bibliographic databases, 405 patents/standards.

4.16.2 Brief Detail about Central Library, IIT Indore

Name of the Library	Central Library, IIT Indore
Establishment year of Library	2009
Name of the Librarian/Library In-charge	Ms. Anjali Bandiwadekar
Total Registered Users of the Library	1340
Total Sitting Capacity for the Users	100
Contact No.	0731-2438713

4.17 Indian Institute of Technology Mandi (IIT Mandi)

IIT Mandi was started in July 2010 from a transit campus in Mandi town. At present the campus of IIT Mandi is in Kamand. It is nearly 20 km away from Mandi town. IIT Mandi has now completely shifted to its main campus at Kamand, except few labs, guest house, postgraduate hostel. IIT Mandi is spread over 538 acres of which 200 acres is flat land and the rest is mountainous. Total number of students in IIT Mandi are 850 (IIT Mandi, 2017).

4.17.1 Central Library of Indian Institute of Technology Mandi

Image: 4.16 Central Library of Indian Institute of Technology Mandi



Source: <http://library.iitmandi.ac.in/>

The Central Library of IIT Mandi provides resources i.e. collection of books and journals in the field of Engineering, Science & Technology and related areas. The

central library uses KOHA integrated library management software making its operation automated. The library provides 15900 print books and 11400 e-books for users. It also provides 5 print periodicals, 237 electronics periodicals, 28 bound volumes. Library provides 15 full text databases and 4 bibliographic databases.

4.17.2 Brief Detail about Central Library, IIT Mandi

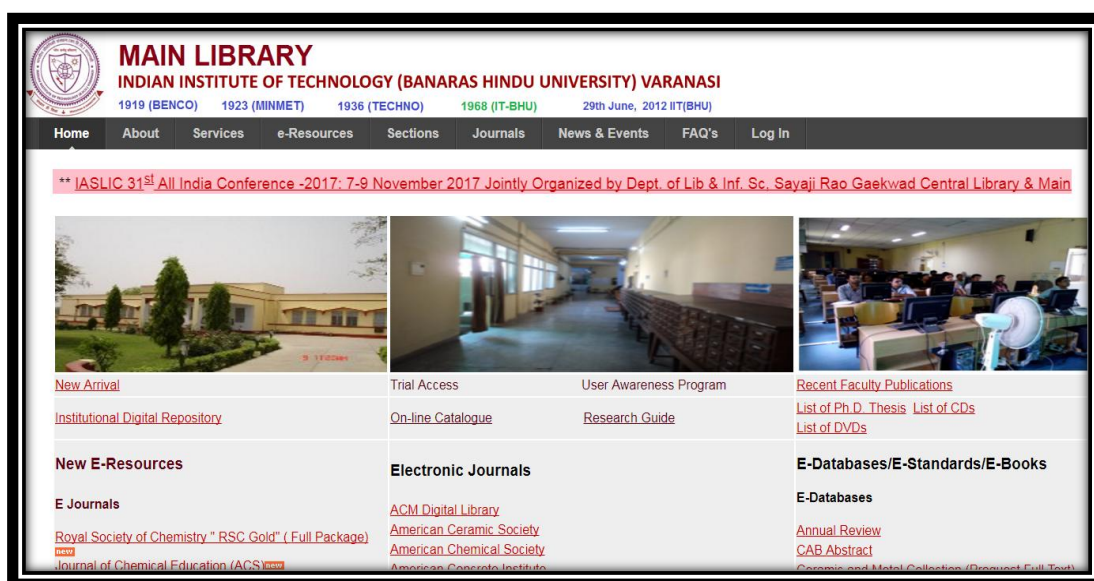
Name of the Library	Central Library, IIT Mandi
Establishment year of Library	2010
Name of the Librarian/Library In-charge	Naresh Singh Bhandari
Total Registered Users of the Library	850
Total Sitting Capacity for the Users	50
Contact No.	01905-267059

4.18 Indian Institute of Technology (BHU) Varanasi (IITBHU)

Indian Institute of Technology (BHU) Varanasi (IITBHU) was established in 2012. It is functioning from Banaras Hindu University (BHU), Varanasi which has 13 departments and three inter-disciplinary schools. Total numbers of students in IIT BHU are 6000 (IIT BHU, 2017).

4.18.1 Main Library, Indian Institute of Technology (BHU)

Image: 4.17 Main Library, Indian Institute of Technology (BHU)



Source: <http://www.iitbhu.ac.in/library/>

Main Library of IIT (BHU) is very rich in collection and it provides print as well as e-resources to their users. Library provides Wi-Fi enabled sections to the users. There is 2 servers and 4 UPS of 30KVA capacity and 40 KVA. 35 colour CCTV cameras are installed and there is 2 coloured monitor for security purpose. The library provides 114275 print books and 500000 e-books for users. It also provides 35 print periodicals, 14000 electronics periodicals, 17738 bound volumes. For the research scholars and students library provides 269 theses/dissertations. It also provides 13 full text and bibliographic databases and 8000 patents/standards.

4.18.2 Brief Detail about Main Library IIT (BHU)

Name of the Library	Main Library IIT (BHU)
Establishment year of Library	2012
Name of the Librarian/Library In-charge	Dr. Navin Upadhyay
Total Registered Users of the Library	6000
Total Sitting Capacity for the Users	200
Contact No.	0979466233

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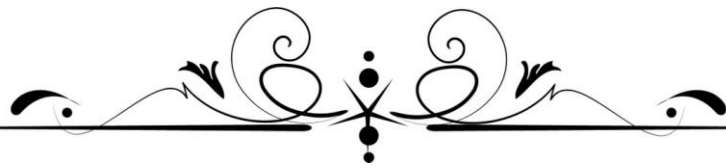
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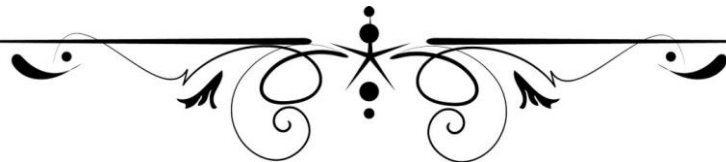
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Chapter- 5
Analysis and Interpretation of
Data



CHAPTER- 5

ANALYSIS AND INTERPRETATION OF DATA

This chapter presents the data analysis and interpretation. The data was collected through questionnaires as a questionnaire survey and observation method. To understand the objective of the study, data was collected from librarians and the users of the libraries of Indian Institutes of Technology (IITs) on various aspects of information communication technology applications. Librarian's questionnaire was prepared to find the information regarding ICT based practices in the library, available ICT Infrastructures, use of social networking sites and problems and issues in the implementation of ICT applications in the libraries. User's questionnaire was designed to identify the broadly the use, satisfaction, opinion and problem faced while using ICT based services in the library.

Following sections have been covered in the librarian questionnaire-

- Personal Profile
- General Information about the Library
- ICT Based Practices in Library
- IT Infrastructures
- Social Networking Sites
- Problems and Issues in the Implementation of ICT

After collecting data, it was analysed using MS Word, Excel and tables and graphs have been created to summarize the data. The data is presented in the following two sections:

5.1 Analysis of Data Collected from the Librarians of Indian Institutes of Technology
and

5.2 Analysis of Data Collected from the Users of the libraries of the Indian Institutes of Technology

5.1 Analysis of Data Collected from the Librarians of Indian Institutes of Technology

Section 1: Personal Profile of Librarians/Library In-charge

5.1.1 Distribution of Questionnaire

Table 5.1.1 shows that there are 7 old IITs, 9 new IITs and total are 16 where one questionnaire were distributed to each librarian or library in-charge of central library of Indian Institute of Technology (IITs). Sixteen out of sixteen were received from there. It means that 100% responses were received from the in-charge of the central library or Librarians or Deputy Librarian or Assistant Librarian etc.

Table: 5.1.1 Distribution of Questionnaire

Indian Institutes of Technology		Questionnaire Distributed	Questionnaire Received	Percentage (%)
Old IITs (N=7)	IITKGP	1	1	100%
	IITB	1	1	100%
	IITM	1	1	100%
	IITK	1	1	100%
	IITD	1	1	100%
	IITG	1	1	100%
	IITR	1	1	100%
Total		7	7	100.00
New IITs (N=9)	IITP	1	1	100%
	IITH	1	1	100%
	IITGN	1	1	100%
	IITBBS	1	1	100%
	IITRPR	1	1	100%
	IITJ	1	1	100%
	IITI	1	1	100%
	IIT Mandi	1	1	100%
	IITBHU	1	1	100%
Total		9	9	100.00

5.1.2 Designation of Respondents

Designation of respondent is tabulated in the below table where in old Indian Institutes of Technology, 3 respondents are Librarians (L), one is Deputy Librarian (DL) and 3 are Assistant Librarians (AL). In new Indian Institutes of Technology, 1 respondent is Librarian (L) only, 5 respondents are Deputy Librarian (DL), 1 respondent is Assistant Librarian (AL) and 2 respondents are Senior Library Information Assistant (SLIA).

Table: 5.1.2 Designation of Respondents

Indian Institutes of Technology		Librarian	DL	AL	SLIA
Old IITs (N=7)	IITKGP	√	-	-	-
	IITB	-	-	√	-
	IITM	-	-	√	-
	IITK	-	-	√	-
	IITD	-	√	-	-
	IITG	√	-	-	-
	IITR	√	-	-	-
Total		3 (42.86)	1 (14.28)	3 (42.86)	-
New IITs (N=9)	IITP	-	-	-	√
	IITH	-	-	√	-
	IITGN	√	-	-	-
	IITBBS	-	√	-	-
	IITRPR	-	√	-	-
	IITJ	-	-	-	√
	IITI	-	√	-	-
	IIT Mandi	-	√	-	-
	IITBHU	-	√	-	-
Total		1 (11.11)	5 (55.56)	1 (11.11)	2 (22.22)

(Figures with in parenthesis are percentage)

It is seen that the overall designation of respondents from 16 central libraries, most (37.50%) of respondents are Deputy Librarian, 4 (25%) respondents are Librarian and 4 (25%) respondents are Assistant Librarian while 2 (12.50%) respondents are Senior Library Information Assistant.

5.1.3 Gender wise Respondents

It is explored from the table 5.1.3 that all the respondents of central libraries of old Indian Institutes of Technology are male and in new Indian Institutes of Technology (IITs), 8 respondents are male while one is female. It means that the all the respondents (Librarians or Deputy Librarian or Assistant Librarian or Senior Library Information Assistant.) of central libraries of IITs are male except one from new IITs (IIT Indore).

Table: 5.1.3 Gender wise Respondents

Indian Institutes of Technology		Male	Female
Old IITs (N=7)	IITKGP	√	-
	IITB	√	-
	IITM	√	-
	IITK	√	-
	IITD	√	-
	IITG	√	-
	IITR	√	-
Total		7 (100)	-
New IITs (N=9)	IITP	√	-
	IITH	√	-
	IITGN	√	-
	IITBBS	√	-
	IITRPR	√	-
	IITJ	√	-
	IITI	-	√
	IIT Mandi	√	-
	IITBHU	√	-
Total		8 (88.89)	1 (11.11)

(Figures with in parenthesis are percentage)

It is seen that overall respondents gender in which majority 15 (93.75%) out 16 are male and only one (6.25%) is female. So we can say that male respondents are dominating over female.

5.1.4 Age wise Respondents

It is observed from the table no 5.1.4 that in the old IITs, 5 respondents are more than 40 years old IITs (IIT Kharagpur, IIT Bombay, IIT Kanpur, IIT Guwahati and IIT Roorkee).

Table: 5.1.4 Age wise Respondents

Indian Institutes of Technology		26-30	31-35	36-40	> 40
Old IITs (N=7)	IITKGP	-	-	-	√
	IITB	-	-	-	√
	IITM (NR)	-	-	-	-
	IITK	-	-	-	√
	IITD (NR)	-	-	-	-
	IITG	-	-	-	√
	IITR	-	-	-	√
Total		-	-	-	5 (71.43)
New IITs (N=9)	IITP	√	-	-	-
	IITH	-	-	√	-
	IITGN	-	-	-	√
	IITBBS	-	-	-	√
	IITRPR	-	-	-	√
	IITJ	-	√	-	-
	IITI	-	-	-	√
	IIT Mandi	-	-	√	-
	IITBHU	-	-	√	-
Total		1(11.11)	1 (11.11)	3 (33.33)	4 (44.44)

(Figures with in parenthesis are percentage)

In new IITs, 4 respondents (IIT Gandhinagar, IIT Bhubaneswar, IIT Ropar and IIT Indore) are more than 40 years old, 3 respondents (IIT Hyderabad, IIT Mandi and IIT BHU) are 36-40 years old and 1 respondent (IIT Jodhpur) is 31-35 years old and 1 respondent (IIT Patna) is 26- 31 years old.

5.1.5 Educational Qualification of Respondents

It is observed from table number 5.1.5 that 5 (71.43%) respondents (IIT Kharagpur, IIT Madras, IIT Delhi, IIT Roorkee and IIT Guwahati) are PhD and 1 (14.28%) respondent (IIT Kanpur) is post graduate.

Table: 5.1.5 Educational Qualification of Respondents

Indian Institutes of Technology		Post Graduate	M.Phil	Ph.D.
Old IITs (N=7)	IITKGP	-	-	√
	IITB (NR)	-	-	-
	IITM	-	-	√
	IITK	√	-	-
	IITD	-	-	√
	IITG	-	-	√
	IITR	-	-	√
Total		1 (14.28)	-	5 (71.43)
New IITs (N=9)	IITP	√	-	-
	IITH	-	-	√
	IITGN	-	-	√
	IITBBS	-	-	√
	IITRPR	-	-	√
	IITJ	√	-	-
	IITI	√	-	-
	IIT Mandi	-	√	-
	IITBHU	-	-	√
Total		3 (33.33)	1 (11.11)	5 (55.55)

(Figures with in parenthesis are percentage)

In new IITs, 5 (55.55%) respondents (IIT Hyderabad, IIT Gandhinagar, IIT Bhubaneswar, IIT Ropar and IIT BHU) are PhD, 3 (33.33%) are post graduate and 1 (11.11%) respondent (IIT Mandi) is M.Phil.

5.1.6 Professional Experience of Respondents

It is represented from the below table 5.1.6 which shows experience of respondents where 4 (57.14%) respondents (IIT Kharagpur, IIT Bombay, IIT Guwahati and IIT Roorkee) have 16-25 years' experience while 2 (28.57%) have more than 25 years' experience.

Table: 5.1.6 Professional Experience of Respondents in Years

Indian Institutes of Technology		<5	6-10	11-15	16-25	>25
Old IITs (N=7)	IITKGP	-	-	-	√	-
	IITB	-	-	-	√	-
	IITM (NR)	-	-	-	-	-
	IITK	-	-	-	-	√
	IITD (NR)	-	-	-	-	-
	IITG	-	-	-	√	-
	IITR	-	-	-	√	-
Total		-	-	-	4 (57.14)	2 (28.57)
New IITs (N=9)	IITP	-	√	-	-	-
	IITH	-	-	√	-	-
	IITGN	-	-	-	-	-
	IITBBS	-	-	-	√	-
	IITRPR	-	-	-	√	-
	IITJ	-	√	-	-	-
	IITI	-	-	-	√	-
	IIT Mandi	-	-	√	-	-
	IITBHU	-	-	√	-	-
Total		-	2 (22.22)	3 (33.33)	3 (33.33)	-

(Figures with in parenthesis are percentage)

In new IITs, 3 (33.33%) respondents (IIT Bhubaneswar, IIT Ropar and IIT Indore) have 16-25 years' experience while 3 (33.33%) have 11-15 year experience and 2 (22.22%) respondents (IIT Patna and IIT Jodhpur) have 6-10 years' experience.

Section 2: About the Library

5.1.7 Sitting Capacity for Users in the Libraries

The analysis of the tabulated data reveals that the sitting capacity for users in the library. In old IITs, IIT Kanpur has the highest (2000) number of chairs are available for sitting in the library followed by IIT Kharagpur (1500), IIT Delhi (800), IIT Madras (550), IIT Bombay and IIT Roorkee (500), IIT Guwahati (301).

Table: 5.1.7 Sitting Capacity for Users in the Libraries

Indian Institutes of Technology		Sitting Capacity of Users
Old IITs (N=7)	IITKGP	1500
	IITB	500
	IITM	550
	IITK	2000
	IITD	800
	IITG	301
	IITR	500
New IITs (N=9)	IITP	100
	IITH	50
	IITGN	100
	IITBBS	100
	IITRPR	130
	IITJ	60
	IITI	100
	IIT Mandi	50
	IITBHU	200

In new IITs, IIT BHU is providing 200 chairs for sitting to the users of the library followed by IIT Ropar (130), IIT Patna, IIT Gandhinagar, IIT Bhubaneswar and IIT Indore (100), IIT Jodhpur (60), IIT Mnadi and IIT Hyderabad (50).

5.1.8 Registered Users of the Libraries

It is observed from the table 5.1.8 that in old IITs, IIT Bombay has the maximum (16791) number of registered students followed by IIT Kharagpur and IIT Madras (12000), IIT Delhi (10000), IIT Roorkee (8000), IIT Guwahati (7892) and IIT Kanpur (6000).

Table: 5.1.8 Total Numbers of Registered Users

Indian Institutes of Technology		Total Numbers of Registered Users
Old IITs (N=7)	IITKGP	12000
	IITB	16791
	IITM	12000
	IITK	6000
	IITD	10000
	IITG	7892
	IITR	8000
New IITs (N=9)	IITP	1000
	IITH	2000
	IITGN	1400
	IITBBS	1000
	IITRPR	600
	IITJ	900
	IITI	1340
	IIT Mandi	850
	IITBHU	6000

In new IITs, IIT BHU has the highest (6000) number of students followed by IIT Hyderabad (2000), IIT Gandhinagar (1400), IIT Indore (1340), IIT Patna and IIT Bhubaneswar (1000), IIT Jodhpur (900), IIT Mandi (850) and in IIT Ropar, there is 600 registered students only.

5.1.9 Library Collection

Libraries provide various type of collection and resources like e-journals, e-books, and electronic databases etc. which help to develop reading skills of the students. Library also provides print books, print periodicals, theses/standards, full text and bibliographic databases etc. Analysis of the collection of the central libraries are represented in the table 5.1.9.

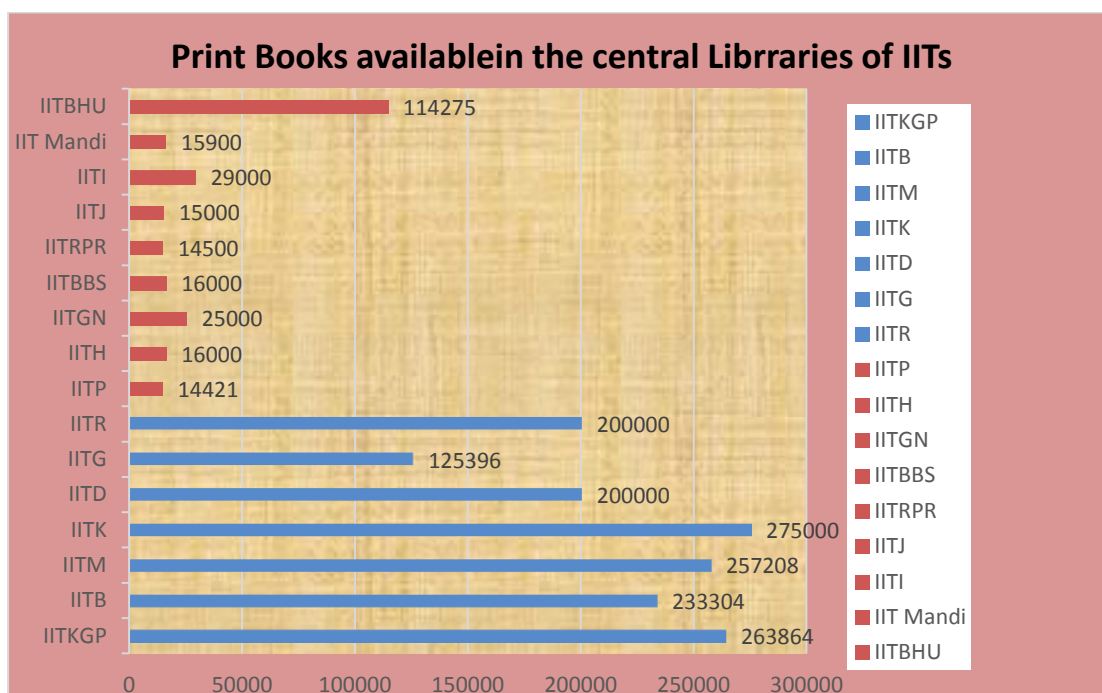
Table: 5.1.9 Library Collection

Purpose	Old IITs (N=9)							New IITs (N=9)								
	IIT KGP	IIT B	IITM	IITK	IIT D	IITG	IITR	IITP	IITH	IITG N	IIT BBS	IIT RPR	IITJ	IITI	IIT Mandi	IIT BHU
Print Books	263864	233304	257208	275000	200000	125396	200000	14421	16000	25000	16000	14500	15000	29000	15900	114275
E-books	100000	5120	6117	16000	-	-	35000	-	-	1	2000	500	50	728	11400	500000
CD-ROM Books	-	1370	356	2000	-	5801	-	-	100	1477	-	750	500	-	-	-
Print Periodicals	80	96	30	-	-	90	91	-	-	132	26	15	-	3	5	35
Electronic Periodicals	25262	20029	704	-	-	24100	15140	-	36	-	8500	7000	-	6000	237	14000
Bound Volumes	132916	119265	113919	280000	100000	35505	60000	-	2284	-	-	-	100	-	28	17738
Theses/ Dissertations	5697	37154	6689	17000	6000	1510	15000	200	-	187	-	50	-	218	-	269
Patents/ Standards	-	67835	1199	3000	-	524	5	-	4	1707	-	-	-	405	-	80000
Full Text	58	200	10	-	50	-	-	4	-	50	46	-	32	17	15	13
Bibliographic	03	07	14	-	8	-	-	-	-	10	4	3	4	5	4	

5.1.9.1. Print Books

Figure 5.1.9.1 reveals the print books available in the central libraries of IITs where in old IITs, highest (275000) number of books are provided by IIT Kanpur, 263864 provided by IIT Kharagpur, 257208 by IIT Madras, 233304 by IIT Bombay, 200000 number of books are provided by IIT Delhi and IIT Roorkee while lowest (125396) print books are provided by IIT Guwahati.

Figure: 5.1.9.1. Print Books available in the Central Libraries of IITs

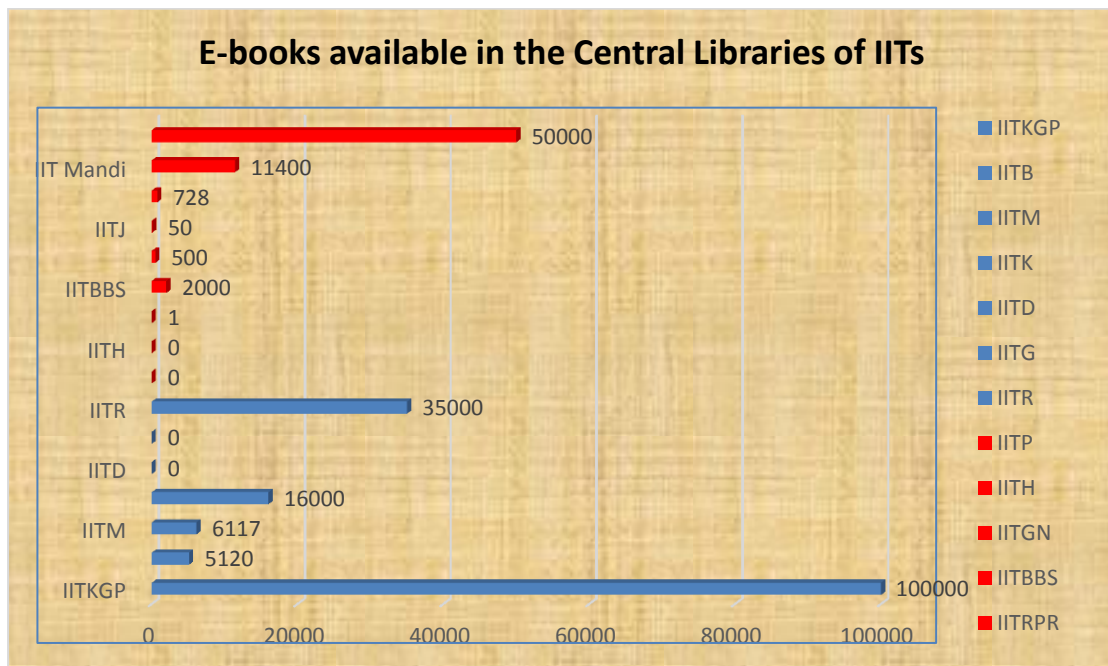


In new IITs, highest (114275) number of prints books are provided by IIT BHU followed by IIT Indore (29000), IIT Gandhinagar (25000), IIT Bhubaneswar and IIT Hyderabad (16000), IIT Mandi (15900), IIT Jodhpur (15000), IIT Ropar (14500) and lowest (14421) prints books are provided by IIT Patna.

5.1.9.2 E-books

It is observed from figure 5.1.9.2 that in old IITs, highest (100000) e-books are provided by IIT Kharagpur, followed by IIT Roorkee (35000), IIT Kanpur (16000), IIT Madras (6117), lowest (5120) e-books are provided by IIT Bombay.

Figure: 5.1.9.2 E-books available in the Central Libraries of IITs

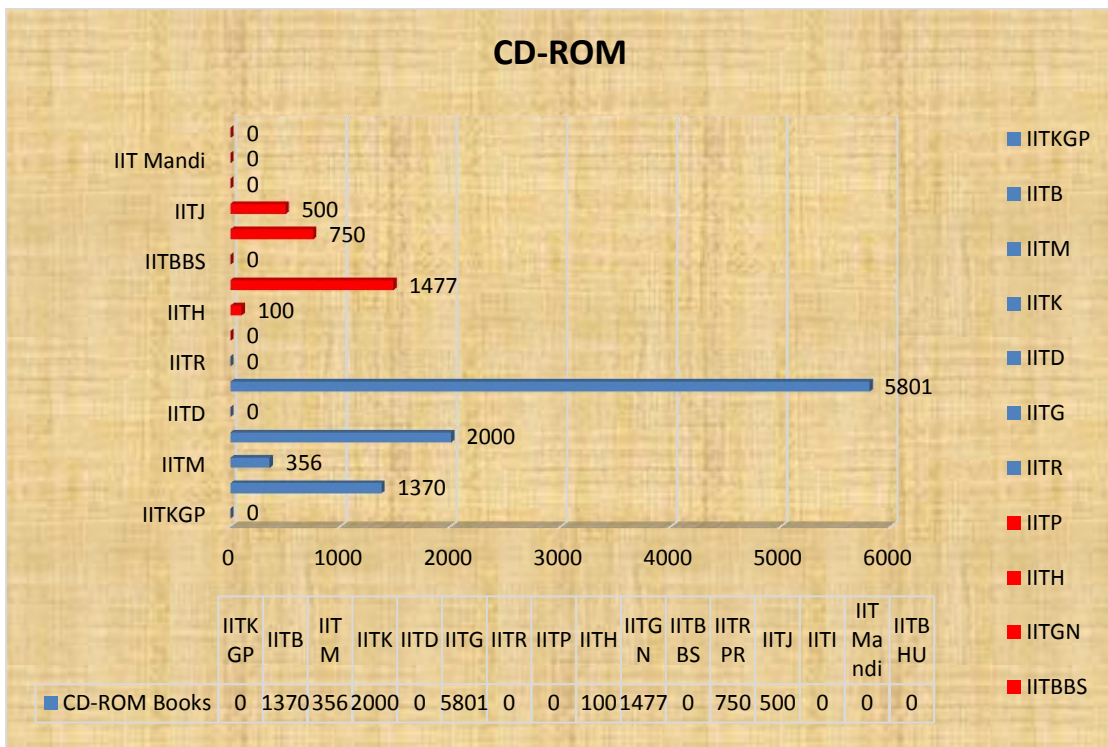


In new IITs, highest (50000) e-books are provided by IIT BHU followed by IIT Mandi (11400), IIT Bhubaneswar (2000), IIT Indore (728), IIT Ropar (500), IIT Jodhpur (50).

5.1.9.3 CD-ROM

It is analysed from figure 5.1.9.3 that in old IITs, highest (5801) CD-ROM are provided by IIT Guwahati followed by IIT Kanpur (2000), IIT Bombay (1370), IIT Madras (356).

Figure: 5.1.9.3 CD-ROM available in the Central Libraries

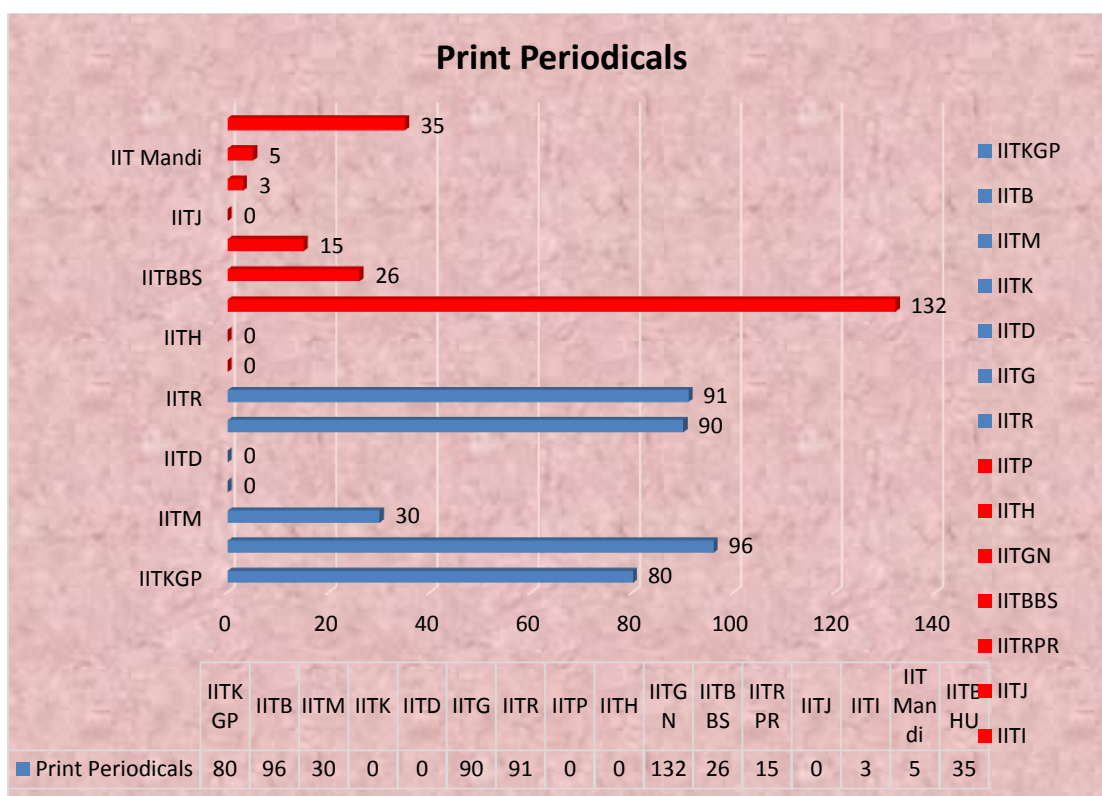


In new IITs, highest (1477) CD-ROM are provided by IIT Gandhinagar followed by IIT Ropar (750), IIT Jodhpur (500) and IIT Hyderabad, IIT Patna, IIT Bhubaneswar, IIT Indore, IIT Mandi and IIT BHU did not respond to it.

5.1.9.4 Print Periodicals

It is depicted from the figure 5.1.9.4 that in old IITs, highest (96) number of print periodicals are provided by IIT Bombay followed by IIT Roorkee (91), IIT Guwahati (90), IIT Kharagpur (80) and IIT Madras (30).

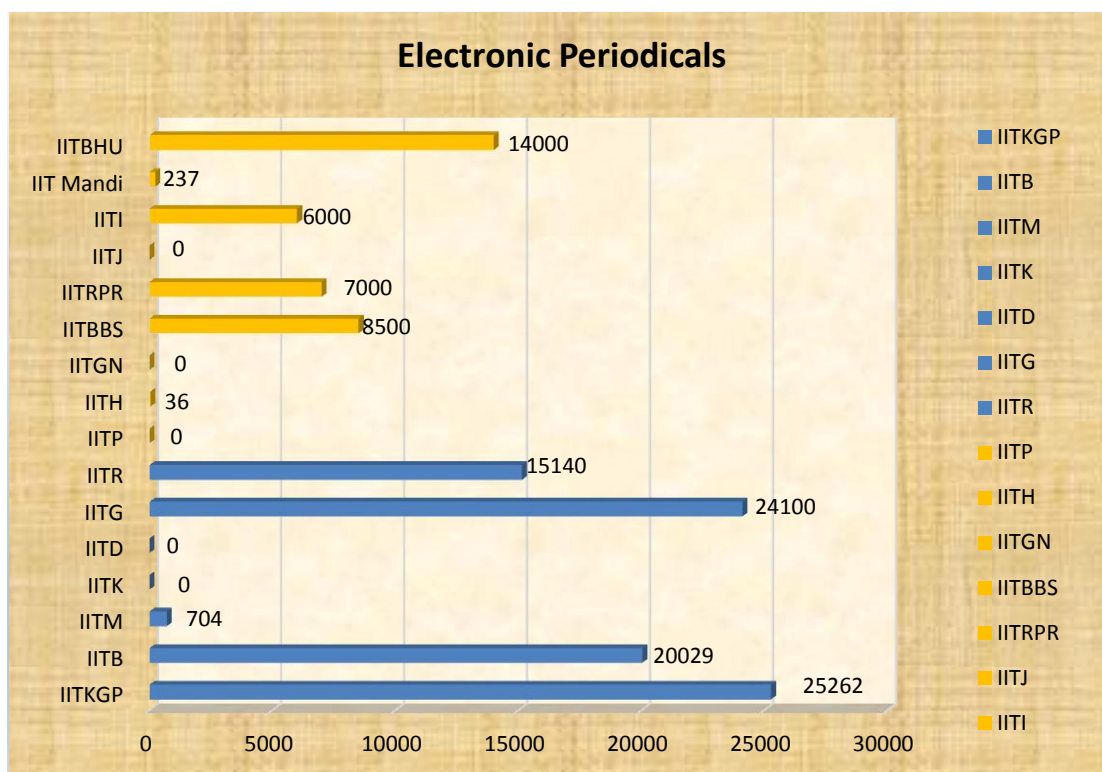
Figure: 5.1.9.4 Print Periodicals available in the Central Libraries



In new IITs, highest (132) print periodicals are provided by IIT Gandhinagar followed by IIT BHU (35), IIT Bhubaneswar (26), IIT Ropar (15), IIT Mnadi (5), IIT Indore (3), while IIT Patna, IIT Hyderabad, IIT Jodhpur did not give response to it.

5.1.9.5 Electronic Periodicals

Figure 5.1.9.5 shows that available electronic periodicals in central libraries of IITs. In old IITs, IIT Kharagpur has 25262 electronic periodicals followed by IIT Guwahati (24100), IIT Bombay (20029) and IIT Madras (704) whereas IIT Delhi and IIT Kanpur did not respond to it.

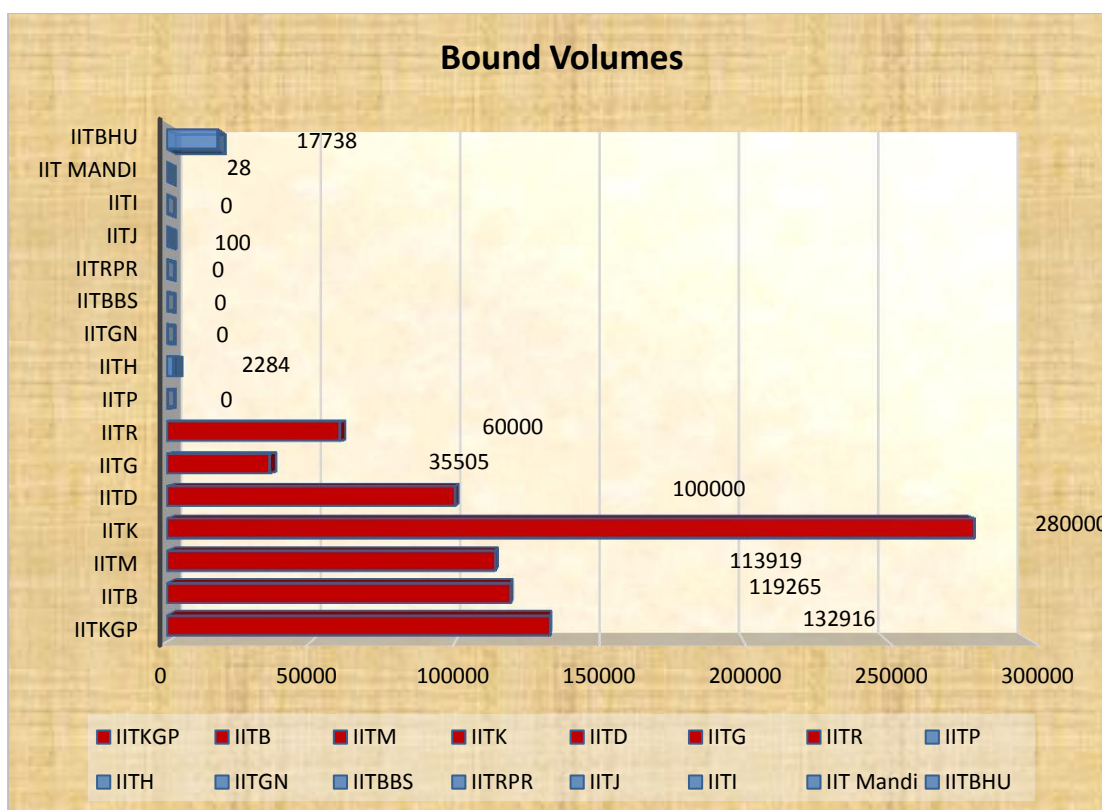
Figure: 5.1.9.5 Electronic Periodicals available in the Central Libraries of IITs

In new IITs, highest (14000) electronic periodicals are provided by IIT BHU followed by IIT Bhubaneswar (8500), IIT Ropar (7000), IIT Indore (6000), IIT Mnadi (237) and lowest (36) are provided by IIT Hyderabad. IIT Patna, IIT Gandhinagar, IIT Jodhpur did not respond to it.

5.1.9.6 Bound Volumes

It is seen from the below figure, in old IITs, IIT Kanpur has 28000 bound volumes followed by IIT Kharagpur (132916), IIT Bombay (119265), IIT Madras (113919), IIT Delhi (100000), IIT Roorkee (60000) and lowest no. of bound volumes are provided by IIT Guwahati i.e. 35505.

Figure: 5.1.9.6 Bound Volumes available in the Central Libraries of IITs

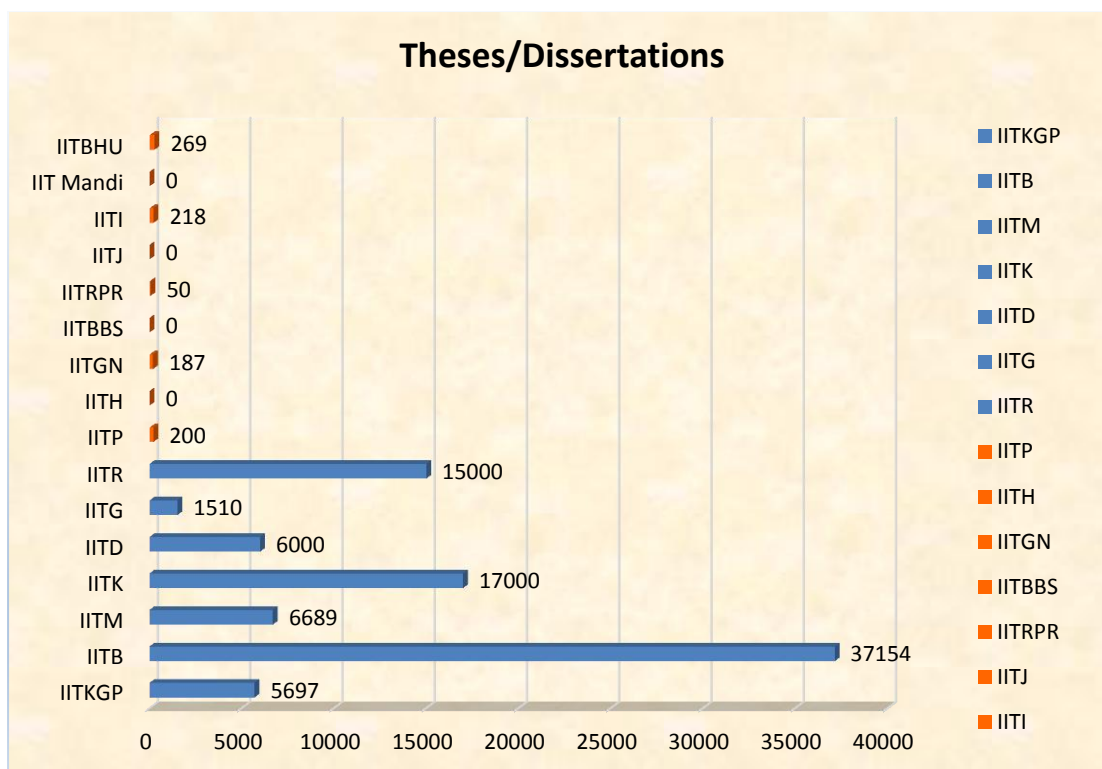


In new IITs, highest (17738) bound volumes are provided by IIT BHU, followed by IIT Hyderabad (2284), IIT Jodhpur (100) and lowest bound volume has been provided by IIT Mnadi i.e. 28 and IIT Patna, IIT Bhubaneswar, IIT Ropar, IIT Indore, IIT Gandhinagar did not respond to it.

5.1.9.7 Theses/Dissertations

It is explored from the below figure that in old IITs, IIT Bombay has highest (37154) number of theses/dissertations followed by IIT Kanpur (17000), IIT Roorkee (15000), IIT Madras (6689), IIT Delhi (6000), IIT Kharagpur (5697) and lowest (1510) in IIT Guwahati.

Figure: 5.1.9.7 Theses/Dissertations available in the Central Libraries of IITs

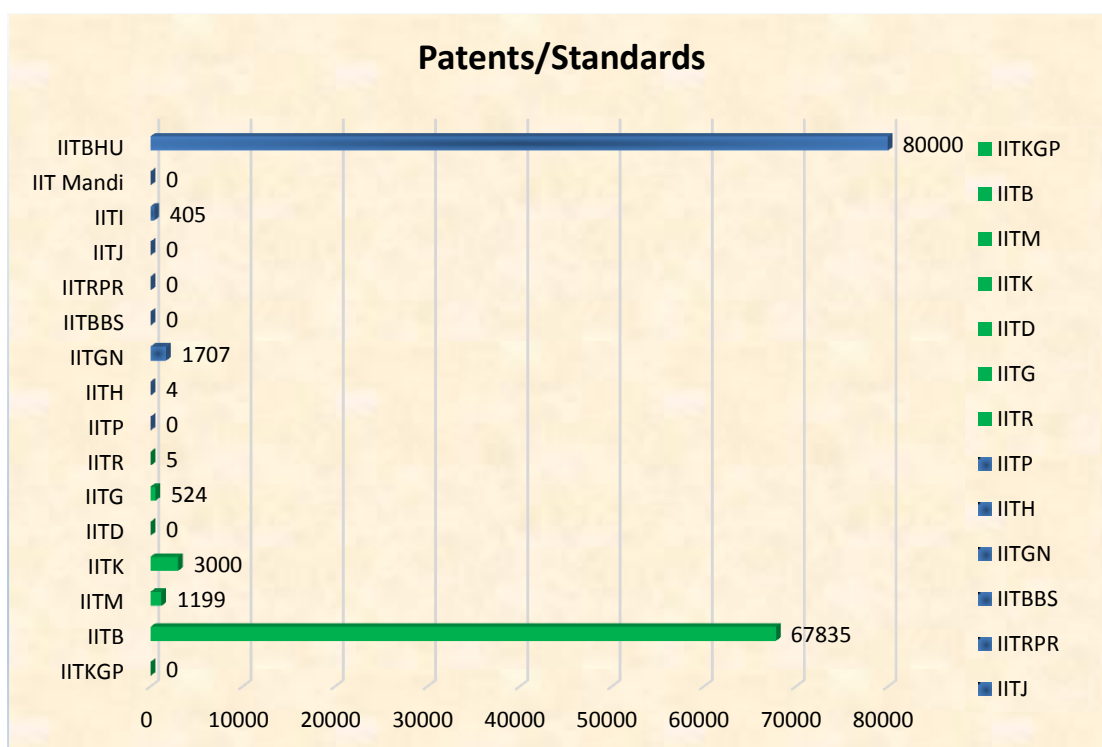


In new IITs, IIT BHU has highest (269) number of theses/dissertations followed by IIT Indore (218), IIT Patna (200), IIT Gandhinagar (187), and lowest (50) available in IIT Ropar. IIT Hyderabad, IIT Bhubaneswar, IIT Jodhpur, IIT Mandi did not respond to it.

5.1.9.8 Standards/Patents

It is observed from figure no. 5.1.8.8 that the Standards/Patents available in the Central Libraries of IITs where in old IITs, IIT Bombay has the highest (67835) number of Standards/Patents followed by IIT Kanpur (3000), IIT Madras (1199), IIT Guwahati (524), IIT Roorkee (5) and IIT Kharagpur, IIT Delhi, did not give response of it.

Figure: 5.1.9.8 Standards/Patents available in the Central Libraries of IITs

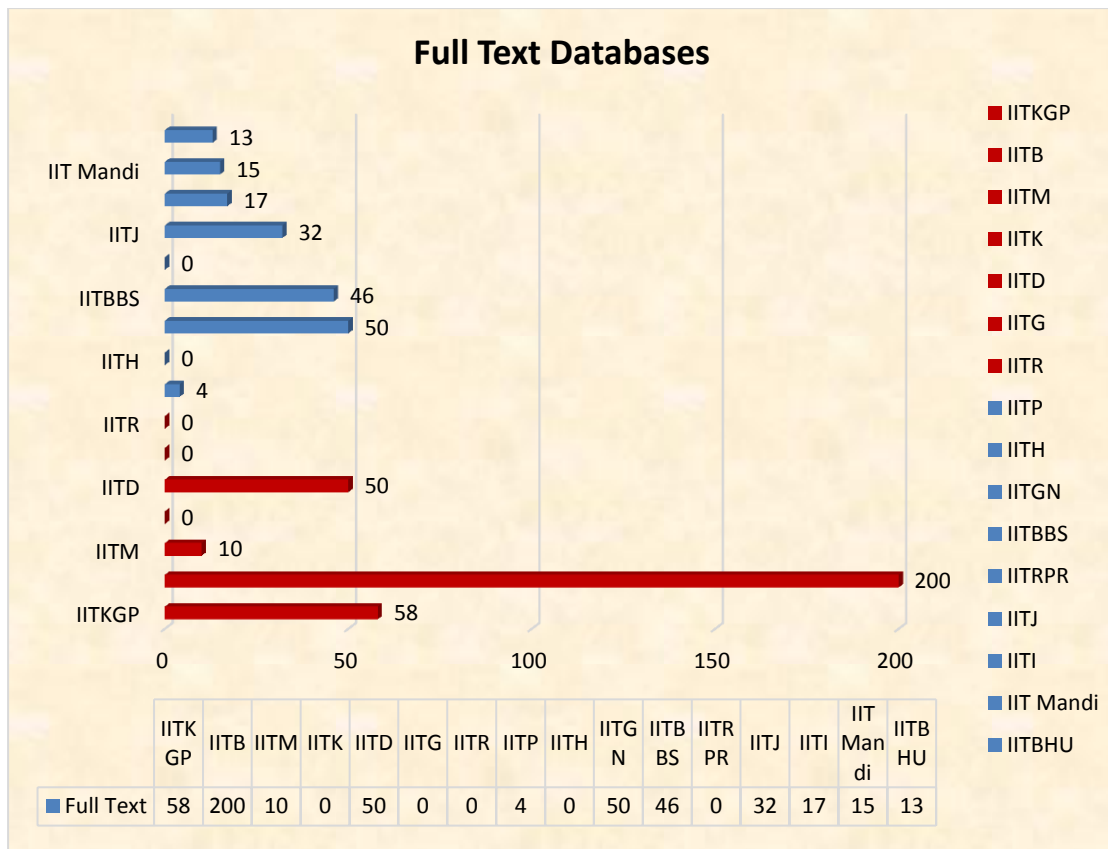


In new IITs, IIT BHU library has the highest (80000) Standards/Patents followed by IIT Gandhinagar (1707), IIT Indore (405), IIT Hyderabad (4) while IIT Patna, IIT Bhubaneswar, IIT Ropar, IIT Jodhpur, IIT Mandi did not give response of it.

5.1.9.9 Full Text Databases

It is seen from figure no. 5.1.9.9 that in old IITs, IIT Bombay has 200 full text databases available in the central library followed by IIT Kharagpur (58), IIT Delhi (50), IIT Madras (10) and IIT Kharagpur, IIT Roorkee, IIT Guwahati did not give response of it.

Figure: 5.1.9.9 Full Text Databases available in the Central Libraries of IITs

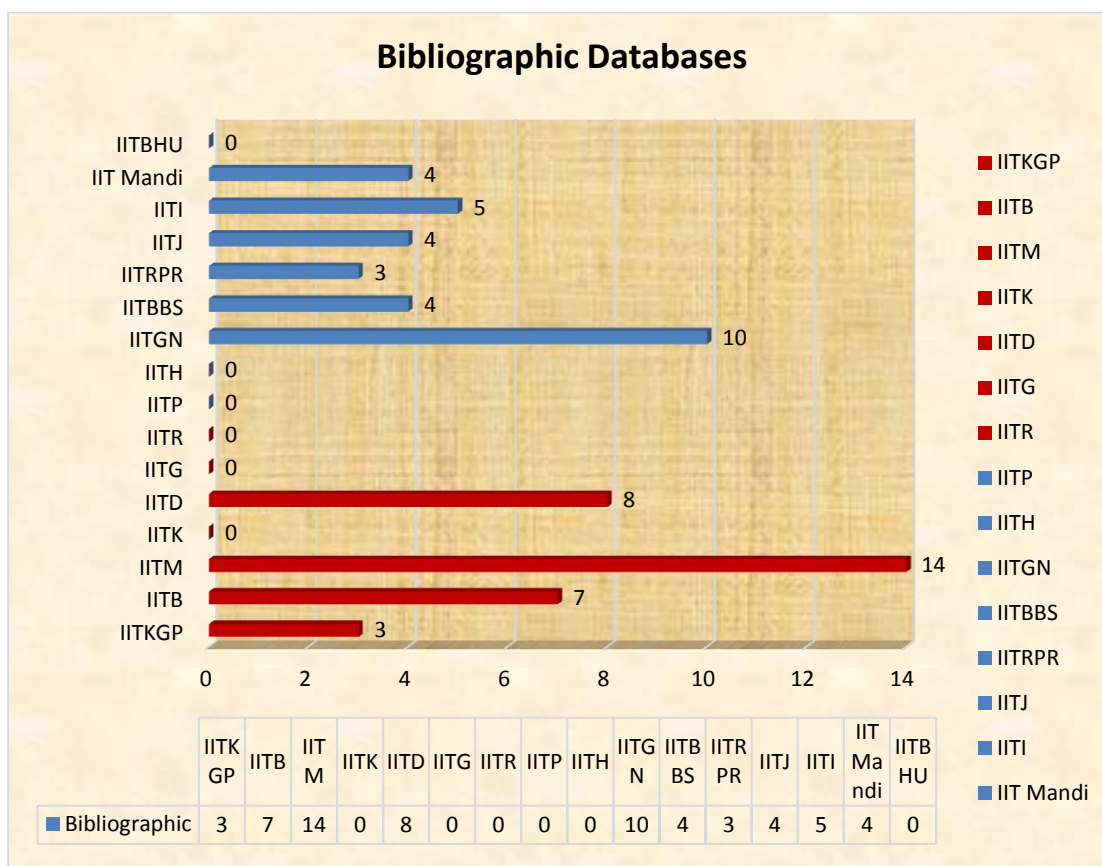


In new IITs, highest (50) number of full text databases available in the central library of IIT Gandhinagar followed by IIT Bhubaneswar (46), IIT Jodhpur (32), IIT Indore (17), IIT Mandi (15), IIT BHU (13).

5.1.9.10 Bibliographic Databases

It is found from below figure, in old IITs, highest (14) bibliographic databases are provided by IIT Madras followed by IIT Delhi (8), IIT Bombay (7), IIT Kharagpur (3), while IIT Guwahati, IIT Roorkee, IIT Kanpur did not give response of it.

Figure: 5.1.9.10 Bibliographic Databases available in the Central Libraries of IITs



In new IITs, highest (10) bibliographic databases are provided by IIT Gandhinagar followed by IIT Indore (5), IIT Bhubaneswar, IIT Mandi, IIT Jodhpur are provided (4) and 3 bibliographic database are provided by IIT Ropar. IIT Patna, IIT Hyderabad, IITBHU did not give response of it.

5.1.10 Library Personnel

Table 5.1.10 shows that the details of library staff where in old IITs, four are the librarians, seven are the deputy librarians, twenty one are the assistant librarians, nine are the Junior Library Information Officer, twenty are the Senior Library Information Officer, Seven are the Junior Library Information Officer, twenty three are the Senior library Information Assistant, fourteen are the Assistant Library Information Officer, forty six are the Graduate Trainees and seventeen are the other library staff.

Table: 5.1.10 Details of Library Personnel

IITs	L	DL	AL	JLIO	SLIO	LIO	SLIA	ALIO	GT	Other	
Old IITs (N=7)	IITKGP	1	1	6	-	1	-	3	-	10	13
	IITB	-	-	3	-	-	2	9	-	-	-
	IITM	1		2	-	-	-	3	2	6	-
	IITK		1	2	5	13	3	-		10	-
	IITD		2	3	-	-	-	3	2	11	4
	IITG	1	1	2	-	6	2	5		6	-
	IITR	1	2	3	4	-	-	-	10	3	-
Total	4	7	21	9	20	7	23	14	46	17	
New IITs (N=9)	IITP	-	-	1	-	-	-	-	-	1	7
	IITH	-	-	1	-	-	-	-	-	1	-
	IITGN	1	-		-	-	-	3	-	5	-
	IITBBS	-	1	1	-	-		2	-	4	-
	IITRPR	-	1	-	-	-	1	2	-	-	-
	IITJ	-	1	-	-	-	-	3	-	-	1
	IITI	-	1	1	-	-	-	4	-	3	-
	IIT Mandi	-	1		-	-	-	4	-	2	1
	IITBHU	-	-	1	-	10	-	-	2	5	-
Total	1	5	5		10	1	18	2	21	9	

In new IITs, only one is the librarian, 5 are the deputy librarians and assistant librarians, ten are the Senior Library Information Officer, one is the Library Information Officer, Eight are the Senior Library Information Assistant, two are the Assistant Library Information Officer, twenty one are the Graduate Trainees and nine are the other library staff such as skilled, semi-skilled etc.

Section 3: ICT Based Practices in Library

5.1.11 ICT based best practices

Central libraries of IITs are ICT based service oriented and these are known by their services. The most important changes are the acceptance of information communication technology for providing library services. These services are used by

the users of the library. Analysis of the ICT based best practices are represented in the table 5.1.11.

Table: 5.1.11 ICT based best practices in the Libraries

Indian Institutes of Technology		E-mail Alerts	E-Referencing	Online SMS/Instant Messaging	SMS Services
Old IITs (N=7)	IITKGP	√	√	-	-
	IITB	√	-	-	√
	IITM	√	√	-	-
	IITK	√	-	-	-
	IITD	√	√	√	-
	IITG	√	√	√	√
	IITR	√	-	√	√
Total		7 (100)	4 (57.14)	3 (42.86)	3 (42.86)
New IITs (N=9)	IITP	√	-	-	-
	IITH	√	-	√	-
	IITGN	√	√	√	√
	IITBBS	√	√	-	-
	IITRPR	√	√	-	-
	IITJ	√	√	-	-
	IITI	√	-	-	-
	IIT Mandi	√	-	√	√
	IITBHU	√	-	-	-
Total		9 (100)	4 (44.44)	3 (33.33)	2 (22.22)

(Figures with in parenthesis are percentage)

The analysis of the tabulated data reveals that the ICT based practices in central libraries of IITs. In old IITs, all the central libraries are using email alerts, 4 (57.14%) are using e-referencing, 3 (42.86%) are using instant messaging and only 2 (58.27%) libraries are using SMS services.

In new IITs, all the Central libraries are using email alerts, 4 (44.44%) are using e-referencing, 3 (33.33%) are using online SMS and instant messaging and only 2 (22.22%) libraries are using SMS services.

5.1.12 Listservs for Collection Development

Listsers send and receive the emails to the specific group which saves the time of the sender and receiver. The main purpose of using Listservs is to create a community where common interest topics are discussed and common goals are achieved. For the analysis of the Listservs for collection development, the data was collected and the same is presented in the following table.

Table: 5.1.12 Use of Listservs for Collection Development

Indian Institutes of Technology		Yes	No
Old IITs (N=7)	IITKGP	-	√
	IITB (NR)	-	-
	IITM (NR)	-	-
	IITK (NR)	-	-
	IITD	√	-
	IITG (NR)	-	-
	IITR	-	√
Total		1 (14.28)	2 (28.57)
New IITs (N=9)	IITP	-	√
	IITH	-	√
	IITGN	√	-
	IITBBS	√	-
	IITRPR	√	-
	IITJ	-	√
	IITI	-	√
	IIT Mandi	-	√
	IITBHU	-	√
Total		3 (33.33)	6 (66.67)

(Figures with in parenthesis are percentage)

Analysis of data in table 5.1.12 shows the use of Listservs for Collection Development in the central libraries of Indian Institutes of Technology in India. In old IITs, only IIT Delhi uses the Listservs for the collection development while IIT Kharagpur and IIT Roorkee don't use it and four IITs (IIT Bombay, IIT Madras, IIT Kanpur and IIT Guwahati) didn't give the response of this.

It is also highlighted from the table no. 5.1.12 that in new IITs, IIT Gandhinagar, IIT Bhubneswar and IIT Roapar use the Listserve for the collection

development while six IITs (IIT Patna, IIT Hyderabad, IIT Jodhpur, IIT Indore, IIT Mandi and IIT BHU) don't use it.

5.1.13 Automation in the Libraries

Automation is the process of handling the work with the help of machines. The process of automation is very important to save the time of users as well as library staff. For analysing automation in the library, data were collected and the same is represented in the following table.

Table: 5.1.13 Automation in the Libraries

Indian Institutes of Technology		Yes	No
Old IITs (N=7)	IITKGP	√	-
	IITB	√	-
	IITM	√	-
	IITK	√	-
	IITD	√	-
	IITG	√	-
	IITR	√	-
Total		7 (100)	-
New IITs (N=9)	IITP	√	-
	IITH	√	-
	IITGN	√	-
	IITBBS	√	-
	IITRPR	√	-
	IITJ	√	-
	IITI	√	-
	IIT Mandi	√	-
	IITBHU	√	-
Total		9 (100)	-

(Figures with in parenthesis are percentage)

It is highlighted from the analysis of the table 5.1.13 that all the central libraries of old and new Indian Institutes of Technology are automated.

5.1.13.1 Automated Acquisition System

Acquisition Systems means books/documents ordering systems. It is defined as the searching, selection, ordering and receiving all kind of documents in the library. For

analysing of the automated modules of acquisition system, data were collected and the same is presented in the following table.

Table: 5.1.13.1 Use of Automated Acquisition System

Indian Institutes of Technology		Acquisition				
		Recommendations	Processing	Ordering	Receiving	Other
Old IITs (N=7)	IITKGP	√	√	√	√	-
	IITB	√	√	√	√	Book exhibition
	IITM	√	√	√	√	-
	IITK	√	√	√	√	Sending pamphlets
	IITD	√	√	√	√	-
	IITG	-	√	√	√	-
	IITR	√	√	√	√	-
Total		6 (85.71)	7 (100)	7 (100)	7 (100)	2 (28.57)
New IITs (N=9)	IITP	-	-	-	-	-
	IITH	-	-	-	-	-
	IITGN	√	√	√	√	-
	IITBBS	√	√	√	√	-
	IITRPR	-	√	-	-	-
	IITJ	√	√	√	√	-
	IITI	-	-	-	-	-
	IIT Mandi	√	√	√	√	-
	IITBHU	-	-	-	-	-
Total		4 (44.44)	5 (55.55)	4 (44.44)	4 (44.44)	-

(Figures with in parenthesis are percentage)

Analysis of the above table shows that the libraries are using automated modules where in old IITs, all the libraries (IIT Kharagpur, IIT Bombay, IIT Madras, IIT Kanpur, IIT Delhi, IIT Guwahati and IIT Roorkee) are performing processing, ordering and receiving of documents while six central libraries of old IITs (IIT Kharagpur, IIT Bombay, IIT Kanpur, IIT Delhi and IIT Roorkee) perform recommendation of documents and only two libraries (IIT Bombay and IIT Kanpur) perform other type of things like book exhibitions and sending pamphlets to vendors.

In new IITs, five Central Libraries (IIT Gandhinagar, IIT Bhubaneshwar, IIT Ropar, IIT Jodhpur and IIT Mandi) are performing recommendations while four central libraries (IIT Gandhinagar, IIT Bhubaneshwar, IIT Jodhpur and IIT Mandi) perform recommendations, ordering and receiving. And only IIT Ropar perform the processing.

5.1.13.2 Automated Circulation System

There are many activities which are involved in circulation system such as preparation of description file for all circulation items, preparation of membership file, charging and discharging of documents, calculation of fine, calculation and printing of various types of statistical reports etc. For analysing automated modules of circulation section, data were collected and the same is presented in the following table.

Table: 5.1.13.2 Use of Automated Circulation System

Indian Institutes of Technology		Circulation				
		Issue Return	Reservation	Fine Collection	Membership Procedure	Overdue Notice
Old IITs (N=7)	IITKGP	√	√	√	√	√
	IITB	√	√	√	√	√
	IITM	√	√	√	√	√
	IITK	√	√	√	√	√
	IITD	√	√	√	√	√
	IITG	√	-	√	√	√
	IITR	√	√	√	√	√
Total		7 (100)	6 (85.71)	7 (100)	7 (100)	7 (100)
New IITs (N=9)	IITP	√	-	√	-	√
	IITH	√	√	-	-	√
	IITGN	√	√	√	√	√
	IITBBS	√	√	√	√	√
	IITRPR	√	√	√	-	√
	IITJ	√	√	√	√	√
	IITI	√	√	√	-	√
	IIT Mandi	√	√	√	√	√
	IITBHU	√	-	√	-	√
Total		9 (100)	7 (77.78)	8 (88.89)	4 (44.44)	9 (100)

(Figures with in parenthesis are percentage)

It is explored from the above table that the libraries are using automated modules for circulation system. In old IITs, all the libraries (IIT Kharagpur, IIT Bombay, IIT Madras, IIT Kanpur, IIT Delhi, IIT Guwahati and IIT Roorkee) are using issue return, fine collection, membership procedure and overdue notice whereas six central libraries of IITs (IIT Kharagpur, IIT Bombay, IIT Madras, IIT Kanpur, IIT Delhi, IIT Guwahati and IIT Roorkee) are using for reservation of the documents.

In new IITs, all the central libraries (IIT Kharagpur, IIT Bombay, IIT Madras, IIT Kanpur, IIT Delhi, IIT Guwahati and IIT Roorkee) are using issue and return, overdue notice service while 8 (88.89%) central libraries are using fine collection, 7 (77.78%) are using reservation and only 4 (44.44%) central libraries are using membership procedure.

5.1.13.3 Automated Cataloguing System

There are many computerized cataloguing activities such as preparation of main entry, preparation of added entry, preparation of authority file and preparation of index files etc. Analysis of the automated modules of cataloguing system are represented in the following table.

Table: 5.1.13.3 Use of Automated Cataloguing System

Indian Institutes of Technology		Cataloguing				
		Entry through Books	Entry Through cards	Through Accession Register	Direct Recommendations	Direct through forms
Old IITs (N=7)	IITKGP	√	-	√	√	√
	IITB	√	√	√	-	-
	IITM	-	-	-	-	-
	IITK	√	-	-	-	-
	IITD	√	√	√	√	√
	IITG	√	-	-	-	-
	IITR	√	-	-	-	-
Total		6 (85.71)	2 (28.57)	3 (42.86)	2 (28.57)	2 (28.57)
New IITs (N=9)	IITP	√	-	√	-	-
	IITH	-	-	-	-	-
	IITGN	√	√	√	√	-
	IITBBS	√	-	√	√	√
	IITRPR	√	-	-	-	-
	IITJ	√	-	√	-	-
	IITI	√	-	-	-	-
	IIT Mandi	√	-	-	-	-
	IITBHU	√	-	√	-	-
	Total		8 (88.89)	1 (11.11)	5 (55.55)	2 (22.22)

(Figures with in parenthesis are percentage)

Analysis of the data in table 5.1.13.3 explores that the use of cataloguing modules by the new and old central libraries of IITs. In old IITs, 6 (85.71%) central libraries do data entry through books, 3 (42.86%) through accession register whereas 2 (28.57%) libraries are doing direct recommendation, direct through forms and data entry through cards.

In new IITs, 8 (88.89%) central libraries do data entry through books while 5 (55.55%) do through accession register, 2 (22.22%) do through direct recommendation and 1 (11.11%) library do direct through forms and data entry through cards.

5.1.13.4 Automated Web OPAC

In present time, many bibliographic description formats are available such as MARC, CCF, ISO 2709, RDA etc. For the analysis of the automated modules of web OPAC, the data were collected and the same is presented in the following table.

Table: 5.1.13.4 Use of Automated Web OPAC

IITs		Web OPAC			
		Bulletin Board	Edit Profile	Book Recommendation	Suggestions
Old IITs (N=7)	IITKGP	-	√	-	-
	IITB	√	-	-	-
	IITM	-	√	√	√
	IITK	-	√	√	-
	IITD	√	√	√	√
	IITG	-	√	-	-
	IITR	-	√	-	-
Total		2 (28.57)	6 (85.71)	3 (42.86)	2 (28.57)
New IITs (N=9)	IITP	-	√	-	-
	IITH	-	-	-	-
	IITGN	√	√	√	√
	IITBBS	√	√	√	√
	IITRPR	-	√	-	√
	IITJ	√	√	√	√
	IITI	-	-	-	√
	IIT Mandi	-	√	√	√
	IITBHU	√	-	√	-
Total		4 (44.44)	6 (66.67)	5 (55.55)	6 (66.67)

(Figures with in parenthesis are percentage)

It is observed from the table which shows the use of automated modules for web OPAC system. In old IITs, it is found that 6 (85.71%) central libraries edit profile using OPAC, 3 (42.86) libraries do book recommendation and 2 (28.57%) libraries do bulletin board and suggestions.

In new IITs, 6 (66.67%) central libraries edit profile and suggestions using OPAC while 5 (55.55%) central libraries use book recommendation and 2 (28.57%) use bulletin board.

5.1.13.5 Automated Serial Control System

With the help of ICT, use of serial control leads to effective and efficient control over subscription, claiming reminders and cancelations. In present time, online publisher catalogue are used for periodical selection. Analysis of the automated modules of serial control section are represented in the below table 5.1.13.5.

Table: 5.1.13.5 Use of Automated Serial Control System

Indian Institutes of Technology		Serial Control					
		Ordering	Processing	Receiving	Receiving request	Indexing	Abstracting
Old IITs (N=7)	IITKGP	-	-	√	√	√	-
	IITB	-	-	-	-	√	-
	IITM	√	√	√	√	-	-
	IITK	√	√	√	√	√	√
	IITD	√	√	√	√	√	√
	IITG	-	√	√	√	-	-
	IITR	√	√	√	-	√	-
Total		4 (57.14)	5 (71.43)	6 (85.71)	5 (71.43)	5 (71.43)	2 (28.57)
New IITs (N=9)	IITP	-	-	-	-	-	-
	IITH	-	-	-	-	-	-
	IITGN	√	√	√	√	√	-
	IITBBS	-	-	-	-	-	-
	IITRPR	-	√	-	-	√	-
	IITJ	√	√	√	-	-	-
	IITI	-	√	√	-	√	-
	IIT Mandi	-	√	√	-	√	-
	IITBHU	-	-	-	-	-	-
Total		2 (22.22)	5 (55.55)	4 (44.44)	1 (11.11)	4 (44.44)	-

(Figures with in parenthesis are percentage)

The analysis of the tabulated data represents that the use of automated modules of serial control system. In old IITs, 6 (85.71%) use receiving service, 5 (71.43%) use

processing, receiving request, indexing service, 4 (57.14%) central libraries do ordering and only 2 (28.57%) do abstracting service with the help of serial control module.

In new IITs, 5 (55.55%) central libraries use processing service, 4 (44.44%) libraries do indexing and receiving service, 2 (22.22%) libraries use ordering service while only 1 (11.11%) receiving request service.

5.1.14 Services offered by the Libraries

Libraries are ICT based service oriented and many services are user leading to save the users' time and with the help of ICT. Services like indexing, abstracting etc. are the time saving, cost saving and skill staff intensive. Many services like Selective Dissemination of Information, exhaustive literature search cannot be manually satisfactory but with the help of ICT, these can be provided timely and efficiently. For the analysis of services offered by the library, the data were collected and the same is represented in the following table.

Table: 5.1.14 Services offered by the Libraries

Services	Old IITs								New IITs									
	IIT KGP	IIT B	IITM	IITK	IITD	IITG	IITR	Total	IITP	IITH	IITGN	IIT BBS	IIT RPR	IITJ	IITI	IIT Mandi	IIT BHU	Total
Lending Service	√	√	√	√	√	√	√	7 (100)	-	-	√	√	√	√	√	√	-	6 (66.67)
Reference Service	√	√	√	√	√	√	√	7 (100)	-	√	√	√	√	√	√	√	√	8 (88.89)
CAS	√	√	√	√	√	√	√	7 (100)	-	√	√	√	√	√	√	√	√	8 (88.89)
Reprographic Service	√	√	√	√	√	√	√	7 (100)	-	√	√	√	√	√	√	-	√	7 (77.78)
Web OPAC	√	√	√	√	√	√	√	7 (100)	√	√	√	√	√	√	√	√	√	9 (100)
User Education	√	√	√	√	√	√	√	7 (100)	-	√	√	√	√	√	√	√	√	8 (88.89)
Alerting Service	√	√	√	√	√	√	√	7 (100)	-	√	√	√	√	√	√	√	√	8 (88.89)
ILL	√	√	√	√	√	√	√	7 (100)	√	-	√	√	√	√	√	√	-	7 (77.78)
Online Database Search	√	√	√	√	√	√	√	7 (100)	√	√	√	√	√	√	√	√	√	9 (100)
CD-ROM Database Service	√	√	√	√	√	√	√	7 (100)	√	√	√	√	√	√	√	√	√	9 (100)
Digital Lib. Service	√	-	√	√	√	√	√	6 (85.71)	√	√	√	√	√	√	√	√	√	9 (100)
I R Service	√	√	√	√	√	√	-	6 (85.71)	√	√	√	√	√	√	√	√	√	9 (100)
Ask Librarian	√	√	√	√	√	√	-	6 (85.71)	√	-	√	√	-	√	-	-	√	5 (55.55)
Remote access to e-resources	√	√	√	√	√	-	-	5 (71.43)	√	√	√	√	√	√	√	√	√	9 (100)
DDS	√	√	√	√	√	√	√	7 (100)	-	√	√	√	√	√	√	√	-	7 (77.78)

(Figures with in parenthesis are percentage)

Analysis of the data in the table 5.1.14 exhibits that the services offered by the central libraries of IITs. In old IITs, 7 (100%) central libraries offer lending services, reference service, CAS, reprographic service, web OPAC, user education, ILL, alerting service, online database search, CD-ROM database service and document delivery service while 6 (85.71%) digital library service, I R service, ask librarian and only 5 (71.43%) central libraries of old IITs offer remote access to e-resources.

In new IITs, 9 (100%) central libraries offer web OPAC, online database search, CD-ROM database service, digital library service, I R service and remote access to e-resources while 8 (88.89%) libraries provide reference service, CAS, user education and alerting service, 7 (77.78%) libraries offer reprographic service, ILL and CAS, 6 (66.67%) provide lending service and only 5 (55.55%) libraries offer ask librarian service.

5.1.15 Current Awareness Services

CAS is the service which is intended to meet the current approach to the demand users. It provides nascent information about newly procured documents and current activities of an institute. Many current awareness services are provided by the central libraries of IITs like bulletin board service, SMS alerting service, newspaper clipping, email alert service, monthly book addition, new arrivals etc. Analysis of the current awareness services are represented in the below table 5.1.15.

Table: 5.1.15 Current Awareness Services offered by the Libraries

IITs		Bulletin Board Service	SMS Alerting Service	Newspaper clipping	Email Alert Service	Monthly book addition	New arrivals
Old IITs (N=7)	IITKGP	-	-	-	√	√	√
	IITB	√	√	√	√	√	√
	IITM	-	-	-	√	√	√
	IITK	-	-	-	√	√	√
	IITD	√	√	-	√	√	√
	IITG	-	√	-	√	√	√
	IITR	-	-	√	-	√	√
Total		2 (28.57)	3 (42.86)	2 (28.57)	6 (85.71)	7 (100)	7 (100)
New IITs (N=9)	IITP	-	-	√	√	-	√
	IITH	√	-	√	√	√	-
	IITGN	√	√	√	√	√	√
	IITBBS	√	-	-	√	√	√
	IITRPR	-	-	√	√	-	√
	IITJ	√	√	-	√	√	√
	IITI	-	-	√	√	√	√
	IIT Mandi	-	√	√	√	√	√
	IITBHU	-	-	√	√	-	√
	Total		4 (44.44)	3 (33.33)	7 (77.77)	9 (100)	6 (66.67)

(Figures with in parenthesis are percentage)

Analysis of the data in the table 5.1.15 reveals current awareness services offered by the library where in old IITs, 7 (100%) libraries offer monthly book addition and new arrivals service to their users while 6 (85.71%) libraries provide email alert service, 3 (42.86%) provide SMS alerting service and 2 (28.57%) libraries provide bulletin board service and newspaper clipping.

It is also represented from above table that in new IITs, 9 (100%) libraries provide email alert service while 8 (88.89%) libraries offer new arrivals service, 7 (77.77%) offer Newspaper clipping service to their users, 6 (66.67%) libraries offer

monthly book addition, 4 (44.44%) libraries provide bulletin board service and 3 (33.33%) provide SMS alerting service.

5.1.16 Add-on Services

For the use of add-on services, ICT is very important for the library and its users. For the analysis of the add-on services offered by the library, the data were collected and the same is presented in the following table.

Table: 5.1.16 Add-on Services provided by Libraries

Indian Institutes of Technology		Library Web-blog Portal	Mobile based Services	Wi-Fi Services
Old IITs (N=7)	IITKGP	√	√	√
	IITB	√	-	√
	IITM	√	√	√
	IITK	√	-	√
	IITD	√	√	√
	IITG	√	√	√
	IITR	√	√	√
Total		7 (100)	5 (71.43)	6 (85.71)
New IITs (N=9)	IITP	√	-	√
	IITH	√	-	√
	IITGN	-	√	√
	IITBBS	√	-	√
	IITRPR	√	-	√
	IITJ	√	√	√
	IITI	-	-	√
	IIT Mandi	√	√	√
	IITBHU	√	-	√
Total		7 (77.78)	3 (33.33)	9 (100)

(Figures with in parenthesis are percentage)

The analysis of the tabulated data explores that add-on services provided by libraries, in old IITs, 7 (100%) libraries provide library web-blog portal, 6 (85.71%) offer Wi-Fi services and 5 (71.43%) offer mobile based services to their users. In old IITs, IIT Bombay is also providing other type of add-on service that is shelf-checkout.

In new IITs, 9 (100%) central libraries offer Wi-Fi services to their users while 7 (77.78%) libraries provide library web-blog portal and 3 (33.33%) provide mobile based services.

5.1.17 Technology used by the Libraries

Information communication technology has transformed the institutions or organizations. Libraries are also utilising modern technology for improvement of existing library services and creation of new services. Analysis of technology used by the library are represented in the table 5.1.17.

Table: 5.1.17 Technology used by the Libraries

Indian Institutes of Technology		Cloud computing	RFID	Smart card	Barcode technology	QR Codes Technology
Old IITs (N=7)	IITKGP	-	√	√	√	-
	IITB	-	-	-	√	-
	IITM	-	√	√	√	-
	IITK	√	-	-	√	-
	IITD	√	√	√	√	-
	IITG	-	√	√	√	√
	IITR	-	√	-	-	-
Total		2 (28.57)	5 (71.43)	4 (57.14)	6 (85.71)	1 (14.28)
New IITs (N=9)	IITP	-	√	√	-	-
	IITH	-	-	√	√	-
	IITGN	-	-	-	√	√
	IITBBS	-	√	√	√	-
	IITRPR	-	√	√	√	-
	IITJ	√	-	-	√	√
	IITI	-	-	√	√	-
	IIT Mandi	√	√	√	√	-
	IITBHU	-	-	-	√	√
Total		2 (22.22)	3 (33.33)	6 (66.67)	8 (88.89)	3 (33.33)

(Figures with in parenthesis are percentage and multiple answers were permitted)

It is clear from the table 5.1.17 that in old IITs, 6 (85.71%) librarians use barcode technology in their libraries while 5 (71.43%) use RFID technology, 4 (57.14%)

respondents use smart cards, 2 (28.57) use cloud computing and only 1 (14.28%) that is IIT Guwahati is using QR code technology in the library.

In new IITs, 8 (88.89%) librarians are using barcode technology while 6 (66.67%) librarians are using smartcards, 3 (33.33%) libraries are using RFID technology and QR Code technology and merely 2 (22.22%) libraries are using cloud computing.

5.1.18 Mobile based Application

For the analysis of mobile based application, the data were collected and the same is presented in the following table.

Table: 5.1.18 Mobile based Library Services

Indian Institutes of Technology		Yes	No
Old IITs (N=7)	IITKGP	-	√
	IITB	-	√
	IITM	-	√
	IITK	-	√
	IITD	-	√
	IITG	√	-
	IITR	-	√
Total		1 (14.28%)	6 (85.71)
New IITs (N=9)	IITP	-	√
	IITH	-	√
	IITGN	√ Beta version	-
	IITBBS	-	√
	IITRPR	-	√
	IITJ	√ NGL Carbon	-
	IITI	-	√
	IIT Mandi	√	-
	IITBHU	-	-
Total		3 (33.33)	5 (55.55)

(Figures with in parenthesis are percentage)

It is observed from the table 5.1.18 that in old IITs, only 1 (14.28%) that is IIT Guwahati is using mobile based library service for the library users.

In new IITs, 3 (33.33) central libraries are using mobile based library service. IIT Gandhinagar is using Beta Version mobile based library service while IIT Jodhpur is using NGL Carbon.

5.1.19 Need of Technical Training to manage ICT Applications

Training is very important for the library staff for handling the ICT based collection and services in the library. Analysis of need of technical training to manage ICT applications are represented in the below table 5.1.19.

Table: 5.1.19 Need of Technical Training to manage ICT Applications

Indian Institutes of Technology		Yes	No
Old IITs (N=7)	IITKGP	-	√
	IITB	√	-
	IITM	√	-
	IITK	√	-
	IITD	-	-
	IITG	-	-
	IITR	-	-
Total		3 (42.86)	1 (14.28)
New IITs (N=9)	IITP	√	-
	IITH	-	-
	IITGN	-	√
	IITBBS	√	-
	IITRPR	√	-
	IITJ	-	-
	IITI	√	-
	IIT Mandi	√	-
	IITBHU	√	-
Total		6 (66.67)	1 (11.11)

(Figures with in parenthesis are percentage)

Analysis of the table no. 5.1.19 shows the need of technical training to manage ICT applications in the central libraries of Indian Institutes of Technology. In old IITs, 3 (42.86%) librarians agreed about need of technical training to manage ICT applications while in new IITs, 6 (66.67%) librarians agreed about need of technical training to manage ICT applications.

Section 4: ICT Infrastructures**5.1.20 Equipments in the Libraries**

ICT has changed the traditional library infrastructure into modern infrastructure. To support library collection and services, many types of hardware or equipment are being utilized by the libraries. To provide ICT based services in the library, the library staff should provide required ICT equipments. Analysis of the equipments available in the library are presented in the table 5.1.20.

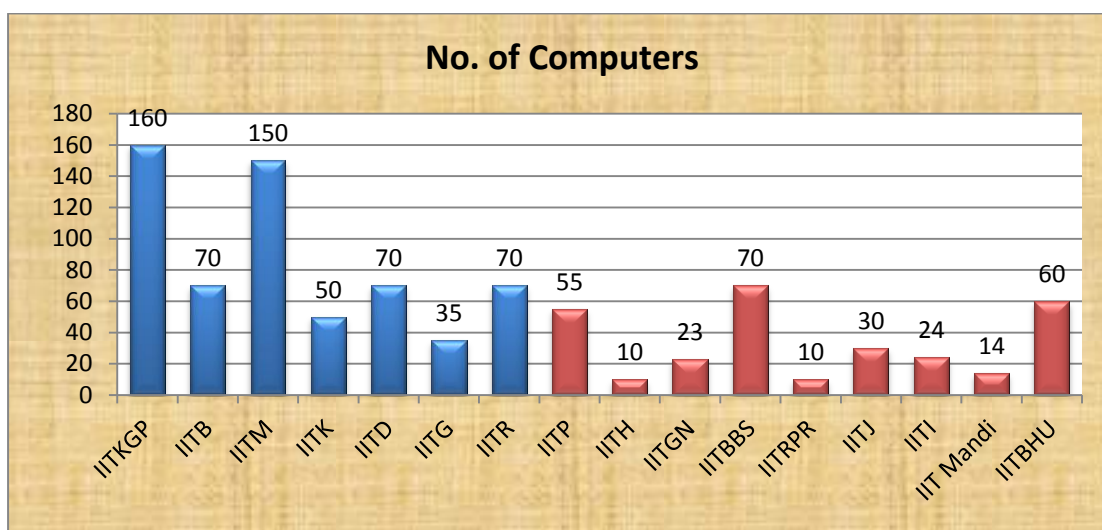
Table: 5.1.20 Availability of Equipments in the Libraries

Purpose	Old IITs							New IITs								
	IIT KGP	IIT B	IITM	IITK	IITD	IITG	IITR	IITP	IITH	IITGN	IIT BBS	IIT RPR	IITJ	IITI	IIT Mandi	IIT BHU
Computer	160	70	150	50	70	35	75	55	20	23	70	10	30	24	14	60
Server machine	3	12	2	-	3	5	7	1	3	3	6	2	-	1	1	2
Photocopy Machine	3	2	2	4	4	2	1	1	2	1	3	1	1	2	-	2
Flatbed Scanner	3	5	2	-	-	-	5	1	-	1	-	-	1	-	1	-
Overhead Scanner	1	-	2	2	2	1	2	1	4	1	3	1	-	4	1	-
Barcode Scanner	6	4	2	15	10	5	-	-	3	5	6	1	3	3	2	5
Hand-held Scanner	1	-	2	10	-	2	-	-	-	-	5	1	-	1	-	-
Laser Printer	8	14	6	2	10	-	5	-	2	6	7	2	2	3	4	10
LCD Projector	2	1	2	2	2	1	2	1	1	-	-	-	-	-	1	2
Digital Camera	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
CD/DVD Writer	√	√	√	√	√	√	-	-	-	-	√	√	√	-	√	-
Storage devices	-	-	√	-	√	√	-	√	-	√	-	√	√	-	√	√
UPS Back- up Facility	√	√	√	√	√	√	√	√	√	NA	√	√	√	√	√	√

5.1.20.1 Computers available in the Libraries

Computers are the basic need of the library for the users to provide ICT based collection and services. Without computer, user cannot use the proper services of the library. Analysis of the no. of computers available in the library are represented in the below table 5.1.21.1.

Figure: 5.1.20.1 No. of Computers



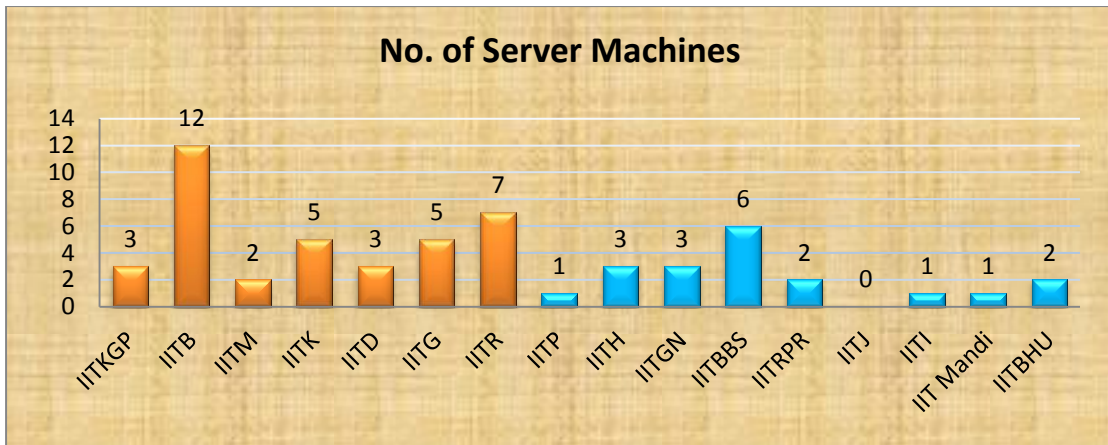
Above figure no. 5.1.20.1 shows that the available computers in the central libraries of Indian Institutes of Technology where in old IITs, IIT Kharagpur has the highest numbers of computers that are 160 followed by IIT Madras (150), IIT Bombay (70), IIT Delhi (70), IIT Roorkee (70).

While in new IITs, 70 are provided by IIT Bhubneshwar, 60 by IIT BHU, 30 by IIT Jodhpur, 24 by IIT Indore, 23 by IIT Gandhinagar, 14 by IIT Mandi and lowest no. of computers are provided by IIT Hyderabad and IIT Ropar that are 10.

5.1.20.2 Server Machines available in the Libraries

Analysis of the no. of server machines available in the library are represented in the below figure 5.1.21.1.

Figure: 5.1.20.2 No. of Server Machines

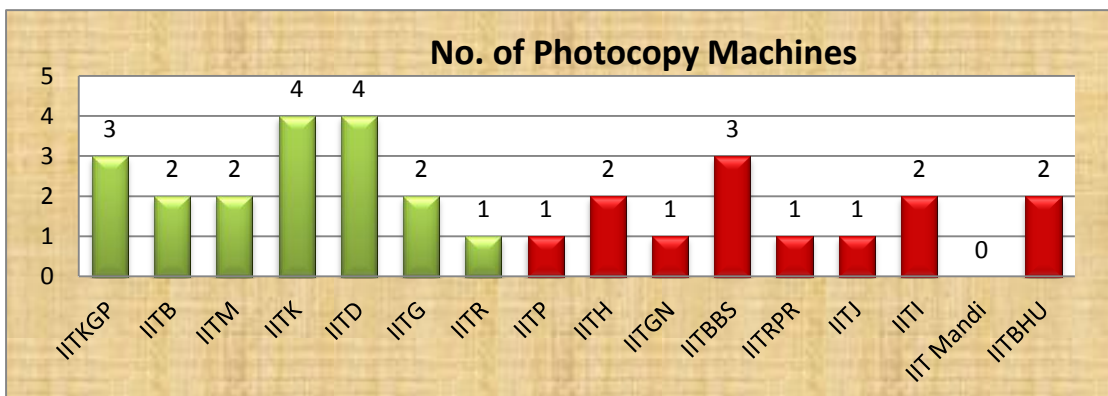


It is explored from the figure no. 5.1.21.2 which shows that the availability of server machines in the central libraries of Indian Institutes of Technology in India. It is observed that in old IITs, highest numbers of server machines are provided by IIT Bombay that is 12 followed by IIT Roorkee (7), IIT Guwahati and IIT Kanpur (5), IIT Kharagpur (3) and IIT Madras (2).

While in new IITs, IIT Bhubneshwar (6), followed by IIT Hyderabad and IIT Gandhinagar (3) and lowest numbers of server machines are provided by IIT Patna, IIT Indore and IIT Mandi that is 1.

5.1.20.3 Photocopy Machines available in the Libraries

Figure: 5.1.20.3 No. of Photocopy Machines



The figure no. 5.1.21.3 depicts that the availability of photocopy machines in the central libraries of Indian Institutes of Technology in India. It is found from the study

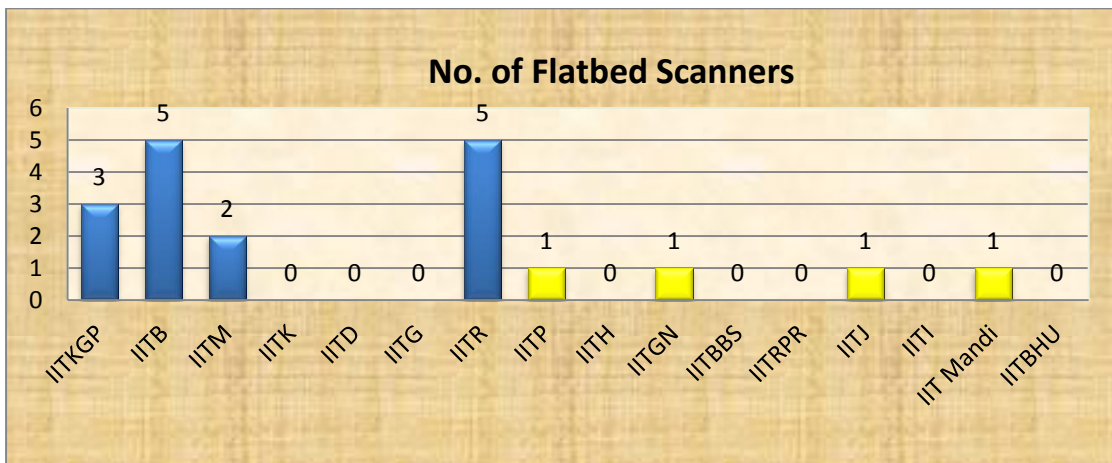
that IIT Kanpur and IIT Delhi are providing 4 photocopy machines for their users followed by IIT Kharagpur that is 3, IIT Bombay, IIT Madras, IIT Guwahati, are providing 2 photocopy machines and only IIT Roorkee is providing only 1 photocopy machine for their library users.

In new IITs, IIT Bhubneshwar is providing 3, IIT Hyderabad, IIT Indore and IIT BHU are providing 2 while IIT Patna, IIT Gandhinagar, IIT Ropar, IIT Jodhpur and IIT Indore are providing only 1 photocopy machine for the library users. Only IIT Mandi central library is not providing the photocopy machine for their users.

5.1.20.4 Flatbed Scanners available in the Libraries

The analysis of the data reveals that the availability of flatbed scanners in the central libraries of Indian Institutes of Technology in India.

Figure: 5.1.20.4 No. of Flatbed Scanners

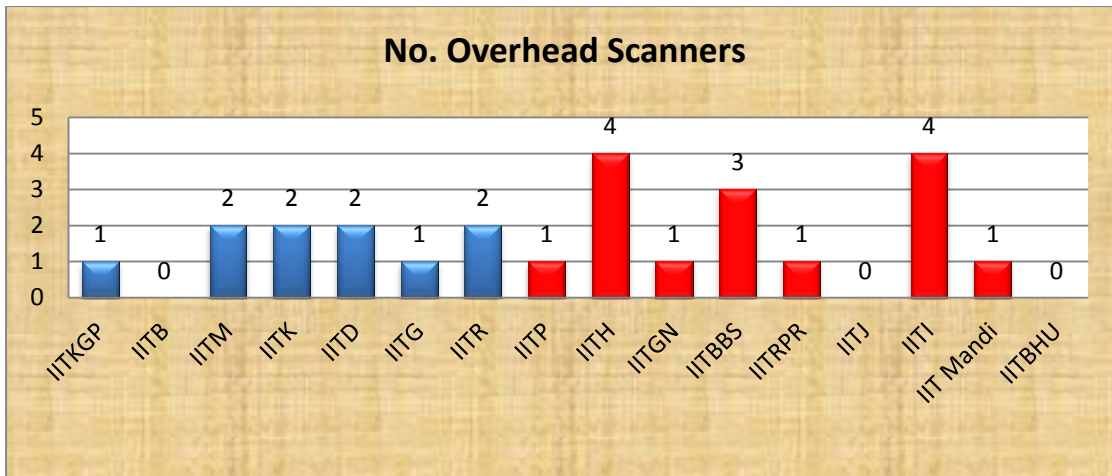


The above figure clearly shows that in old IITs, IIT Bombay and IIT Roorkee are providing 5 flatbed scanners followed by IIT Kharagpur that is 3, IIT Madras that is 2, while IIT Kanpur, IIT Delhi, IIT Guwahati have no facility of flatbed scanner.

In new IITs, IIT Patna, IIT Gandhinagar, IIT Jodhpur and IIT Mandi has only 1 flatbed scanner. IIT Hyderabad, IIT Bhubneshwar, IIT Ropar, IIT Indore and IIT BHU have no flatbed scanner in their central library.

5.1.20.5 No. of Overhead Scanners available in the Libraries

Figure: 5.1.20.5 No. of Overhead Scanners



The figure no. 5.1.21.5 perceived that the availability of overhead scanners in the central libraries of Indian Institutes of Technology. It is analysed that in old IITs, IIT Madras, IIT Kanpur, IIT Delhi, IIT Roorkee have 2 overhead scanners whereas IIT Kharagpur, IIT Guwahati have only 1.

In the new IITs, IIT Hyderabad and IIT Indore has 4 overhead scanners while IIT Bhubaneswar has 3 whereas IIT Patna, IIT Gandhinagar, IIT Ropar and IIT Mandi have only 1. Only IIT Bombay and IIT Jodhpur does not have the overhead scanner.

5.1.20.6 No. of Barcode Scanners available in the Libraries

Figure: 5.1.20.6 No. of Barcode Scanners

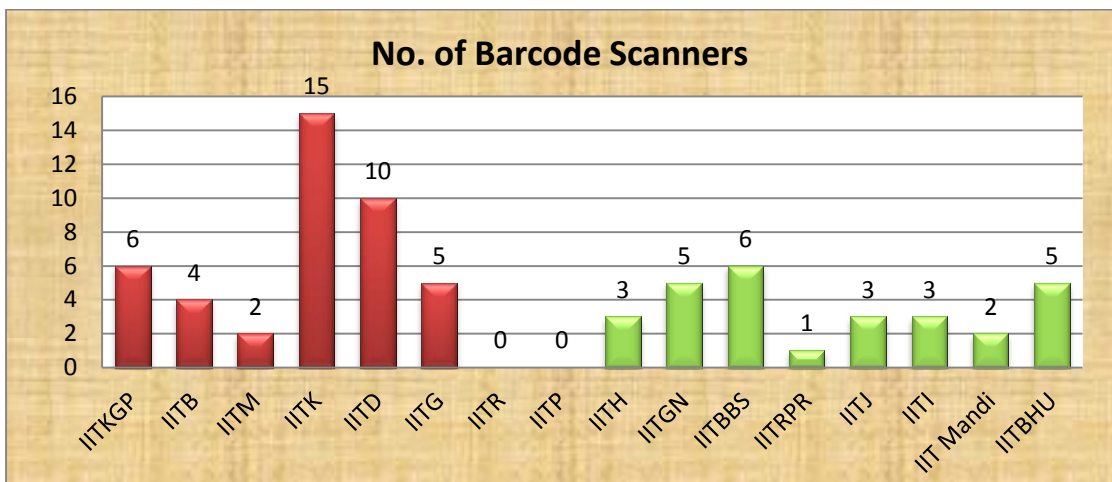
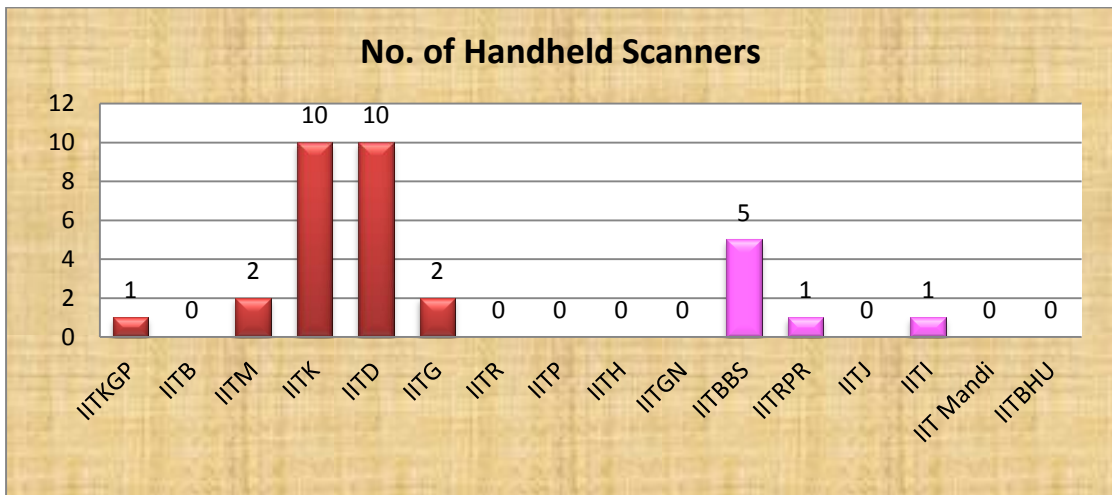


Figure no. 5.1.20.6 investigated that the availability of barcode scanners in the central libraries of Indian Institutes of Technology. It is explored from the above figure that IIT Kanpur has the highest (15) numbers of barcode scanners followed by IIT Delhi (10), IIT Kharagpur and IIT Guwahati, IIT Bombay (4), IIT Madras (2) and IIT Roorkee doesn't have barcode scanner.

While in new IITs, IIT Bhubaneswar (6), IIT Gandhinagar, IIT BHU (5), IIT Hyderabad, IIT Jodhpur, IIT Indore (3), IIT Mandi (2) while IIT Ropar has only one barcode scanner. IIT Patna doesn't have barcode scanner.

5.1.20.7 Handheld Scanners available in the Libraries

Figure: 5.1.20.7 No. of Handheld Scanners

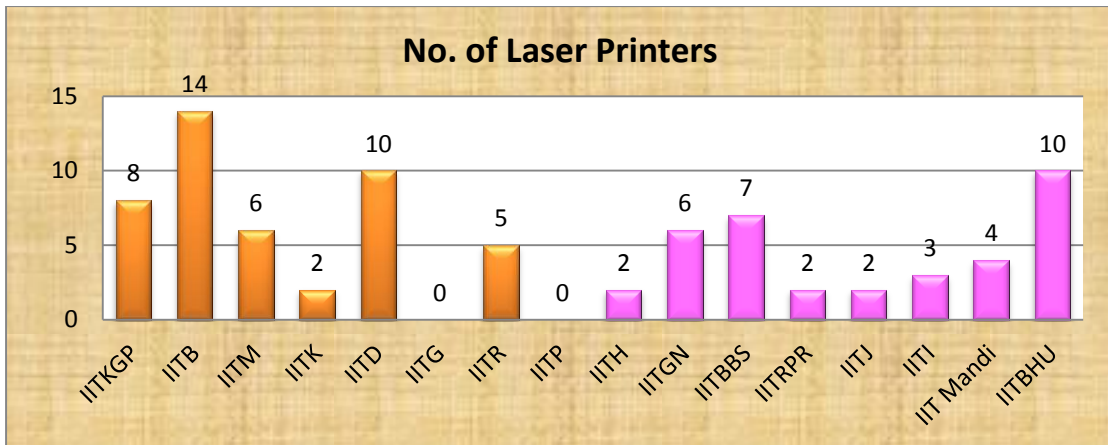


It is depicted from the figure no. 5.1.21.7, IIT Kanpur and IIT Delhi have the highest (10) no. of handheld scanners followed by IIT Madras, IIT Guwahati (2) while IIT Kharagpur, have only 1 handheld scanners. IIT Bombay, IIT Roorkee don't have handheld scanners.

In new IITs, IIT Bhubaneswar has the highest (5), IIT Ropar, IIT Indore have only 1 handheld scanners. IIT Patna, IIT Hyderabad, IIT Gandhinagar, IIT Jodhpur, IIT Mandi and IIT BHU don't have handheld scanners.

5.1.20.8 Laser Printers available in the Libraries

Figure: 5.1.20.8 No. of Laser Printers

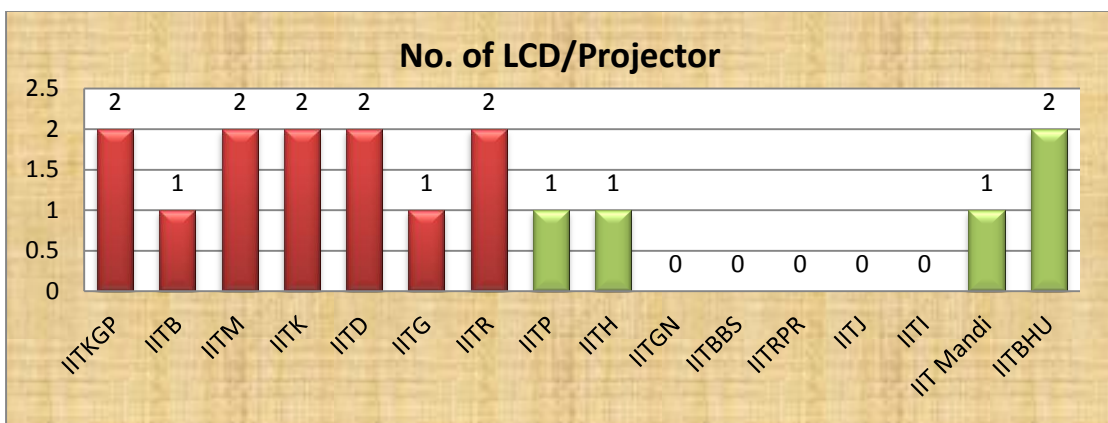


Above figure shows that the availability of laser printers in the central libraries of Indian Institutes of Technology. It is observed that IIT Bombay has the highest (14) numbers of laser printers followed by IIT Delhi (10), IIT Kharagpur (8), IIT Madras (6), IIT Roorkee (5) while IIT Kanpur has 2 laser printers. IIT Guwahati central library doesn't have laser printers.

In new IITs, IIT BHU has 10 laser printers followed by IIT Kharagpur (8), IIT Bhubaneswar (7), IIT Gandhinagar (6), IIT Mandi (4), IIT Indore (3) while IIT Hyderabad, IIT Ropar, IIT Jodhpur have 2 laser printers. IIT Patna central library doesn't have laser printers.

5.1.20.9 LCD/Projectors available in the Library

Figure: 5.1.20.9 No. of LCD/Projectors



The analysis of the data reveals that the availability of LCD/Projector in the central libraries of Indian Institutes of Technology. Study examined that the IIT Kharagpur, IIT Madras, IIT Kanpur, IIT Delhi, IIT Roorkee have 2 LCD/projector while IIT Bombay, IIT Guwahati have 1.

In new IITs, IIT BHU has 2 LCD/projector while IIT Patna, IIT Hyderabad and IIT Mandi have 1. IIT Gandhinagar, IIT Bhubaneswar, IIT Ropar, IIT Jodhpur, IIT Indore don't have LCD/projector in their library.

5.1.21 Library Management Software

Library Management Software performs all library housekeeping activities. The most commonly used house-keeping activities are Acquisition, Classification, Cataloguing, Circulation, Serial control and Stock-taking. There are many library management software to which house keeping activities are done. These softwares' are KOHA, Libsys, Vertua and NewGenLib etc. Analysis of the library management software are represented in the below table 5.1.21.

Table: 5.1.21 Different Types of Library Management Software

Indian Institutes of Technology		Library Management Software			
		Koha	Libsys	VTLS	Anyother
Old IITs (N=7)	IITKGP	-	√	-	-
	IITB	√	-	-	Libsuit
	IITM	-	-	√	-
	IITK	-	√	-	-
	IITD	-	√	-	-
	IITG	-	√	-	-
	IITR	-	√	-	-
Total		1 (14.28)	5 (71.43)	1 (14.28)	1 (14.28)
New IITs (N=9)	IITP	-	√	-	-
	IITH	√	-	-	-
	IITGN	√	-	-	-
	IITBBS	√	-	-	-
	IITRPR	-	√	-	-
	IITJ	-	-	-	NewGenLib
	IITI	-	√	-	-
	IIT Mandi	√	-	-	-
	IITBHU	√	-	-	-
Total		5 (55.55)	3 (33.33)	-	1 (11.11)

(Figures with in parenthesis are percentage and multiple answers were permitted)

Above table no. 5.1.21 shows library management software. In old IITs, 5 (71.43%) central libraries that are IIT Kharagpur, IIT Kanpur, IIT Delhi, IIT Guwahati and IIT Roorkee are using Libsys software while IIT Bombay is using Koha and Libsult software and IIT Madras is using VTLS.

In new IITs, 5 (55.55%) central libraries that are IIT Hyderabad, IIT Gandhinagar, IIT Bhubneshwar, IIT Mandi and IIT BHU are using Koha library management software while IIT Patna, IIT Ropar and IIT Indore are using Libsys library management software and IIT Jodhpur is using NewGenLib software.

5.1.22 Digital/Institutional Repository Software

Repository provides the set of services to the academic community for the dissemination of digital material created by the institution. Institutional repository collects, preserves and provides free, unrestricted online access to all types of institutional research outputs, knowledge. For the analysis of digital/institutional repository software, the data were collected and the same is presented in the following table.

Table: 5.1.22 Different types of Digital/Institutional Repository Software

Indian Institutes of Technology		D-Space	Greenstone	E-Print Archive	Any other
Old IITs (N=7)	IITKGP	√	-	-	-
	IITB	√	-	-	-
	IITM	√	-	√	-
	IITK	√	-	-	-
	IITD	√	-	-	-
	IITG	√	-	-	-
	IITR	√	-	-	-
Total		7 (100)	-	1 (14.28)	-
New IITs (N=9)	IITP	√	-	-	-
	IITH	√	-	-	-
	IITGN	√	-	-	-
	IITBBS	√	-	-	-
	IITRPR	√	-	-	-
	IITJ	√	-	-	-
	IITI	√	-	-	-
	IIT Mandi	√	-	-	-
	IITBHU	√	-	-	-
Total		9 (100)	-	-	-

(Figures with in parenthesis are percentage and multiple answers were permitted)

The analysis of the tabulated data in table no. 5.1.22 shows the use of digital/institutional repository software in the central libraries of IITs. All the IITs are using digital/institutional repository software. In old IITs, all the central libraries are using DSpace digital/institutional repository software while IIT Madras is using DSpace and E-Print Archive.

In new IITs, all the central libraries are using DSpace digital/institutional repository software.

5.1.23 Security System in the Library

Libraries are providing RFID technology, smart cards and CCTV surveillance to the benefit of library. For the analysing the security system in the library, the data were collected and the same is represented in the following table.

Table: 5.1.23 Use of Security System in the Libraries

Indian Institutes of Technology		CCTV	Smart card	RFID	Biometrics
Old IITs (N=7)	IITKGP	√	-	-	-
	IITB	√ & 3M System	-	-	-
	IITM	√	√	√	√
	IITK	-	-	-	-
	IITD	√	√	√	√
	IITG	√	√	√	-
	IITR	√	-	√	-
Total		6 (85.71)	3 (42.86)	4 (57.14)	2 (28.57)
New IITs (N=9)	IITP	√	√	√	-
	IITH	-	√	-	-
	IITGN	√	-	-	-
	IITBBS	√	√	√	-
	IITRPR	√	√	√	-
	IITJ	√	-	-	-
	IITI	√	-	-	-
	IIT Mandi	√	√	√	-
	IITBHU	√	-	-	-
Total		8 (88.89)	5 (55.55)	4 (44.44)	-

(Figures with in parenthesis are percentage and multiple answers were permitted)

Aforesaid table no. 5.1.23 shows the security system in the library where in old IITs, 6 (85.71%) libraries are using CCTV while 4 (57.14%) libraries use RFID, 3 (42.86%) use smart cards and 2 (28.57%) use biometrics. IIT Bombay is using 3M System CCTV.

In new IITs, 8 (88.89%) libraries use CCTV while 5 (55.55%) libraries are using smart cards and 4 (44.44%) libraries that are IIT Patna, IIT Bhubneshwar, IIT Ropar and IIT Mandi are using RFID.

5.1.24 Use of antivirus in the Libraries

Antivirus is a security which protects the machines/computers from the viruses. For analysing the use of antivirus in the library, data were collected and the same is presented in the following table.

Table: 5.1.24 Use of antivirus in the Libraries

Indian Institutes of Technology		McAfee	Quick Heel	Kaspersky	Other
Old IITs (N=7)	IITKGP	-	-	-	eTrust
	IITB	-	-	-	-
	IITM	-	-	√	-
	IITK	-	-	-	Manage by CC
	IITD	-	-	-	In-housed
	IITG	√	-	-	MS Essential
	IITR	-	-	-	-
Total		1 (14.28)	-	1 (14.28)	4 (57.14)
New IITs (N=9)	IITP	-	-	-	Symentic
	IITH	-	-	-	-
	IITGN	-	√	-	-
	IITBBS	-	-	-	-
	IITRPR	√	-	√	-
	IITJ	-	-	-	-
	IITI	√	-	-	-
	IIT Mandi	-	√	-	-
	IITBHU	-	√	-	-
	Total		2 (22.22)	3 (33.33)	1 (11.11)

(Figures with in parenthesis are percentage) (CC is Computer Centre)

The overall conclusion drawn from the table no. 5.1.24 that in old IITs, IIT Guwahati is using McAfee and MS essential antivirus in the library while IIT Madras is using

Kaspersky antivirus, IIT kharagpur is using eTrust and IIT Kanpur librarian said that it is managed by computer center, IIT Delhi is using in-house antivirus. IIT Bombay and IIT Roorkee did not give response of this.

In new IITs, IIT Gandhnagar, IIT Mandi and IIT BHU are using quickheel antivirus in the library while IIT Ropar and IIT Indore are using McAfee, IIT Patna is using Symantic antivirus in the library to protect their systems. IIT Ropar is also using Kaspersky antivirus. IIT Hyderabad, IIT Bhubneshwar and IIT Jodhpur did not give response.

5.1.25 Browser in the Libraries

Web browsers are very essential for handling the library and information services. Central libraries of IITs are using different types of web browsers such as Google Chrome, Mozilla Firefox and Internet Explorer. Analysis of the browser in the library are represented in the below table 5.1.25.

Table: 5.1.25 Use of Browser in the Libraries

Indian Institutes of Technology		Google Chrome	Mozilla Firefox	Internet Explorer
Old IITs (N=7)	IITKGP	√	√	√
	IITB	√	√	-
	IITM	√	√	√
	IITK	√	√	√
	IITD	√	√	√
	IITG	√	√	-
	IITR	√	-	-
Total		7 (100)	6 (85.71)	4 (57.14)
New IITs (N=9)	IITP	√	-	-
	IITH	√	√	-
	IITGN	√	-	-
	IITBBS	√	√	√
	IITRPR	√	√	√
	IITJ	√	√	√
	IITI	√	√	-
	IIT Mandi	√	√	-
	IITBHU	√	-	-
	Total		9 (100%)	6 (66.67)

(Figures with in parenthesis are percentage and multiple answers were permitted)

Data presented in the table 5.1.25 observes that use of browser in the library. In old IITs, 7 (100%) libraries are using Google Chrome while 6 (85.71%) libraries are using Mozilla Firefox and 4 (57.14%) are using Internet Explorer.

In new IITs, 9 (100%) central libraries are using Google Chrome while 6 (66.67%) libraries are using Mozilla Firefox and 3 (33.33) use Internet Explorer.

5.1.26 Network System Software in the Libraries

Central libraries of IITs are using different types of network system software in the library such as LINUX, Windows NT etc. For the analysis of network system software in the library, the data were collected and the same is represented in the following table.

Table: 5.1.26 Use of Network System Software in the Libraries

IITs		UNIX	LINUX	Windows NT
Old IITs (N=7)	IITKGP	-	√	-
	IITB	-	√	-
	IITM	-	√	-
	IITK	-	-	-
	IITD	-	√	-
	IITG	-	√	-
	IITR	-	-	√
Total		-	5 (71.43)	1 (14.28)
New IITs (N=9)	IITP	-	√	-
	IITH	-	-	√
	IITGN	-	√	-
	IITBBS	-	√	√
	IITRPR	-	√	√
	IITJ	-	√	√
	IITI	-	√	√
	IIT Mandi	-	√	-
	IITBHU	-	√	√
	Total		-	8 (88.89)

(Figures with in parenthesis are percentage and multiple answers were permitted)

The overall conclusion drawn from the table 5.1.26 which depicts that 5 (71.43%) libraries of old IITs are using LINUX while only 1 (14.28%) library is using Windows NT.

In new IITs, 8 (88.89%) libraries are using LINUX while only 6 (66.67%) libraries are using Windows NT. No one library is using UNIX operating system.

5.1.27 Library Network

Library networking allows sharing resources among member libraries. Networking facilitates member libraries to share expertise, resources and services among member libraries. Analysis of the library network are represented in the below table 5.1.27.

Table: 5.1.27 Types of Library Network

Indian Institutes of Technology		LAN	MAN	WAN
Old IITs (N=7)	IITKGP	√	-	-
	IITB	√	-	-
	IITM	√	-	-
	IITK	√	-	√
	IITD	√	√	√
	IITG	√	-	-
	IITR	√	-	-
Total		7 (100)	1 (14.28)	2 (28.57)
New IITs (N=9)	IITP	√	-	-
	IITH	√	-	-
	IITGN	√	-	-
	IITBBS	√	-	-
	IITRPR	√	-	-
	IITJ	√	-	-
	IITI	-	-	-
	IIT Mandi	-	-	-
	IITBHU	-	-	-
Total		6 (66.67)	-	-

(Figures with in parenthesis are percentage and multiple answers were permitted)

The analysis of the data in the table no. 5.1.27 reveals the different types of library network used by the central libraries of IITs. In old IITs, 7 (100%) libraries are using

local area network while IIT Delhi is also using metropolitan area network, IIT Kanpur and IIT Delhi are also using wide area network.

In new IITs, 6 (66.67%) central libraries that are IIT Patna, IIT Hyderabad, IIT Gandhinagar, IIT Bhubneshwar, IIT Ropar and IIT Jodhpur are using local area network. The librarian of IIT Indore, IIT Mandi and IIT BHU did not give response of this.

5.1.28 Internet Connectivity in the Library

The internet is giving access to an irresistible amount of information, data and electronic information amenities provided by its regular users. For the analysing the internet connectivity offered by the library, the data were collected and the same is presented in the following table 5.1.28.

Table: 5.1.28 Use of Internet Connectivity in the Libraries

Indian Institutes of Technology		Broad Band	Wi-Fi	Li-Fi
Old IITs (N=7)	IITKGP	√	-	NKN Connectivity
	IITB	-	√	-
	IITM	√	-	-
	IITK	√	√	-
	IITD	√	√	-
	IITG	√	√	-
	IITR	-	√	-
Total		5 (71.43)	5 (71.43)	1 (14.28)
New IITs (N=9)	IITP	-	√	-
	IITH	√	-	-
	IITGN	-	√	-
	IITBBS	√	-	-
	IITRPR	√	√	-
	IITJ	√	√	-
	IITI	√	√	-
	IIT Mandi	√	√	-
	IITBHU	-	√	-
Total		6 (66.67)	7 (77.78)	-

(Figures with in parenthesis are percentage and multiple answers were permitted)

Table no. 5.1.28 shows that the use of internet connectivity in the library. In old IITs, 5 (71.43%) libraries are using broad band while 5 (71.43%) libraries are using Wi-Fi and only IIT Kharagpur is using Li-Fi internet connectivity that is NKN Connectivity.

In new IITs, 6 (66.67%) libraries are using broad band while 7 (77.78%) libraries are using Wi-Fi and no one library is using Li-Fi internet connectivity.

Section 5: Social Networking Sites

5.1.29 Use of Social Networking Sites

The use of social networking sites are increasing day by day in the libraries to linking up with library users for the promotional activities like users education program, creating awareness about library collection and services, getting feedback or sharing the resources to the users etc. For the analysis of social networking sites offered by the library, the data were collected and the same is presented in the following table.

Table: 5.1.29 Use of Social Networking Sites

Indian Institutes of Technology		Yes	No
Old IITs (N=7)	IITKGP	√	-
	IITB	√	-
	IITM	√	-
	IITK	-	√
	IITD	-	√
	IITG	-	√
	IITR	-	√
Total		3 (42.86)	4 (57.14)
New IITs N=9)	IITP	√	-
	IITH	√	-
	IITGN	-	√
	IITBBS	√	-
	IITRPR	√	-
	IITJ	-	√
	IITI	-	√
	IIT Mandi	-	√
	IITBHU	-	√
Total		4 (44.44)	5 (55.55)

(Figures with in parenthesis are percentage)

The analysis of the data in the table no. 5.1.29 depicts that the use of social networking sites by the central libraries of Indian Institutes of Technology where only 2 old central libraries of IITs are using social networking sites while in new, 4 central libraries are using social networking sites.

It means that overall, only 7 (43.75%) out of 16 central libraries of Indian Institutes of Technology are using Social networking Sites like Facebook, YouTube, Blog and Twitter.

5.1.30 Social Networking Sites

There are many social networking sites such as Facebook, YouTube, Twitter, RSS Feed etc. which help to linking with the library users. Analysis of the social networking sites are offered by the library represented in the below table 5.1.30.

Table: 5.1.30 Different types of Social Networking Sites

Indian Institutes of Technology		Facebook	YouTube	Blog	Flicker	Twitter
(Old IITs N=7)	IITKGP	√	√	-	-	-
	IITB	√	√	-	-	√
	IITM	√	-	√	-	-
	IITK	-	-	-	-	-
	IITD	-	-	-	-	-
	IITG	-	-	-	-	-
	IITR	-	-	-	-	-
Total		3 (42.86)	2 (28.57)	1 (14.28)	-	1 (14.28)
(New IITs N=9)	IITP	√	-	-	-	√
	IITH	√	√	√	√	√
	IITGN	-	-	-	-	-
	IITBBS	√	√	-	-	-
	IITRPR	√	-	-	-	√
	IITJ	-	-	-	-	-
	IITI	-	-	-	-	-
	IIT Mandi	-	-	-	-	-
	IITBHU	√	-	-	-	-
Total		5 (55.55)	2 (22.22)	1 (11.11)	1 (11.11)	3 (33.33)

(Figures with in parenthesis are percentage and multiple answers were permitted)

Aforesaid table shows that used tools of social networking sites where 2 (28.58%) old central libraries are using Facebook while only one (14.27%) is using YouTube and

one (14.27) is using Blog. In new IITs 4 (44.44%) are using Facebook, 2 (22.22%) are using YouTube, blog and 3 (33.33%) are using Twitter.

It is seen that overall used tools of social networking sites in the Indian Institutes of Technology, 6 (43.75%) are using Facebook, 4 (25.00%) are using YouTube, 3(18.75%) are using Blog and 3 (25.00%) are using Twitter.

5.1.31 Purpose of Using Social Networking Sites

The use of social networking sites are very vital in the libraries to linking up with library users for the promotional activities like users education program, creating awareness about library collection and services, getting feedback or sharing the resources to the users etc. For analysing purpose of using social networking sites by the library, data were collected and the same is presented in the following table 5.1.31.

Table: 5.1.31 Purpose of Using Social Networking Sites

Indian Institutes of Technology		Linking with Lib. Users	Promotion activities and users education programme	Creating awareness about library collection and services	Getting feedback/sharing the problems from the users
Old IITs (N=7)	IITKGP	√	√	√	-
	IITB	√	√	√	√
	IITM	√	√	√	√
	IITK	-	-	-	-
	IITD	-	-	-	-
	IITG	-	-	-	-
	IITR	-	-	-	-
Total		3 (42.86)	3 (42.86)	3 (42.86)	2 (28.57)
New IITs (N=9)	IITP	√	-	√	-
	IITH	√	-	√	√
	IITGN	-	-	-	-
	IITBBS	√	√	√	√
	IITRPR	√	√	√	√
	IITJ	-	-	-	-
	IITI	-	-	-	-
	IIT Mandi	-	-	-	-
	IITBHU	-	√	√	-
Total		4 (44.44)	3 (33.33)	5 (55.55)	3 (33.33)

(Figures with in parenthesis are percentage and multiple answers were permitted)

Above table no. 5.1.31 clearly shows that the purpose of using social networking sites where in old IITs, 3 (42.86%) central libraries are using for linking with library users, for promotional activities and user education programme, and 3 (42.86%) central libraries are also using for creating awareness about library collection and services while only 2 (28.57%) central library are using for getting feedback/sharing the problems to the users.

In new IITs, 4 (44.44%) central libraries are using for linking with library users, 4 (44.44%) central libraries are using for creating awareness about library collection and services whereas 2 (22.22%) are using for the promotional activities and users education programme and 3 (33.34%) for getting feedback/sharing the problems to the users.

Section 6: Problems and Issues

5.1.32 Problems during Implementation of ICT Applications

There may be many kinds of problems arise in the time of planning and implementation of the information communication technology applications in the library and information centres. Analysis of problems during implementation of ICT applications are represented in the below table 5.1.32.

Analysis of the data in the table no. 5.1.32 exhibits that the facing problems during implementation of ICT applications in the central libraries of Indian Institutes of Technology where in old IITs, Librarians (28.57%) of IIT Madras and IIT Guwahati face the problem at the time of implementation of ICT applications while five (71.43%) old IIT Librarians (IIT Kharagpur, IIT Bombay, IIT Kanpur, IIT Delhi and IIT Madras) say that there is no problem while implementing the ICT applications.

Table: 5.1.32 Facing Problems during Implementation of ICT Applications

Indian Institutes of Technology		Yes	No
Old IITs (N=7)	IITKGP	-	√
	IITB	-	√
	IITM	√	-
	IITK	-	√
	IITD	-	√
	IITG	√	-
	IITR	-	√
Total		2 (28.57)	5 (71.43)
New IITs (N=9)	IITP	√	-
	IITH	√	-
	IITGN	√	-
	IITBBS	-	√
	IITRPR	-	√
	IITJ	-	√
	IITI	-	√
	IIT Mandi	√	-
	IITBHU	√	-
	Total		5 (55.55)

(Figures with in parenthesis are percentage)

In the new IITs, 5 (55.55%) respondents (IIT Patna, IIT Hyderabad, IIT Gandhinagar, IIT Mandi and IIT BHU) are facing problems during implementation of ICT applications in the central libraries of Indian Institutes of Technology while four respondents say that there is no problem while implementing the ICT applications.

5.1.33 Different Problems during Implementation of ICT Applications

There are many kinds of problems may be faced by library professionals in the implementation of information communication technology such as non-administrative supports, un-willingness of the staff, trained manpower, financial support etc. Analysis of the problems during implementation of ICT applications are represented in the below table 5.1.33.

Table: 5.1.33 Different types of Problems faced during Implementation of ICT Applications

Purpose	Old IITs (N=9)								New IITs (N=9)									
	IIT KGP	IIT B	IITM	IITK	IITD	IITG	IITR	Total /%	IITP	IITH	IITGN	IIT BBS	IIT RPR	IITJ	IITI	IIT Mandi	IIT BHU	Total/%
Scarcity/Paucity of Funds	-	-	-	-	-	√	-	1 (14.28)	-	-	-	-	-	-	-	-	√	1 (11.11)
Lack of ICT Infrastructure	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	1 (11.11)
Inadequate Trained Professionals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	1 (11.11)
Increasing Cost of Hardware and Software	-	-	√	-	-	√	-	2 (28.57)	√	-	√	-	-	-	-	√	√	4 (11.11)
Implementation of latest device and gadgets	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	1 (11.11)
Lack of co-operation and co-ordination among staff	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	1 (11.11)
Lack of support from higher authority	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	1 (11.11)
Non Availability of Consultancy Services	-	-	√	-	-	√	-	2 (28.57)	-	-	-	-	-	-	-	-	√	1 (11.11)
In Selection of open vs. Commercial software	-	-	√	-	-	√	-	2 (28.57)	-	√	√	-	-	-	-	-	√	1 (11.11)
Server vs. cloud computing technology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	1 (11.11)

(Figures with in parenthesis are percentage and multiple answers were permitted)

The table no. 5.1.33 inspects the different types of problems during implementation of ICT applications in the central libraries of Indian Institutes of Technology. In old IITs, one respondent says that facing problem due to scarcity/paucity of funds, two respondent say that because of increasing cost of hardware and software, non-availability of consultancy services and in selection of open vs. commercial software.

In new IITs, four respondents say that facing problems due to increasing cost of hardware and software while only one respondent say that facing problem because of scarcity/paucity of funds, non-availability of consultancy services, selection of open vs. commercial software, lack of ICT infrastructure, inadequate trained professionals, implementation of latest device and gadgets, lack of co-operation and co-ordination among staff, lack of support from higher authority and server vs. cloud computing technology.

5.2. Analysis of Data Collected from the Users of the Indian Institutes of Technology

On the basis of analysis, results and inferences were drawn and proposed null hypotheses were statistically tested. The measurable examination of the information for the current investigation was finished by utilizing a straightforward Chi-Square test for expressed theory as it were. The Chi-Square test is a vital trial of noteworthiness and is utilized to figure a watched gathering of frequencies from the null hypothesis (Kothari, 2004). The level of significance testing was set at 0.05. The factual investigation of the information of the present examination was finished by utilizing SPSS version -20 Software. Chi-Square Formula:

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

Where, O stands for observed frequency, E stands for expected frequency and Σ , summation. The researcher has fixed the 0.05 level of significance for the testing of stated research hypothesis.

5.2.1 Distribution and Receiving of Questionnaire

Table No. 5.2.1 reveals that the highest 404 (96.19%) No. of responses were found from the users of Old Indian Institutes of Technology (Indian Institute of Technology Kharagpur, IIT Bombay, IIT Madras, IIT Kanpur, IIT Delhi, IIT Guwahati and IIT Roorkee) while 404 (91.67%) of responses were received from New (IIT Patna, IIT Hyderabad, IIT Gandhinagar, IIT Bhubaneswar, IIT Ropar, IIT Jodhpur, IIT Indore, IIT Mandi and IIT BHU).

Table 5.2.1 Distribution and Receiving of Questionnaire

Indian Institutes of Technology		Questionnaire Distributed	Questionnaire received
Old IITs (N= 404)	IITKGP	60	58 (96.67)
	IITB	60	51 (85.00)
	IITM	60	55 (91.67)
	IITK	60	60 (100.00)
	IITD	60	60 (100.00)
	IITG	60	60 (100.00)
	IITR	60	60 (100.00)
Total		420	404 (96.19)
New IITs (N=495)	IITP	60	50 (83.33)
	IITH	60	60 (100.00)
	IITGN	60	60 (100.00)
	IITBBS	60	60 (100.00)
	IITRPR	60	52 (86.67)
	IITJ	60	60 (100.00)
	IITI	60	42 (70.00)
	IIT Mandi	60	51 (85.00)
	IITBHU	60	60 (100.00)
Total		540	495 (91.67)

(Figures with in parenthesis are percentage)

The table 5.2.1 exhibits that users' response of different Indian Institutes of Technology. The results shows that highest response rate was 100% from many old

and new IITs like IIT Kanpur, IIT Delhi, IIT Guwahati, IIT Rooraki, IIT Gandhinagar, IIT Hyderabad, IIT Bhubneshwar, IIT Jodhpur and IIT (BHU). Lowest responses were received from IIT Bombay (85.00%) in old IITs and IIT Indore (70.00%) in new IITs in comparison to all IITs.

In old IITs, 96.67%, 91.67% and 85.00% responses have been given by the users of IIT Kharagpur, IIT Madras and IIT Bombay respectively. In New IITs 86.67%, 85.00%, 83.33% and 70.00% have been responded by the users of IIT Ropar IIT, IIT Mandi, IIT Patna and IIT Indore respectively.

5.2.2 Gender wise Respondents

The data were collected from the male as well as female users of the central libraries of old and new IITs. The data are presented in the table 5.2.2 below.

Table 5.2.2 Gender wise Respondents

Indian Institutes of Technology		Male	Female
Old IITs (N= 404)	IITKGP 58	47 (81.03)	11 (18.97)
	IITB 51	48 (94.12)	3 (5.88)
	IITM 55	43 (78.18)	12 (21.81)
	IITK 60	41 (68.33)	19 (31.67)
	IITD 60	45 (75.00)	15 (25.00)
	IITG 60	57 (95.00)	3 (5.00)
	IITR 60	47 (78.33)	13 (21.67)
Total		328 (81.19)	76 (18.81)
New IITs (N=495)	IITP 50	46 (92.00)	4 (8.00)
	IITH 60	53 (88.33)	7 (11.67)
	IITGN 60	47 (78.33)	13 (21.67)
	IITBBS 60	56 (93.33)	4 (6.67)
	IITRPR 52	42 (80.77)	10 (19.23)
	IITJ 60	46 (76.67)	14 (23.33)
	IITI 42	37 (88.09)	5 (11.01)
	IIT Mandi 51	42 (82.35)	9 (17.65)
	IITBHU 60	48(80.00)	12(20)
Total		417 (84.24)	78 (15.76)

(Figures within parenthesis are percentage)

It has been observed from the table and 5.2.2 that 81.19% respondents are male and 18.81% respondents are female where as in new IITs, 84.24% respondents are male and only 15.76% respondents are female.

5.2.3 Designation of Respondents

Data of the users of central libraries of old and new IITs are categorised into the under graduate students, post graduate students and research scholars. The analysis for same is presented in the table 5.2.3 below.

Table 5.2.3 Designation of Respondents

Indian Institutes of Technology		UG	PG	Research Scholar
Old IITs (N= 404)	IITKGP 58	21 (36.21)	24 (41.38)	13 (22.41)
	IITB 51	15 (29.41)	23 (45.09)	13 (22.41)
	IITM 55	29 (52.73)	10 (18.18)	16 (29.09)
	IITK 60	23 (38.33)	29 (48.33)	8 (13.33)
	IITD 60	22 (36.67)	29 (48.33)	9 (15.00)
	IITG 60	18 (30.00)	25 (41.67)	17 (28.33)
	IITR 60	20 (33.33)	34 (56.67)	6 (10.00)
Total		148 (36.64)	174 (43.06)	82 (20.29)
New IITs (N=495)	IITP 50	12 (24.00)	28 (56.00)	10 (20.00)
	IITH 60	18 (30.00)	28 (46.67)	14 (23.33)
	IITGN 60	27 (45.00)	23 (38.33)	10 (16.67)
	IITBBS 60	13 (21.67)	31 (51.67)	16 (26.67)
	IITRPR 52	18 (34.62)	19 (36.54)	15 (28.85)
	IITJ 60	39 (65.00)	17 (28.33)	4 (6.67)
	IITI 42	11 (26.19)	22 (52.38)	9 (21.43)
	IIT Mandi 51	32 (62.75)	10 (19.61)	9 (17.65)
	IITBHU 60	40 (66.67)	15 (25.00)	5 (8.33)
Total		210 (42.42)	193 (38.99)	92 (18.59)

(Figures within parenthesis are percentage)

Table 5.2.3 reveals that the designation of the respondents of Indian Institutes of Technology. It is clear that in old IITs, highest (43.06%) numbers of respondents are post graduate while 36.63% of respondents are under graduate and lowest numbers of respondents are research scholars in old Indian Institutes of Technology.

In new IITs, highest (42.42%) numbers of respondents are under graduate whereas 38.99% are post graduate and lowest numbers (18.59%) of respondents are research scholars in new Indian Institutes of Technology.

5.2.4 Age wise Respondents

For the analysis of age wise respondents of IITs, three categories were prepared in the questionnaire. The analysis for the same is presented in the table 5.2.4 below.

Table 5.2.4 Age wise Respondents

Indian Institutes of Technology		<20	20-25	More than 26
Old IITs (N= 404)	IITKGP 58	9 (15.52)	37 (63.79)	12 (20.69)
	IITB 51	19 (37.25)	27 (52.94)	5 (9.80)
	IITM 55	19 (34.54)	19 (34.54)	17 (30.90)
	IITK 60	7 (11.67)	46 (76.67)	7 (11.67)
	IITD 60	00	40 (66.67)	20 (33.33)
	IITG 60	14 (23.33)	31 (51.67)	15 (25.00)
	IITR 60	10 (16.67)	46 (76.67)	4 (6.67)
Total		78 (19.30)	246 (60.90)	80 (19.80)
New IITs (N=495)	IITP 50	11 (22.00)	25 (50.00)	14 (28.00)
	IITH 60	12 (20.00)	33 (55.00)	15 (25.00)
	IITGN 60	10 (16.67)	46 (76.67)	4 (6.67)
	IITBBS 60	9 (15.00)	36 (60.00)	15 (25.00)
	IITRPR 52	13 (25.00)	27 (51.92)	12 (23.08)
	IITJ 60	30 (50.00)	21 (35.00)	9 (15.00)
	IITI 42	6 (14.28)	25 (59.52)	11 (26.19)
	IIT Mandi 51	11 (21.57)	35 (68.63)	5 (9.80)
	IITBHU 60	20 (33.333)	33 (55)	7 (11.67)
Total		122 (24.65)	281 (56.77)	92 (18.58)

(Figures within parenthesis are percentage)

It is observed from the table 5.2.4 that in the old IITs, highest 246 (60.90%) of respondents are between 20-25 years old, 80 (19.80%) respondents are more than 26year old and lowest 78 (19.30%) respondents are less than 20 years old whereas in new IITs, highest 281 (56.77%) respondents are 20-25 years old, 122 (24.65%) respondents are less than 20 years old and lowest 92 (18.58%) respondents are more

than 26 years old. It is clear that most of the respondents are from 20-25 years age from both old and new IITs.

5.2.5 Frequency of users visit in the Library

Before observing the purpose of visit to the library, it is also very necessary to know the frequency of visit to the library of users of IITs. For the convenience of the study the frequency of visit has been classified into five categories as shown in table number 5.2.4.

Table 5.2.5 Frequency of users visit in the Library

Indian Institutes of Technology		Daily	Twice a week	Weekly	Monthly	When Needed
Old IITs (N= 404)	IITKGP 58	21(36.21)	16 (27.59)	2 (3.45)	1 (1.72)	18 (31.03)
	IITB 51	9 (17.65)	8 (15.69)	5 (9.80)	4 (7.84)	16 (31.37)
	IITM 55	14 (25.45)	15 (27.00)	4 (7.27)	2 (3.64)	20 (36.36)
	IITK 60	32 (53.33)	10 (16.67)	21(35.00)	-	16 (26.67)
	IITD 60	46 (76.67)	4 (6.67)	2 (3.33)	2 (3.33)	4 (6.67)
	IITG 60	6 (10.00)	8 (13.33)	4 (6.67)	2 (3.33)	32 (53.33)
	IITR 60	31 (51.67)	8 (13.33)	3 (3.00)	-	18 (30.00)
Total		159 (39.36)	69 (17.08)	41 (10.15)	11 (2.72)	124 (30.69)
New IITs (N=495)	IITP 50	10 (20.00)	8 (16.00)	4 (8.00)	3 (6.00)	23 (46.00)
	IITH 60	10 (16.67)	5 (8.33)	3 (5.00)	2 (3.33)	39 (65.00)
	IITGN 60	24 (40.00)	9 (15.00)	6 (10.00)	-	20 (33.33)
	IITBBS 60	4 (6.67)	11 (18.33)	13 (21.67)	7 (11.67)	25 (41.67)
	IITRPR 52	35 (67.31)	1 (1.92)	1 (1.92)	-	13 (25.41)
	IITJ 60	7 (11.67)	12 (20.00)	11 (18.33)	12 (20.00)	24 (40.00)
	IITI 42	9 (21.43)	5 (11.90)	6 (14.29)	3 (7.14)	19 (45.24)
	IIT Mandi 51	27 (52.94)	8 (15.69)	3 (5.88)	1 (1.96)	12 (23.53)
	IITBHU 60	23 (38.33)	14 (23.33)	2 (3.33)	-	21 (35.00)
Total		149 (30.10)	73 (14.75)	49 (9.90)	28 (5.66)	196 (39.59)

(Figures within parenthesis are percentage)

Above table explores that in old IITs, the highest 159 (39.36%) number of users visit library daily, followed by 124 (30.69%) users visit when they need, 69 (17.08%) number of users visit library twice a week, 41 (10.15%) number of users visit weekly and lowest 11 (2.72%) number of users visit library monthly.

In new IITs, highest 196 (39.59%) number of users visit library when they need followed by 149(30.20%) number of users visit library daily, 73 (14.75%) number of users visit library twice a week, 49 (9.90%) number of users visit weekly while lowest 28 (5.66%) number of users visit library monthly.

5.2.6 Reasons for not visiting library frequently (daily or twice a week)

It is very necessary to know the reason for not visiting library frequently (daily or twice a week) to know this, analysis has been categorised in the table 5.2.6.

Table 5.2.6 depicts that in old IITs, highest 99(56.25%) number of users do not visit library frequently because information is available on desktop followed by 79 (44.89%) number of users do not visit due to shortage of time, 44 (25.00%) number of users do not visit library frequently to do research work, 25(14.20%) number of users do not visit library frequently because required information is not available in library and 11 (6.25%) number of users do not visit library frequently due to inconvenient library hours, busy on old schedule etc.

In new IITs, highest 144 (52.75%) number of users do not visit library frequently because information is available on desktop followed by 124 (45.42%) number of users do not visit due to shortage of time, 62 (22.71%) number of users do not visit library frequently to do research work, 46(16.85%) number of users do not visit library frequently because required information is not available in library and 24 (8.70%) number of users do not visit library frequently due to inconvenient library hours, busy on old schedule etc.

Table 5.2.6 Reasons for not visiting library frequently (daily or twice a week)

Indian Institutes of Technology		To do research work	Shortage of time	Required info. not available	Info. available on desktop	Any other
Old IITs (N= 176)	IITKGP 21	5 (23.81)	12 (57.14)	2 (9.52)	8(38.09)	2 (9.52)
	IITB 25	11 (44.00)	19 (76.00)	7 (28.00)	21 (84.00)	3 (12.00)
	IITM 26	6 (23.07)	8 (30.77)	1 (3.84)	14 (53.85)	2 (7.69)
	IITK 37	2 (5.40)	5 (13.51)	1 (2.70)	10 (27.02)	1 (2.70)
	IITD 8	2 (25.00)	2 (25.00)	0	4 (50.00)	0
	IITG 38	15 (39.48)	19 (50.00)	12 (31.58)	33 (86.84)	2 (5.26)
	IITR 21	3 (14.28)	14 (66.67)	2 (9.52)	9 (42.85)	1 (4.76)
Total		44 (25.00)	79 (44.89)	25 (14.20)	99 (56.25)	11(6.25)
Chi-Square Calculated Value (X^2)=18.209, Degree of freedom = 24.0 and p value = 0.792 ($\leq .05$ non-significant) Chi-square Critical Value (Tabulated Value) = 36.415						
New IITs (N=273)	IITP 30	8 (26.67)	26 (86.67)	15 (50.00)	17 (56.67)	3 (10.00)
	IITH 44	16 (36.36)	23 (52.27)	11 (25.00)	29 (65.90)	2 (4.54)
	IITGN 26	8 (30.77)	11 (42.31)	1 (3.85)	12 (46.15)	3 (11.54)
	IITBBS 45	0	10 (4.5)	6 (13.33)	29 (64.44)	3 (6.67)
	IITRPR 14	2 (14.29)	6 (42.86)	1 (7.14)	7 (50.00)	1 (7.14)
	IITJ 47	16 (34.04)	14 (29.79)	3 (6.38)	22 (46.81)	1 (2.13)
	IITI 28	7 (25.00)	18 (64.29)	6 (21.43)	17 (60.71)	3 (10.71)
	IIT Mandi 16	3 (18.75)	5 (31.25)	1 (6.25)	3 (18.75)	4 (25.00)
	IITBHU 23	2 (8.70)	11 (47.83)	2 (8.70)	8 (34.78)	4 (17.39)
Total		62 (22.71)	124 (45.42)	46 (16.85)	144 (52.75)	24 (8.79)
Chi-Square Calculated Value (X^2)=64.26, Degree of freedom = 32.0 and p value = 0.0006 ($\leq .05$ significant) Chi-square Critical Value (Tabulated Value) = 46.194						

(Multiple answers were permitted & Figures within parenthesis are percentage)

For the old IITs, the Chi-square calculated value is **18.209** which is smaller than Chi-square tabulated or critical value. Therefore, the results of table indicated the no significant variation and for the new IITs, the results of Chi-Square test indicated that the chi square calculated value is **64.26**, which is higher than Chi-square tabulated critical value also indicated the significant variations.

The above data was analysed using Chi-Square test. For old IITs, $X^2 = 18.209$, $p = 0.792$ (≤ 0.05 non-significant), There is no significant difference in reasons for not visiting the library frequently.

For new IITs, $X^2 = 64.26$, $p = 0.0006$ (≤ 0.05 significant), There is a significant difference in reasons for not visiting library frequently.

5.2.7 Purpose of visit to the Library

The analysis shown in the table 5.2.7 reveals the purpose of visit to the library. In old IITs, highest 208 (51.49%) users visit for reading subject books followed by 154 (38.12%) number of users visit for borrowing and returning books, 152(30.71%) number of users visit for consulting reference books, 146 (29.49%) number of users visit for completing their class assignments, 119 (29.46%) number of users visit library for purpose of reading general books, 97 (19.59%) number of users visit library for purpose of getting reference service, 89 (22.03) number of users visit library for purpose of reading newspapers and magazines and lowest 57 (11.51) number of number of users visit library for other reasons that are good ambience, for preparing competitive exam, peaceful place & better environment, AC, to study in peace, quite place to work, to do research work, to complete thesis work, to read story book, to use computers, Wi-Fi and internet.

In new IITs, highest 273 (55.15%) numbers of users visit for reading subject books followed by 271 (54.75%) number of users visit for borrowing and returning books, 170 (34.34%) number of users visit for reading newspapers and magazines, 144(29.09%) number of users visit for reading general books, 129 (31.93%) number of users visit for completing class assignment, 61 (15.35%) number of users visit library for any other reason like good ambience, for preparing competitive exam, peaceful place & better environment, AC, to study in peace, quite place to work, to do research work, to complete thesis work, to read story book, to use computers, wi-fi and internet and lowest 51 (12.62%) number of users visit for getting reference service.

Table 5.2.7 Purpose of visit to the Library

Purpose of visit to the Library	Old IITs (N= 404)							New IITs (N=495)										
	IIT KGP 58	IIT B 51	IITM 55	IITK 60	IITD 60	IITG 60	IITR 60	Total	IITP 50	IITH 60	IITGN 60	IIT BBS 60	IIT RPR 52	IITJ 60	IITI 42	IIT Mlandi 51	IIT BHU 60	Total
borrow and return the books	28 (48.28)	32 (62.74)	29 (52.73)	17 (28.33)	8 (13.33)	21 (35.00)	19 (31.67)	154 (38.12)	26 (52.00)	26 (42.33)	43 (71.67)	39 (65)	27 (51.92)	46 (76.67)	32 (76.19)	11 (21.57)	21 (35.00)	271 (54.75)
read general books	22 (37.93)	18 (35.29)	13 (23.64)	12 (20.00)	21 (35.00)	11 (18.33)	22 (36.67)	119 (29.46)	11 (22.00)	11 (18.33)	27 (45.00)	17 (28.33)	30 (57.69)	10 (16.67)	8 (19.05)	5 (9.80)	25 (41.67)	144 (29.09)
read newspapers /magazines	21(36.21)	12 (23.53)	2 (3.64)	3 (5)	14 (23.33)	13 (21.67)	21 (35.00)	89 (22.03)	17 (34.00)	17 (28.33)	21 (35.00)	23 (38.33)	23 (44.23)	20 (33.33)	11 (26.19)	7 (13.72)	31 (51.67)	170 (34.34)
read subject books	35 (60.34)	19 (37.25)	26 (47.27)	38 (63.33)	34 (56.67)	17 (28.33)	39 (65.00)	208 (51.49)	22 (44.00)	35 (58.33)	32 (53.33)	39 (65.00)	37 (71.15)	31 (51.67)	22 (52.38)	21 (41.17)	34 (56.67)	273 (55.15)
consult reference books	23 (39.66)	11 (21.57)	21 (38.18)	20 (33.33)	12 (20.00)	15 (25.00)	16 (26.67)	152 (30.71)	9 (18.00)	17 (28.33)	32 (53.33)	17 (28.33)	22 (42.31)	21 (35.00)	9 (21.43)	6 (11.76)	19 (31.67)	118 (29.21)

complete class assignments	23 (39.66)	8 (13.79)	9 (15.52)	<p>Chi-Square Calculated Value (X^2)=105.126, Degree of freedom = 42.0 and p value = 2.5e-7(\leq.05 significant) Chi-square Critical Value (Tabulated Value) = 58.124</p>	<p>Chi-Square Calculated Value (X^2)=103.867, Degree of freedom = 56.0 and p value = 0.0001 (\leq.05 significant) Chi-square Critical Value (Tabulated Value) = 74.468</p>
get reference service	31 (56.36)	5 (9.09)	12 (21.82)		
	24 (40.00)	6 (10)	19 (31.67)		
	16 (26.67)	7 (11.67)	10 (16.67)		
	14 (23.33)	8 (13.33)	6 (10.00)		
	16 (26.67)	10 (16.67)	4 (6.67)		
	146 (29.49)	97 (19.59)	57 (11.51)		
	18 (36.00)	11 (22.00)	10 (20.00)		
	15 (25.00)	11 (18.33)	5 (8.33)		
	23 (38.33)	10 (16.67)	7 (11.67)		
	7 (11.67)	13 (21.67)	8 (13.33)		
	24 (46.15)	10 (19.23)	4 (7.69)		
	22 (36.67)	12 (20.00)	2 (3.33)		
	17 (40.48)	15 (35.71)	3 (7.14)		
	11 (21.57)	7 (13.72)	3 (5.88)		
	9 (15.00)	8 (13.33)	15 (25.00)		
	129 (31.93)	51 (12.62)	61 (15.35)		

(Multiple answers were permitted & Figures within parenthesis are percentage)

For the old IITs, the Chi-square calculated value is **105.126** which is higher than Chi-square tabulated or critical value. Therefore, the results of table indicated the significant variation and for the new IITs, the results of Chi-Square test indicated that the chi square calculated value is **103.867**, which is higher than Chi-square tabulated critical value also indicated the significant variations.

The above data was analysed using Chi-Square test. For the old IITs, $X^2 = 105.126$, $p = 2.5e-7$ (≤ 0.05 significant), There is a significant difference in purpose of visit to the Library.

For new IITs, $X^2 = 103.867$, $p = 0.0001$ (≤ 0.05 significant), There is a significant difference in purpose of visit to the Library.

5.2.8 Information Communication Technology based services

Table 5.2.8 explores the information Communication Technology based services where in old IITs, highest 300 (74.26%) users of library agree with the use of online library catalogue, 200 (49.50%) numbers of users use reservation of book service, 199 (49.28%) library users use online access of electronic resources, 156 (38.61%) number of users use automatic issue and return of book service, 134 (33.17%) number of users agree with the use of digital reference service, 93 (23.02%) number of users use remote access service of the library, 86 (21.29%) numbers of users use in house digital collection service, 85 (21.04%) numbers of users use online user education service, 78 (19.31%) numbers of users use instant messaging service of library, lowest 60 (14.85%) numbers of users use library for CD-ROM access on campus network.

Table 5.2.8 Information Communication Technology based services

ICT based services	Old IITs (N= 404)										New IITs (N= 495)									
	Total 404	IITR 60	IITG 60	IITD 60	IITK 60	IITM 55	IIT B 51	IIT KGP 58	Total 495	IITP 50	IITH 60	IITGN 60	IIT BBS 60	IITRPR 52	IITJ 60	IITI 42	Mandi 51	IIT BHU 60		
Instant messaging	78 (19.31)	17 (28.33)	8 (13.33)	9 (15.00)	7 (11.67)	12 (21.82)	11 (21.57)	14 (24.14)	16 (32.00)	12 (20.00)	20 (33.33)	18 (30.00)	15 (28.85)	27 (45)	9 (21.43)	5 (9.80)	4 (6.67)			
Automatic issue and return of books	156 (38.61)	21 (35.00)	15 (25.00)	34 (56.67)	13 (21.67)	43 (78.18)	18 (35.29)	12 (20.69)	22 (44.00)	17 (28.33)	14 (23.33)	37 (61.67)	36 (69.23)	29 (48.33)	17 (40.48)	21 (41.18)	13 (21.67)			
Online library catalogue	300 (74.28)	42 (70.00)	49 (89.67)	44 (73.33)	45 (75.00)	39 (70.91)	39 (76.47)	42 (72.41)	29 (58.00)	35 (58.33)	55 (91.67)	42 (70.00)	34 (65.38)	40 (66.67)	32 (76.19)	7 (13.73)	24 (40.00)			
Reservation of books	200 (49.50)	21 (35.00)	40 (66.67)	26 (43.33)	31 (51.67)	36 (65.45)	28 (54.90)	18 (31.03)	10 (20.00)	32 (52.33)	48 (80.00)	39 (65.00)	31 (59.62)	14 (23.33)	27 (64.29)	13 (25.49)	20 (33.33)			
Remote Acces	93 (23.02)	14 (23.00)	21 (33.33)	14 (33.33)	11 (18.33)	15 (27.27)	7 (13.73)	11 (18.96)	16 (32.00)	11 (18.33)	21 (35.00)	14 (23.33)	15 (28.84)	24 (40)	11 (26.19)	7 (13.73)	9 (15.00)			

Online access of electronic resources	182 (36.77)	89 (17.99)	127 (25.66)	81 (16.36)	93 (18.79)
CD-ROM access on the campus network	16 (26.67)	6 (10.00)	19 (31.67)	9 (15.00)	5 (8.33)
Digital reference Service	6 (11.76)	3 (5.88)	4 (7.84)	6 (11.76)	13 (25.49)
In-house digital collection	9 (21.34)	6 (14.29)	8 (19.05)	7 (16.67)	13 (30.95)
Online user education	25 (41.67)	5 (8.33)	20 (33.33)	7 (11.67)	11 (18.33)
	21 (40.38)	10 (19.23)	19 (36.54)	7 (13.56)	12 (23.08)
	33 (55.00)	15 (25.00)	11 (18.33)	11 (18.33)	7 (11.77)
	35 (58.33)	20 (33.33)	30 (50.00)	17 (28.33)	17 (28.33)
	22 (36.67)	13 (21.67)	9 (15.00)	8 (13.33)	7 (11.67)
	17 (34.00)	11 (22.00)	7 (14.00)	9 (18.00)	8 (16.00)
	199 (49.28)	60 (14.85)	134 (33.17)	86 (21.29)	85 (21.04)
	34 (56.67)	10 (16.67)	20 (33.33)	10 (16.67)	18 (30.00)
	32 (53.33)	9 (15.00)	11 (18.33)	15 (25.00)	8 (13.33)
	32 (53.33)	12 (20.00)	20 (33.33)	16 (26.67)	15 (25.00)
	22 (36.67)	2 (3.33)	12 (20.00)	7 (11.67)	6 (10.00)
	28 (50.91)	7 (12.73)	23 (40.82)	12 (21.82)	14 (25.45)
	23 (45.10)	13 (25.49)	15 (29.41)	11 (21.57)	10 (19.61)
	28 (48.27)	7 (12.07)	33 (56.90)	15 (25.86)	14 (24.14)
<p>Chi-Square Calculated Value (X^2) = 92.979, Degree of freedom = 54.0 and p value = 0.0007(≤ 0.05 significant) Chi-square Critical Value (Tabulated Value) = 72.153</p>					
<p>Chi-Square Calculated Value (X^2) = 140.334, Degree of freedom = 72.0 and p value = 0.0000(≤ 0.05 significant) Chi-square Critical Value (Tabulated Value) = 92.808</p>					

(Multiple answers were permitted & Figures within parenthesis are percentage)

In new IITs, highest 298 (60.20%) users of library agree with the use of online library catalogue, 234 (47.27%) numbers of users use reservation of book service, 206 (41.62%) number of users use automatic issue and return of book service, 182 (36.77%) library users use online access of electronic resources, 128 (25.85%) number of users use remote access service of the library, 127 (25.66%) number of users agree with the use of digital reference service, 126 (25.45%) numbers of users use instant messaging service of library, 93 (18.79%) numbers of users use online user education service, 89 (17.99%) numbers of users use library for CD-ROM access on campus network while lowest 81 (16.36%) numbers of users use in house digital collection service.

For the old IITs, the Chi-square calculated value is **92.979** which is higher than Chi-square tabulated or critical value. Therefore, the results of table indicated the significant variation and for the new IITs, the results of Chi-Square test indicated that the chi square calculated value is **140.334**, which is higher than Chi-square tabulated critical value also indicated the significant variations.

The above data was analysed using Chi-Square test. For the old IITs, $X^2 = 92.979$, $p = 0.0007$ (≤ 0.05 significant), There is a significant difference in information communication technology based services.

For the new IITs, $X^2 = 140.334$, $p = 0.0000$ (≤ 0.05 significant), There is a significant difference in information communication technology based services.

5.2.9 Use of Social Networking Sites in the Library

The use of social networking sites are increasing day by day in the libraries to linking up with library users for the promotional activities like users education program, creating awareness about library collection and services, getting feedback or sharing the resources to the users etc. The analysis to know the use of social networking sites is exhibited below in the table.

Table 5.2.9 Use of Social Networking Sites in the Library

Indian Institutes of Technology		Yes	No
Old IITs (N= 404)	IITKGP 58	58 (100.00)	-
	IITB 51	51 (100.00)	-
	IITM 55	55 (100.00)	-
	IITK 60	-	60 (100.00)
	IITD 60	-	60 (100.00)
	IITG 60	-	60 (100.00)
	IITR 60	-	60 (100.00)
Total		164 (40.60)	240 (59.40)
New IITs (N=495)	IITP 50	50 (100.00)	-
	IITH 60	60 (100.00)	-
	IITGN 60	-	60 (100.00)
	IITBBS 60	60 (100.00)	-
	IITRPR 52	52 (100.00)	-
	IITJ 60	-	60 (100.00)
	IITI 42	-	42 (100.00)
	IIT Mandi 51	-	51 (100.00)
	IITBHU 60	-	60 (100.00)
Total		222 (44.85)	273 (55.15)

(Figures within parenthesis are percentage)

It is clear from table 5.2.9 that in old IITs, only 164 (40.60%) users of IITKGP, IITB, IITM are using social networking sites while 240 (59.40%) number of users of IITK IITD IITG and IITR do not use social networking sites.

In new IITs, 222 (44.85%) users of IITP, IITH, IITBBS and IITRPR are using social networking sites while 273 (55.15%) number of users of IITGN, IITJ, IITI, IIT Mandi and IITBHU do not use social networking sites.

5.2.10 Social Networking Sites

It is found from the table 5.2.10 that 118 (71.95%) users use Facebook followed by 98 (59.76%) use YouTube for their activities, 39 (23.78%) users use Twitter while lowest 26 (15.88%) number of users use RSS feed in the old IITs.

Table 5.2.10 Different types Social Networking Sites

Indian Institutes of Technology		Facebook	YouTube	RSS feed	Twitter
Old IITs (N= 164)	IITKGP 58	39 (67.24)	37 (63.79)	9 (15.52)	14 (24.14)
	IITB 51	41 (80.39)	32 (62.74)	7 (13.73)	8 (15.69)
	IITM 55	38 (69.09)	29 (52.73)	10 (18.18)	17 (30.91)
	IITK 60	-	-	-	-
	IITD 60	-	-	-	-
	IITG 60	-	-	-	-
	IITR 60	-	-	-	-
Total		118 (71.95)	98 (59.76)	26 (15.85)	39 (23.78)
New IITs (N=222)	IITP 50	40 (80.00)	33 (66.00)	14 (28.00)	12 (24.00)
	IITH 60	43 (71.67)	32 (53.33)	8 (13.33)	13 (21.67)
	IITGN 60	-	-	-	-
	IITBBS 60	47 (78.33)	39 (65.00)	12 (20.00)	9 (15.00)
	IITRPR 52	38 (73.08)	37 (71.15)	9 (17.30)	13 (25.00)
	IITJ 60	-	-	-	-
	IITI 42	-	-	-	-
	IIT Mandi 51	-	-	-	-
	IITBHU 60	-	-	-	-
Total		168 (75.67)	141 (63.51)	43 (19.37)	47 (21.17)

(Multiple answers were permitted, figures with in parenthesis are percentage)

In new IITs, 168 (75.67%) number of users use Facebook followed by 141 (63.51%) number of users use YouTube for their activities, 47 (21.17%) number of users use Twitter while lowest 43 (19.37%) number of users use RSS feed.

5.2.11 Satisfaction with the digitized collection

It is revealed from table 5.2.11 that 374 (92.57%) number of users are satisfied with the digitized collection of central libraries of old IITs while 30 (7.43%) number of users are not satisfied with the digitized collection of old IITs.

In new IITs, 441 (89.09%) number of users are satisfied with the digitized collection of central libraries while 54 (10.91%) number of users are not satisfied with the digitized collection.

Table 5.2.11 Satisfaction with the digitized collection

Indian Institutes of Technology		Yes	No
Old IITs (N= 404)	IITKGP 58	50 (86.21)	8 (13.79)
	IITB 51	48 (94.12)	3 (5.88)
	IITM 55	52 (94.54)	3 (5.46)
	IITK 60	55 (91.67)	5 (8.33)
	IITD 60	59 (98.33)	1 (1.67)
	IITG 60	52 (86.67)	8 (13.33)
	IITR 60	58 (96.67)	2 (3.33)
Total		374 (92.57)	30 (7.43%)
Chi-Square Calculated Value (X^2) = 11.38, Degree of freedom = 6.0 and p value = 0.772 (≤ 0.05 non-significant) Chi-square Critical Value (Tabulated Value) = 12.592			
New IITs (N=495)	IITP 50	42 (84.00)	8 (16.00)
	IITH 60	56 (93.33)	4 (6.67)
	IITGN 60	58 (96.67)	2 (3.33)
	IITBBS 60	52 (86.67)	8 (13.33)
	IITRPR 52	48 (92.31)	4 (6.69)
	IITJ 60	53 (88.33)	7 (11.67)
	IITI 42	37 (88.10)	5 (11.90)
	IIT Mandi 51	42 (82.35)	9 (17.65)
	IITBHU 60	53 (88.33)	7 (11.67)
Total		441 (89.09)	54 (10.91)
Chi-Square Calculated Value (X^2) = 9.40, Degree of freedom = 8.0 and p value = 0.3097 (≤ 0.05 non-significant) Chi-square Critical Value (Tabulated Value) = 15.507			

(Figures within parenthesis are percentage)

For the old IITs, the Chi-square calculated value is **11.38** which is smaller than Chi-square tabulated or critical value. Therefore, the results of table indicated the no significant variation and for the new IITs, the results of Chi-Square test indicated that the chi square calculated value is **9.40**, which is smaller than Chi-square tabulated critical value also indicated the no significant variations.

The above data was analysed using Chi-Square test. For the old IITs, $X^2 = 11.38$, $p = 0.772$ (≤ 0.05 non-significant), There is no significant difference in satisfaction with the digitized collection.

For the new IITs, $X^2 = 140.334$, $p = 0.3097$ (≤ 0.05 non-significant), There is a no significant difference in satisfaction with the digitized collection.

5.2.12 Satisfaction Level with the digitized collection

Table 5.2.12 reveal that opinion about the use of digital collection where in old IITs, highest 161 (43.05%) number of users said that digital collection is highly useful while 158 (42.25%) number of users agree with the digital collection is moderately useful where lowest 55 (14.70%) users said that digital collection is slightly useful for library users.

Table 5.2.12 Satisfaction Level with the digitized collection

Indian Institutes of Technology		Highly useful	Moderately useful	Slightly useful
Old IITs (N= 374)	IITKGP 50	29 (58.00)	16 (32.00)	5 (10.00)
	IITB 48	19 (39.58)	22 (45.83)	7 (14.58)
	IITM 52	20 (38.46)	25 (48.08)	7 (13.46)
	IITK 55	20 (36.36)	27 (49.09)	8 (14.55)
	IITD 59	29 (49.15)	19 (32.20)	11 (18.64)
	IITG 52	16 (30.77)	26 (50)	10 (19.23)
	IITR 58	28 (48.28)	23 (39.66)	7 (12.07)
Total		161 (43.05)	158 (42.25)	55 (14.70)
Chi-Square Calculated Value (X^2) =13.34, Degree of freedom =12.0 and p value = 0.3446(≤ 0.05 non-significant) Chi-square Critical Value (Tabulated Value) = 21.026				
New IITs (N=441)	IITP 42	16 (38.10)	15 (35.71)	11 (36.19)
	IITH 56	20 (35.71)	28 (50.00)	8 (14.29)
	IITGN 58	22 (37.93)	29 (50.00)	7 (12.07)
	IITBBS 52	26 (50.00)	19 (36.54)	7 (13.46)
	IITRPR 48	17 (35.42)	25 (52.08)	6 (12.50)
	IITJ 53	26 (49.06)	15 (28.30)	12 (22.64)
	IITI 37	11 (29.73)	22 (59.46)	4 (10.81)
	IIT Mandi 42	10 (23.81)	25 (59.52)	7 (16.67)
	IITBHU 53	27 (50.94)	19 (35.85)	7 (13.21)
Total		175 (41.72)	197 (44.67)	69 (15.65)
Chi-Square Calculated Value (X^2) =25.62, Degree of freedom =16.0 and p value = 0.596 (≤ 0.05 non-significant) Chi-square Critical Value (Tabulated Value) = 26.296				

(Figures within parenthesis are percentage)

In new IITs, majority 197 (44.67%) number of users are saying that digital collection is moderately useful whereas 175 (41.72%) number of users said that digital collection is highly useful and 69 (15.65%) number of users said it is slightly useful.

For the old IITs, the Chi-square calculated value is **13.34** which is smaller than Chi-square tabulated or critical value. Therefore, the results of table indicated the no significant variation and for the new IITs, the results of Chi-Square test indicated that the chi square calculated value is **25.62**, which is smaller than Chi-square tabulated critical value also indicated the no significant variations.

The above data was analysed using Chi-Square test. For the old IITs, $X^2 = 13.34$, $p = 0.3446$ (≤ 0.05 non-significant), There is a no significant difference in opinion about the use of digital collection.

For the new IITs, $X^2 = 25.62$, $p = 0.596$ (≤ 0.05 non-significant), There is a no significant difference in opinion about the use of digital collection.

5.2.13 Satisfaction to the Library Services

It is observed from table 5.2.13 that in old IITs, 384 (95.05%) number of users are satisfied with the services of central libraries while 20 (4.95%) number of users are not satisfied with the servicer of libraries.

In new IITs, 449 (90.71%) number of users are satisfied with the services of central libraries while 46 (9.29%) number of users are not satisfied with library services.

Table 5.2.13 Satisfaction to the Library Services

Indian Institutes of Technology		Yes	No
Old IITs (N=404)	IITKGP 58	57 (98.28)	1 (1.72)
	IITB 51	47 (92.16)	4 (7.84)
	IITM 55	55 (100.00)	-
	IITK 60	54 (90.00)	6 (10.00)
	IITD 60	57 (95.00)	3 (5.00)
	IITG 60	56 (93.33)	4 (6.67)
	IITR 60	58 (96.67)	2 (3.33)
Total		384 (95.05)	20 (4.95)
Chi-Square Calculated Value (X^2) = 9.02, Degree of freedom = 6.0 and p value = 0.172 ($\leq .05$ non-significant) Chi-square Critical Value (Tabulated Value) = 12.592			
New IITs (N=495)	IITP 50	44 (88.00)	6 (12.00)
	IITH 60	52 (86.67)	8 (13.33)
	IITGN 60	60 (100.00)	-
	IITBBS 60	55 (91.67)	5 (8.33)
	IITRPR 52	48 (92.31)	4 (7.69)
	IITJ 60	56 (93.33)	4 (6.67)
	IITI 42	39 (92.86)	3 (7.14)
	IIT Mandi 51	45 (88.24)	6 (11.76)
	IITBHU 60	50 (83.33)	10 (16.67)
Total		449 (90.71)	46 (9.29)
Chi-Square Calculated Value (X^2) = 12.93, Degree of freedom = 8.0 and p value = 0.114 ($\leq .05$ non-significant) Chi-square Critical Value (Tabulated Value) = 15.507			

(Figures within parenthesis are percentage)

For the old IITs, the Chi-square calculated value is **9.02** which is smaller than Chi-square tabulated or critical value. Therefore, the results of table indicated the no significant variation and for the new IITs, the results of Chi-Square test indicated that the chi square calculated value is **12.93**, which is smaller than Chi-square tabulated critical value also indicated the no significant variations.

The above data was analysed using Chi-Square test. For the old IITs, $X^2 = 9.02$, $p = 0.172$ ($\leq .05$ non-significant), There is a no significant difference in in satisfaction to the library services.

For the new IITs, $X^2 = 12.93$, $p = 0.114$ ($\leq .05$ non-significant), There is a no significant difference in satisfaction to the library services.

5.2.14 Satisfaction level about the library services

Table 5.2.14 shows the opinion about the library services. In old IITs, 173 (45.05%) number of users are satisfied with the library services, 116 (30.21%) number of users said that they were fully satisfied with library services while 95 (24.74%) number of users are partially satisfied with the services of libraries.

In new IITs, 172 (38.31%) number of users are satisfied with the library services, 139 (30.96%) number of users said that they were fully satisfied with library services while 138 (30.76%) number of users are partially satisfied with the services of libraries.

Table 5.2.14 Satisfaction level about the library services

Indian Institutes of Technology		Fully satisfied	Partially Satisfied	Satisfied
Old IITs (N= 384)	IITKGP 57	23 (40.35)	9 (15.79)	25 (43.86)
	IITB 47	8 (17.02)	18 (38.30)	21 (44.68)
	IITM 55	24 (43.64)	7 (12.73)	24 (43.64)
	IITK 54	7 (12.96)	19 (35.19)	28 (51.85)
	IITD 57	23 (40.35)	7 (12.28)	27 (47.37)
	IITG 56	16 (28.57)	18 (32.14)	22 (39.29)
	IITR 58	15 (25.86)	17 (29.31)	26 (44.83)
Total		116 (30.21)	95 (24.74)	173 (45.05)
Chi-Square Calculated Value (X^2) = 32.91, Degree of freedom = 12.0 and p value = 0.001 (≤ 0.05 significant) Chi-square Critical Value (Tabulated Value) = 21.026				
New IITs (N=449)	IITP 44	12 (27.27)	9 (20.45)	23 (52.27)
	IITH 52	13 (25.00)	14 (26.92)	25 (48.08)
	IITGN 60	27 (45.00)	13 (21.67)	20 (33.33)
	IITBBS 55	25 (45.45)	10 (18.18)	20 (36.36)
	IITRPR 48	16 (33.33)	13 (27.08)	19 (39.58)
	IITJ 56	12 (21.43)	22 (39.29)	22 (39.29)
	IITI 39	13 (33.33)	9 (23.08)	17 (43.59)
	IIT Mandi 45	13 (28.89)	17 (37.78)	15 (33.33)
	IITBHU 50	8 (16.00)	31 (62.00)	11 (42.00)
Total		139 (30.96)	138 (30.76)	172 (38.31)
Chi-Square Calculated Value (X^2) = 46.98, Degree of freedom = 16.0 and p value = 0.0001 (≤ 0.05 significant) Chi-square Critical Value (Tabulated Value) = 26.296				

(Figures within parenthesis are percentage)

For the old IITs, the Chi-square calculated value is **32.91** which is higher than Chi-square tabulated or critical value. Therefore, the results of table indicated the significant variation and for the new IITs, the results of Chi-Square test indicated that the chi square calculated value is **103.867**, which is higher than Chi-square tabulated critical value also indicated the significant variations.

The above data was analysed using Chi-Square test. For the old IITs, $X^2 = 32.91$, $p = 0.001$ (≤ 0.05 significant), There is a significant difference in opinion about the library services.

For the new IITs, $X^2 = 46.98$, $p = 0.0001$ (≤ 0.05 significant), There is a significant difference in opinion about the library services.

5.2.15 Satisfaction with the relevant collection available in library

It is demonstrated from the table 5.2.15 that in old IITs, 374 (92.57%) number of users agreed with satisfaction for the availability of relevant collection in the library while 30 (7.43%) number of users are not satisfied with the availability of relevant collection in the libraries.

In new IITs, 428 (86.46%) number of users agreed with availability of relevant collection in the library while 67 (13.54%) number of users do not agree with the availability of relevant collection in the library.

Table 5.2.15 Satisfaction with the relevant collection available in library

Indian Institutes of Technology		Yes	No
Old IITs (N= 404)	IITKGP 58	57 (98.27)	1 (1.72)
	IITB 51	47 (92.16)	4 (7.84)
	IITM 55	54 (98.18)	1 (1.82)
	IITK 60	51 (85.00)	9 (15.00)
	IITD 60	56 (93.33)	4 (6.67)
	IITG 60	55 (95.67)	5 (8.33)
	IITR 60	54 (90.00)	6 (10.00)
Total		374 (92.57)	30 (7.43)
Chi-Square Calculated Value (X^2) = 10.98, Degree of freedom = 6.0 and p value = 0.0890 (≤ 0.05 non-significant) Chi-square Critical Value (Tabulated Value) = 12.592			
New IITs (N=495)	IITP 50	48 (96.00)	2 (4.00)
	IITH 60	55 (91.67)	5 (8.33)
	IITGN 60	56 (93.33)	4 (6.67)
	IITBBS 60	54 (90.00)	6 (10.00)
	IITRPR 52	38 (70.08)	14 (26.92)
	IITJ 60	49 (81.67)	11 (18.33)
	IITI 42	34 (80.95)	8 (19.05)
	IIT Mandi 51	40 (78.43)	11 (21.57)
	IITBHU 60	54 (90.00)	6 (10.00)
Total		428 (86.46)	67 (13.54)
Chi-Square Calculated Value (X^2) = 22.02, Degree of freedom = 8.0 and p value = 0.0049 (≤ 0.05 significant) Chi-square Critical Value (Tabulated Value) = 15.507			

(Figures within parenthesis are percentage)

For the old IITs, the Chi-square calculated value is **10.98** which is smaller than Chi-square tabulated or critical value. Therefore, the results of table indicated the no significant variation and for the new IITs, the results of Chi-Square test indicated that the chi square calculated value is **22.02**, which is higher than Chi-square tabulated critical value indicated the significant variations.

The above data was analysed using Chi-Square test. For the old IITs, $X^2 = 10.98$, $p = 0.0890$ (≤ 0.05 non-significant), There is a no significant difference in satisfaction with the relevant collection available in library.

For the new IITs, $X^2 = 22.02$, $p = 0.0049$ (≤ 0.05 significant), There is a significant difference in satisfaction with the relevant collection available in library.

5.2.16 Satisfaction level with relevant collection available in the library

Table 5.2.16 depict the opinion with the relevant collection available in the Library in old IITs, 193 (51.60%) number of users said good for the availability of relevant collection whereas 102 (27.27%) number of users said relevant collection of library is very good, lowest 79 (21.12%) number of users said that relevant collection of library is excellent.

In new IITs, 211 (49.30%) number of users said good for the availability of relevant collection whereas 121 (28.27%) number of users said relevant collection of library is very good, lowest 96 (22.43%) number of users said that relevant collection of library is excellent.

Table 5.2.16 Satisfaction level with relevant collection available in the Library

Indian Institutes of Technology		Excellent	Very good	Good
Old IITs (N= 374)	IITKGP 57	13 (22.81)	15 (26.32)	29 (50.88)
	IITB 47	7 (14.89)	16 (34.04)	32 (68.08)
	IITM 54	14 (25.93)	15 (27.78)	22 (40.74)
	IITK 51	8 (15.69)	14 (27.45)	25 (49.02)
	IITD 56	12 (21.43)	9 (16.07)	27 (48.21)
	IITG 55	16 (29.09)	20 (36.36)	26 (27.27)
	IITR 54	9 (16.67)	13 (24.07)	32 (59.26)
Total		79 (21.12)	102 (27.27)	193 (51.60)
Chi-Square Calculated Value (X^2) = 10.21, Degree of freedom = 12.0 and p value = 0.597 (≤ 0.05 non-significant) Chi-square Critical Value (Tabulated Value) = 21.026				
New IITs (N=428)	IITP 48	12 (25.00)	15 (31.25)	21 (43.75)
	IITH 55	14 (25.45)	23 (41.82)	18 (32.73)
	IITGN 56	13 (23.21)	15 (26.79)	30 (53.57)
	IITBBS 54	11 (20.37)	14 (25.93)	21 (38.89)
	IITRPR 38	7 (18.42)	9 (23.68)	21 (55.26)
	IITJ 49	7 (14.28)	10 (20.41)	27 (55.10)
	IITI 34	11 (32.35)	13 (38.23)	10 (29.41)
	IIT Mandi 40	9 (22.50)	11 (27.50)	29 (72.50)
	IITBHU 54	12 (22.22)	11 (20.37)	34 (62.96)
Total		96 (22.43)	121 (28.27)	211 (49.30)
Chi-Square Calculated Value (X^2) = 21.56, Degree of freedom = 16.0 and p value = 0.1578 (≤ 0.05 non-significant) Chi-square Critical Value (Tabulated Value) = 26.296				

(Figures within parenthesis are percentage)

For the old IITs, the Chi-square calculated value is **10.21** which is smaller than Chi-square tabulated or critical value. Therefore, the results of table indicated the no significant variation and for the new IITs, the results of Chi-Square test indicated that the chi square calculated value is **21.56**, which is smaller than Chi-square tabulated critical value also indicated the no significant variations.

The above data was analysed using Chi-Square test. For the old IITs, $X^2 = 10.21$, $p = 0.597 (\leq 0.05 \text{ non-significant})$, There is a no significant difference in opinion with the relevant collection available in the Library.

For the new IITs, $X^2 = 21.56$, $p = 0.157 (\leq 0.05 \text{ non-significant})$, There is a no significant difference in opinion with the relevant collection available in the Library.

5.2.17 Use of Available E-resources in the Library

Table 5.2.17 present the Use of Available E-resources in the Library. In old IITs, 254 (62.87%) number of respondents were using the available e-resources in the Library while 150 (37.13%) number of respondents were not using available e-resources in the library.

In new IITs, 333 (67.27%) number of respondents were using the available E-resources in the Library while 162 (32.73%) number of respondents were not using available e-resources in the Library.

Table 5.2.17 Use of Available E-resources in the Library

Indian Institutes of Technology		Yes	No
Old IITs (N= 404)	IITKGP 58	40 (68.97)	18 (31.03)
	IITB 51	43 (84.31)	8 (15.69)
	IITM 55	29 (52.73)	26 (47.27)
	IITK 60	22 (36.67)	38 (63.33)
	IITD 60	32 (53.33)	28 (46.67)
	IITG 60	51 (85.00)	9 (15.00)
	IITR 60	37 (61.67)	23 (38.33)
Total		254 (62.87)	150 (37.13)
Chi-Square Calculated Value (X^2) = 46.00, Degree of freedom = 6.0 and p value = 2.95e-08 ($\leq .05$ significant) Chi-square Critical Value (Tabulated Value) = 12.592			
New IITs (N=495)	IITP 50	34 (68.00)	16 (32.00)
	IITH 60	48 (80.00)	12 (20.00)
	IITGN 60	50 (80.33)	10 (16.67)
	IITBBS 60	51 (85.00)	9 (15.00)
	IITRPR 52	21 (40.38)	31 (59.62)
	IITJ 60	34 (56.67)	26 (43.33)
	IITI 42	25 (59.52)	17 (40.48)
	IIT Mandi 51	40 (78.43)	11 (21.57)
	IITBHU 60	30 (50.00)	30 (50.00)
Total		333 (67.27)	162 (32.73)
Chi-Square Calculated Value (X^2) = 52.32, Degree of freedom = 8.0 and p value = 1.46e-08 ($\leq .05$ significant) Chi-square Critical Value (Tabulated Value) = 15.507			

(Figures within parenthesis are percentage)

For the old IITs, the Chi-square calculated value is **46.00** which is higher than Chi-square tabulated or critical value. Therefore, the results of table indicated the significant variation and for the new IITs, the results of Chi-Square test indicated that the chi square calculated value is **52.32**, which is higher than Chi-square tabulated critical value also indicated the significant variations.

The above data was analysed using Chi-Square test. For the old IITs, $X^2 = 46.00$, $p = 2.95e-08$ (≤ 0.05 significant), There is a significant difference in use of available E-resources in the library.

For the new IITs, $X^2 = 52.32$, $p = 1.46e-08$ (≤ 0.05 significant), There is a significant difference in use of available E-resources in the library.

5.2.18 Used E-resources of the Library

The aforesaid table 5.2.18 show the used e-resources of the library by users. In old IITs, 150 (59.06%) number of users use e-journals for their study and research, 132 (51.97%) number of users use e-books, 72 (28.35%) number of users use e-database, 64 (25.18%) number of users use e-thesis for research purpose, 47 (18.50%) number of users use E- scholarly content and 3 (1.18%) number of users use E-resources for their various activities like previous year question papers, conference papers and technical reports.

In new IITs, 202 (60.66%) number of users use e-journals for their study and research, 144 (43.24%) number of users use e-books, 91 (27.33%) number of users use e-thesis for research purpose, 86 (25.83%) number of users use e-database, 67 (20.13%) number of users use E- scholarly content and 13 (3.90%) number of users use E-resources for their various activities like previous year question papers, conference papers and technical reports.

For the old IITs, the Chi-square calculated value is **38.39** which is smaller than Chi-square tabulated or critical value. Therefore, the results of table indicated no significant variation and for the new IITs, the results of Chi-Square test indicated that the chi square calculated value is **157.33**, which is higher than Chi-square tabulated critical value also indicated the significant variations.

Table 5.2.18 Used E-resources of the Library

Indian Institutes of Technology	E-Journals	E-Databases	E-Books	E-Theses	E-Scholarly Content	Any other	
Old IITs (N=254)	IITKGP 40	25 (62.50)	9 (22.50)	30 (75.00)	8 (20.00)	8 (20.00)	2 (5.00)
	IITB 43	37 (86.05)	10 (23.06)	12 (27.91)	11 (25.58)	6 (13.95)	-
	IITM 29	19 (65.51)	8 (27.59)	19 (65.51)	8 (27.59)	4 (13.79)	-
	IITK 22	16 (70.72)	10 (45.45)	10 (45.45)	12 (54.54)	9 (40.91)	-
	IITD 32	13 (40.62)	8 (25.00)	14 (43.75)	7 (21.87)	6 (18.75)	-
	IITG 51	23 (45.10)	15 (29.41)	18 (35.29)	10 (19.61)	8 (15.69)	-
	IITR 37	17 (33.33)	12 (23.53)	29 (56.86)	8 (15.69)	6 (11.76)	1 (1.96)
Total	150 (59.06)	72 (28.35)	132 (51.97)	64 (25.18)	47 (18.50)	3 (1.18)	
Chi-Square Calculated Value (X^2) = 38.39, Degree of freedom = 30.0 and p value = 0.1399 (≤ 0.05 non-significant) Chi-square Critical Value (Tabulated Value) = 43.773							
New IITs (N=333)	IITP 34	21 (61.76)	11 (32.35)	15 (44.12)	9 (26.47)	7 (20.59)	-
	IITH 48	23 (47.92)	9 (18.75)	12 (25.00)	13 (27.08)	6 (12.50)	-
	IITGN 50	34 (68.00)	12 (24.00)	22 (44.00)	9 (18.00)	7 (14.00)	-
	IITBBS 51	22 (43.14)	16 (31.37)	13 (25.49)	15 (21.41)	11 (21.57)	-
	IITRPR 21	15 (71.43)	6 (28.57)	14 (66.67)	6 (28.57)	4 (19.05)	13 (61.90)
	IITJ 34	25 (73.53)	11 (32.35)	23 (67.65)	12 (35.29)	8 (23.53)	-
	IITI 25	22 (88.00)	9 (36.00)	14 (56.00)	13 (52.00)	15 (60.00)	-
	IIT Mandi 40	28 (70.00)	7 (17.50)	13 (32.50)	9 (22.50)	7 (17.50)	-
	IITBHU 30	12 (40.00)	5 (16.67)	18 (60.00)	5 (16.67)	2 (6.67)	-
Total	202 (60.66)	86 (25.83)	144 (43.24)	91 (27.33)	67 (20.12)	13 (3.90)	
Chi-Square Calculated Value (X^2) = 157.33, Degree of freedom = 40.0 and p value = 7.75e-16 (≤ 0.05 significant) Chi-square Critical Value (Tabulated Value) = 55.758							

(Multiple answers were permitted & Figures within parenthesis are percentage)

The above data was analysed using Chi-Square test. For the old IITs, $X^2 = 38.39$, $p = 0.1399$ (≤ 0.05 non-significant), There is a no significant difference in use of available E-resources in the library.

For the new IITs, $X^2 = 157.33$, $p = 7.75e-16$ (≤ 0.05 significant), There is a significant difference in use of available e-resources in the library.

5.2.19 Problems faced while using the e-resources of the library

From table 5.2.19, problems faced while using the e-resources of the library is noticed. In the old IITs, 200 (49.50%) respondents were facing problem while using

E-resources, whereas 204 (50.50%) number of users were not facing any type of problem while using E-resources in the library.

In the new IITs, 205 (41.41%) respondents were facing problem while using E-resources, whereas 290 (58.59%) number of users were not facing any type of problem while using E-resources in the library.

Table 5.2.19 Problems faced while using the e-resources of the library

Indian Institutes of Technology		Yes	No
Old IITs (N= 404)	IITKGP 58	30 (51.72)	28 (48.28)
	IITB 51	24 (47.06)	27 (43.14)
	IITM 55	30 (54.54)	25 (45.56)
	IITK 60	27 (45.00)	33 (55.00)
	IITD 60	29 (48.33)	31 (51.67)
	IITG 60	21 (35.00)	39 (65.00)
	IITR 60	39 (65.00)	21 (35.00)
Total		200 (49.50)	204 (50.50)
Chi-Square Calculated Value (X^2) = 12.13, Degree of freedom = 6.0 and p value = 0.592 ($\leq .05$ non-significant) Chi-square Critical Value (Tabulated Value) = 12.592			
New IITs (N=495)	IITP 50	17 (34.00)	33 (66.00)
	IITH 60	10 (16.67)	50 (83.33)
	IITGN 60	30 (50.00)	30 (50.00)
	IITBBS 60	28 (46.67)	32 (53.33)
	IITRPR 52	26 (50.00)	26 (50.00)
	IITJ 60	23 (38.33)	37 (61.67)
	IITI 42	12 (28.57)	30 (71.43)
	IIT Mandi 51	20 (39.22)	31 (60.78)
	IITBHU 60	39 (65.00)	21 (35.00)
Total		205 (41.41)	290 (58.59)
Chi-Square Calculated Value (X^2) = 12.13, Degree of freedom =8.0 and p value = 1.01e-05 ($\leq .05$ significant) Chi-square Critical Value (Tabulated Value) = 15.507			

(Figures within parenthesis are percentage)

For the old IITs, the Chi-square calculated value is **12.13** which is smaller than Chi-square tabulated or critical value. Therefore, the results of table indicated no significant variation and for the new IITs, the results of Chi-Square test indicated that

the chi square calculated value is **12.13**, which is higher than Chi-square tabulated critical value also indicated the significant variations.

The above data was analysed using Chi-Square test. For the old IITs, $X^2 = 12.13$, $p = 0.592$ (≤ 0.05 non-significant), There is a no significant difference in problems faced while using the e-resources of the library.

For the new IITs, $X^2 = 12.13$, $p = 1.01e-05$ (≤ 0.05 significant), There is a significant difference in problems faced while using the e-resources of the library.

5.2.20 Different types of Problems while using the e-resources of the library

It is revealed from the table 5.2.20 that in old IITs, 77 (38.50%) respondents said that they face problem in reading from desktop screen while using the e-resources of the library, 75 (37.50%) users face problem due to unorganised information, 69 (34.50%) users face problem due to inadequate resources, 41 (20.50%) users face problem due to poor connectivity of internet and 3 (1.50%) users face problem due to other reasons like rush at minor time, no discussion room Wi-Fi problem sometimes login account base facilities are out of order.

In new IITs, 11 (55.15%) respondents said that they face problem due to inadequate resources, , 98 (47.80%) users face problem due to poor connectivity of internet, 76 (37.07%) users face problem due to difficulty in reading from screen while using the e-resources of the library, 75 (36.59%) users face problem due unorganised information and 3(1.46%) users face problem due to other reasons like rush at minor time, no discussion room Wi-Fi problem sometimes login account base facilities are out of order Lack of study room.

Table 5.2.20 Different types of Problems while using the e-resources of the library

Indian Institutes of Technology		Inadequate resources	Sometimes Poor connectivity of internet	Unorganized information	Difficult to read from screen	Other
Old IITs (N= 200)	IITKGP 30	8 (26.67)	5 (16.66)	18 (60.00)	10 (33.33)	-
	IITB 24	12 (50.00)	8 (33.33)	13 (54.17)	15 (62.50)	-
	IITM 30	12 (40.00)	14 (46.67)	3 (10.00)	9 (30.00)	-
	IITK 27	6 (22.22)	1 (3.70)	10 (37.03)	11 (40.74)	-
	IITD 29	11 (37.93)	2 (6.90)	6 (20.69)	5 (17.24)	3 (1.34)
	IITG 21	8 (38.09)	7 (33.33)	11 (52.38)	12 (57.14)	-
	IITR 39	12 (30.77)	4 (10.26)	14 (35.90)	15 (38.46)	-
Total		69 (34.50)	41 (20.50)	75 (37.50)	77 (38.50)	3 (1.50)
Chi-Square Calculated Value (X^2) = 60.48, Degree of freedom = 24.0 and p value = 0.0001 ($\leq .05$ significant) Chi-square Critical Value (Tabulated Value) = 36.415						
New IITs (N=205)	IITP 17	8 (47.06)	11 (64.70)	11 (64.70)	7 (41.18)	-
	IITH 10	6 (60.00)	7 (70.00)	9 (90.00)	5 (50.00)	-
	IITGN 30	13 (43.33)	7 (23.33)	9 (30.00)	9 (30.99)	-
	IITBBS 28	28 (100.00)	12 (42.86)	14 (50.00)	7 (25.00)	-
	IITRPR 26	11 (42.31)	8 (30.77)	6 (23.08)	13 (50.00)	-
	IITJ 23	16 (69.57)	5 (21.74)	2 (8.70)	7 (30.43)	-
	IITI 12	7 (58.33)	11 (91.67)	8 (66.67)	5 (41.67)	-
	IIT Mandi 20	8 (40.00)	19 (95.00)	3 (15.00)	17 (85.00)	2 (10.00)
	IITBHU 39	14 (35.90)	18 (46.15)	13 (33.33)	6 (15.38)	1 (2.56)
Total		111 (54.15)	98 (47.80)	75 (36.59)	76 (37.07)	3 (1.46)
Chi-Square Calculated Value (X^2) = 59.59, Degree of freedom = 32.0 and p value = 0.0022 ($\leq .05$ significant) Chi-square Critical Value (Tabulated Value) = 46.194						

(Multiple answers were permitted & Figures within parenthesis are percentage)

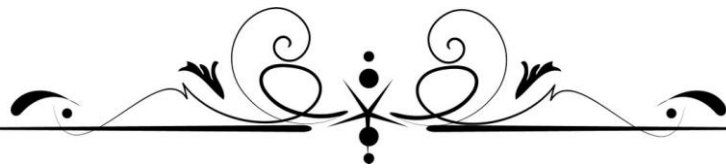
For the old IITs, the Chi-square calculated value is **60.48** which is higher than Chi-square tabulated or critical value. Therefore, the results of table indicated the significant variation and for the new IITs, the results of Chi-Square test indicated that the chi square calculated value is **59.59**, which is higher than Chi-square tabulated critical value also indicated the significant variations.

The above data was analysed using Chi-Square test. For the old IITs, $X^2 = 60.48$, $p = 0.0001$ (≤ 0.05 significant), There is a significant difference problems faced while using the e-resources of the library.

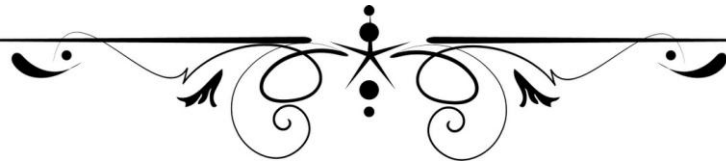
For the new IITs, $X^2 = 59.59$, $p = 0.0022$ (≤ 0.05 significant), There is a significant difference in problems faced while using the e-resources of the library.

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Chapter- 6
Findings, Conclusion and
Suggestions



CHAPTER- 6

FINDINGS, CONCLUSION AND SUGGESTIONS

6.1 Introduction

The study was conducted to find the current trends in information communication technology applications in the central libraries of Indian Institutes of Technology. This chapter explains the findings of the study with reference to objectives of the study with testing of hypothesis, conclusions and suggestions that can be drawn from the analysis and interpretation of data. It also presents a real picture of the central libraries of Indian Institutes of Technology. This chapter concludes with suggestions and recommendations on the basis of users' feedback for further research in the context of central libraries of IITs. The following findings are purely based on data which collected through questionnaire and observations from the librarian/library in-charge of Indian Institutes of Technology.

6.2 Summary of the findings from the questionnaires of librarian

This study finds several findings and these are summarised as under various headings:

6.2.1 General Findings

Distribution of Questionnaire

100% responses have been received from In-charge of the central library or Librarians or Deputy Librarian or Assistant Librarian or Senior Library Information Assistant of New and Old Indian Institutes of Technology. (Table 5.1.1)

Designation of Respondents

In old Indian Institutes of Technology, 3 (42.86%) respondents are Librarians (L), one (14.28%) is Deputy Librarian (DL) and 3 (42.86%) are Assistant Librarians (AL) while in new Indian Institutes of Technology, 1 (11.11%) respondent is Librarian (L),

5 (55.56%) respondents are Deputy Librarian (DL), 1 (11.11%) respondent is Assistant Librarian (AL) and 2 (22.22%) respondents are Senior Library Information Assistant (SLIA). (Table 5.1.2)

Gender wise Respondents

In old Indian Institutes of Technology, all respondents are male and in new Indian Institutes of Technology (IITs), 8 (88.88%) respondents are male while one is female. It means that the all the respondents (Librarians or Deputy Librarian or Assistant Librarian or Senior Library Information Assistant.) of central libraries of IITs are male except one from new IITs that is from IIT Indore. (Table 5.1.3)

Age wise Respondents

In old IITs, 5 (71.43%) respondents are more than 40 years old, while in new IITs, 4 (44.44%) respondents are more than 40 years old, 3(33.33%) respondents are 36-40 years old and 1(11.11%) respondent is 31-35 years old and 1 respondent is 26-31 years old. (Table 5.1.4)

Educational Qualification of Respondents

4 (57.14%) respondents of old IITs are PhD. and 1 (14.28%) respondent is post graduate. In new IITs, 5 (55.55%) respondents are PhD, 3 (33.33%) are post graduate and 1 (11.11%) respondent is M.Phil. The respondents of old Indian Institutes of Technology are more experienced than new Indian Institutes of Technology. (Table 5.1.5)

Professional Experience of Respondents

In old IITs, 4 (57.14%) respondents have 16-25 years' experience while 2 (28.57%) have more than 25 years' experience. In new IITs, 3 (33.33%) respondents have 16-25 years' experience while 3 (33.33%) have 11-15 years' experience and 2 (22.22%) respondents have 6-10 years' experience. (Table 5.1.6)

Sitting Capacity for the Users in the Libraries

In old IITs, IIT Kanpur has the highest (2000) number of chairs are available for sitting in the library followed by IIT Kharagpur (1500), IIT Delhi (800), IIT Madras (550), IIT Bombay and IIT Roorkee (500), IIT Guwahati (301).

In new IITs, IIT BHU is providing 200 chairs for sitting followed by IIT Ropar (130), IIT Patna, IIT Gandhinagar, IIT Bhubaneswar and IIT Indore (100), IIT Jodhpur (60), IIT Mnadi and IIT Hyderabad (50). (Table 5.1.7)

Registered Users of the Library

In old IITs, IIT Bombay has the maximum (16791) number of registered students followed by IIT Kharagpur and IIT Madras (12000), IIT Delhi (10000), IIT Roorkee (8000), IIT Guwahati (7892) and IIT Kanpur (6000).

In new IITs, IIT BHU has the highest (6000) number of students followed by IIT Hyderabad (2000), IIT Gandhinagar (1400), IIT Indore (1340), IIT Patna and IIT Bhubaneswar (1000), IIT Jodhpur (900), IIT Mandi (850) and in IIT Ropar, there is 600 registered students only. (Table 5.1.8)

6.2.2 Findings on objectives of the study

Objective 1: To identify best practices based on Information Communication Technology Applications in the central libraries of old and new IITs in India.

ICT based best practices

In old IITs, all the central libraries are using email alerts, 4 (57.14%) are using e-referencing, 3 (42.86%) are using instant messaging and only 2 (58.27%) libraries are using SMS services.

In new IITs, all the Central libraries are using email alerts, 4 (44.44%) are using e-referencing, 3 (33.33%) are using online SMS and instant messaging and only 2 (22.22%) libraries are using SMS services. (Table 5.1.11)

Listservs for Collection Development

In old IITs, only IIT Delhi uses the Listservs for the collection development while IIT Kharagpur and IIT Roorkee don't use it.

In new IITs, IIT Gandhinagar, IIT Bhubneswar and IIT Roapar use the Listserve for the collection development while six IITs (IIT Patna, IIT Hyderabad, IIT Jodhpur, IIT Indore, IIT Mandi and IIT BHU) don't use it. (Table 5.1.12)

Automation in the Library and Automated Modules of Acquisition System

All the central libraries of Indian Institutes of Technology are automated. (Table 5.1.13)

In old IITs, all the libraries (IIT Kharagpur, IIT Bombay, IIT Madras, IIT Kanpur, IIT Delhi, IIT Guwahati and IIT Roorkee) are using processing, ordering and receiving of acquisition module while 6 (85.71%) central libraries of old IITs (IIT Kharagpur, IIT Bombay, IIT Kanpur, IIT Delhi and IIT Roorkee) are using recommendation and only 2 (28.57%) libraries (IIT Bombay and IIT Kanpur) are using other type of things like book exhibitions and Sending pamphlets to vendors.

In new IITs, 5 (55.55%) Central Libraries (IIT Gandhinagar, IIT Bhubaneshwar, IIT Ropar, IIT Jodhpur and IIT Mandi) are using recommendations while 4 (44.44%) central libraries (IIT Gandhinagar, IIT Bhubaneshwar, IIT Jodhpur and IIT Mandi) use processing, ordering and receiving of acquisition section. And only IIT Ropar uses the processing of acquisition section. (Table 5.1.13.1)

Automated Modules of Circulation System

In old IITs, all (100%) the libraries (IIT Kharagpur, IIT Bombay, IIT Madras, IIT Kanpur, IIT Delhi, IIT Guwahati and IIT Roorkee) are using Issue Return, Fine Collection, Membership Procedure and Overdue Notice of circulation section whereas

6 (85.71%) central libraries of IITs (IIT Kharagpur, IIT Bombay, IIT Madras, IIT Kanpur, IIT Delhi, IIT Guwahati and IIT Roorkee) are using reservation for the users.

In new IITs, all (100%) the Central Libraries (IIT Kharagpur, IIT Bombay, IIT Madras, IIT Kanpur, IIT Delhi, IIT Guwahati and IIT Roorkee) are using issue and return, overdue notice service while 8 (88.89%) central libraries are using fine collection, 7 (77.78%) are using reservation service and only 4 (44.44%) central libraries are using membership procedure service. (Table 5.1.13.2)

Automated Modules of Cataloguing System

In old IITs, 6 (85.71%) central libraries do data entry through books, 3 (42.86%) central libraries do through accession register whereas 2 (28.57%) do direct recommendation, direct through forms and data entry through cards.

In new IITs, 8 (88.89%) central libraries do data entry through books while 5 (55.55%) do through accession register, 2 (22.22%) do direct recommendation and 1 (11.11%) do direct through forms and data entry through cards. (Table 5.1.13.3)

Automated Modules of Web OPAC System

In old IITs, it is found that 6 (85.71%) central libraries do edit profile using OPAC, 3 (42.86) do Book Recommendation and 2 (28.57%) do Bulletin Board and suggestions.

In new IITs, 6 (66.67%) central libraries do edit profile and suggestions using OPAC while 5 (55.55%) central libraries use Book Recommendation and 2 (28.57%) Bulletin Board. (Table 5.1.13.4)

Automated Modules of Serial Control System

In old IITs, 6 (85.71%) use receiving service, 5 (71.43%) use processing, receiving request, indexing service, 4 (57.14%) central libraries do ordering and only 2 (28.57%) do abstracting service with the help of serial control module.

In new IITs, 5 (55.55%) central libraries use processing service, 4 (44.44%) libraries do indexing and receiving service, 2 (22.22%) libraries use ordering service while only 1 (11.11%) receiving request service. (Table 5.1.13.5)

Technology used by the Library

In old IITs, 6 (85.71%) librarians use barcode technology in their libraries while 5 (71.43%) use RFID technology, 4 (57.14%) respondents use smart cards, 2 (28.57%) use cloud computing and only 1 (14.28%) that is IIT Guwahati is using QR code technology in the library.

In new IITs, 8 (88.89%) librarians are using barcode technology while 6 (66.67%) librarians are using smartcards, 3 (33.33%) libraries are using RFID technology and QR Code technology and merely 2 (22.22%) libraries are using cloud computing. (Table 5.1.17)

Mobile based Application

In old IITs, only 1 (14.28%) that is IIT Guwahati is using mobile based library service for the library users while in new IITs, 3 (33.33%) central libraries are using mobile based library services. IIT Gandhinagar is using Beta Version mobile based library service while IIT Jodhpur is using NGL Carbon. (Table 5.1.18)

Need of Technical Training to manage ICT Applications

In old IITs, 3 (42.86%) librarians say that there is need of technical training to manage ICT applications while in new IITs, 6 (66.67%) librarians say that there is need of technical training to manage ICT applications. (Table 5.1.19)

Security System in the Library

In old IITs, 6 (85.71%) libraries are using CCTV while 4 (57.14%) libraries use RFID, 3 (42.86%) use smart cards and 2 (28.57%) use biometrics. IIT Bombay is using 3M System CCTV.

In new IITs, 8 (88.89%) libraries use CCTV while 5 (55.55%) libraries are using smart cards and 4 (44.44%) libraries that are IIT Patna, IIT Bhubaneswar, IIT Ropar and IIT Mandi are using RFID. (Table 5.1.23)

Use of antivirus in the Library

In old IITs, IIT Guwahati is using McAfee and MS Essential antivirus in the Library while IIT Madras is using Kaspersky, IIT kharagpur is using eTrust and IIT Kanpur librarian said that it is managed by computer center, IIT Delhi is using in-house antivirus.

In new IITs, IIT Gandhnagar, IIT Mandi and IIT BHU are using Quickheel antivirus in the library while IIT Ropar and IIT Indore are using McAfee, IIT Patna is using Symantic antivirus in the library to protect their systems. IIT Ropar is also using Kaspersky antivirus. IIT Hyderabad, IIT Bhubaneswar and IIT Jodhpur did not give response of this. (Table 5.1.24)

Browser in the Library

In old IITs, 7 (100%) libraries are using Google Chrome while 6 (85.71%) libraries are using Mozilla Firefox and 4 (57.14%) are using Internet Explorer.

In new IITs, 9 (100%) central libraries are using Google Chrome while 6 (66.67%) libraries are using Mozilla Firefox and 3 (33.33%) use Internet Explorer. (Table 5.1.25)

Network System Software in the Library

In old IITs, 5 (71.43%) libraries of old IITs are using LINUX while only 1 (14.28%) library is using windows NT. IIT Kanpur librarian did not give response of it.

In new IITs, 8 (88.89%) libraries are using LINUX while only 6 (66.67%) libraries are using Windows NT. No one library is using UNIX operating system. (Table 5.1.26)

Library Network

In old IITs, 7 (100%) libraries are using Local Area Network while IIT Delhi is also using Metropolitan Area Network, IIT Kanpur and IIT Delhi are also utilising Wide Area Network.

In new IITs, 6 (66.67%) central libraries that are IIT Patna, IIT Hyderabad, IIT Gandhinagar, IIT Bhubaneswar, IIT Ropar and IIT Jodhpur are using Local Area Network. The librarian of IIT Indore, IIT Mandi and IIT BHU did not give response of this. (Table 5.1.27)

Internet Connectivity in the Library

In old IITs, 5 (71.43%) libraries are using Broad Band while 5 (71.43%) libraries are using Wi-Fi and only IIT Kharagpur is using Li-Fi Internet connectivity that is NKN Connectivity.

In new IITs, 6 (66.67%) libraries are using Broad Band while 7 (77.78%) libraries are using Wi-Fi and no one library is using Li-Fi Internet connectivity. (Table 5.1.28)

Objective 2: To find out the use of emerging ICT applications in development of library collection, activities and services.

Library Collection**Print Books**

In old IITs, highest 275000 number of books are provided by IIT Kanpur, 263864 books are provided by IIT Kharagpur, 257208 books are provided by IIT Madras, 233304 number of books are provided by IIT Bombay, 200000 number of books are provided by IIT Delhi and IIT Roorkee while lowest 125396 print books are provided by IIT Guwahati.

In new IITs, highest 114275 number of books are provided by IIT BHU followed by IIT Indore 29000, IIT Gandhinagar 25000, IIT Bhubaneswar and IIT Hyderabad 16000, IIT Mandi 15900, IIT Jodhpur 15000, IIT Ropar 14500 and lowest (14421) books prints are provided by IIT Patna. (Figure 5.1.9.1)

E-books

In old IITs, highest 100000 E-books are provided by IIT Kharagpur, followed by IIT Roorkee 35000, IIT Kanpur 16000, IIT Madras 6117, lowest 5120 E-books are provided by IIT Bombay while IIT Delhi and IIT Guwahati did not respond to it. In new IITs, highest 50000 E-books are provided by IIT BHU followed by IIT Mandi 11400, IIT Bhubaneswar 2000, IIT Indore 728, IIT Ropar 500, IIT Jodhpur 50. Lowest 1 in IIT Gandhinagar and IIT Patna and IIT Hyderabad did not respond to it. (Figure 5.1.9.2)

CD-ROM

In old IITs, highest 5801 CD-ROM are provided by IIT Guwahati followed by IIT Kanpur 2000, IIT Bombay 1370, IIT Madras 356 and IIT Roorkee, IIT Delhi and IIT Kharagpur did not respond to it. In new IITs, highest 1477 CD-ROM are provided by IIT Gandhinagar followed by IIT Ropar 750, IIT Jodhpur 500 and IIT Hyderabad, IIT Patna, IIT Bhubaneswar, IIT Indore, IIT Mnadi and IITBHU did not respond to it. (Figure 5.1.9.3)

Print Periodicals

Highest number of print periodicals are provided by IIT Bombay followed by IIT Roorkee 91, IIT Guwahati 90, IIT Kharagpur 80, and IIT Madras 30 and IIT Delhi and IIT Kanpur did not give response to it. In new IITs highest 132 print periodicals are provided by IIT Gandhinagar 132 followed by IITBHU 35, IIT Bhubaneswar 26,

IIT Ropar 15, IIT Mnadi 5, IIT Indore 3, while IIT Patna IIT Hyderabad, IIT Jodhpur did not give response to it. (Figure 5.1.9.4)

Electronic Periodicals

In old IITs, IIT Kharagpur has 25262 electronic periodicals followed by IIT Guwahati 24100, IIT Bombay 20029, and IIT Madras 704 whereas IIT Delhi and IIT Kanpur did not respond to it. In new IITs, highest 14000 electronic periodicals are provided by IITBHU followed by IIT Bhubaneswar 8500, IIT Ropar 7000, IIT Indore 6000, IIT Mnadi 237 and lowest 36 are provided by IIT Hyderabad. IIT Patna, IIT Gandhinagar, IIT Jodhpur did not respond to it. (Figure 5.1.9.5)

Bound Volumes

IIT Kanpur has highest, 28000 bound volumes followed by IIT Kharagpur 132916, IIT Bombay 119265, IIT Madras 113919, IIT Delhi 100000, IIT Roorkee 60000 and lowest no. of bound volumes are provided by IIT Guwahati i.e 35505. In new IITs highest 17738 bound volumes are provided by IITBHU, followed by IIT Hyderabad 2284, IIT Jodhpur 100, and lowest bound volume has been provided by IIT Mnadi i.e 28 and IIT Patna, IIT Bhubaneswar, IIT Ropar, IIT Indore and IIT Gandhinagar did not respond to it. (Figure 5.1.9.6)

Theses/Dissertations

IIT Bombay has highest 37154 theses/dissertation followed by IIT Kanpur 17000, IIT Roorkee 15000, IIT Madras 6689, IIT Delhi 6000, IIT Kharagpur 5697 and lowest 1510 in IIT Guwahati. In new IITs IITBHU has highest 269 theses/dissertation followed by IIT Indore 218, IIT Patna 200, IIT Gandhinagar 187, and lowest 50 IIT Ropar. IIT Hyderabad, IIT Bhubaneswar, IIT Jodhpur, IIT Mandi did not respond to it. (Figure 5.1.9.7)

Standards/Patents

In old IITs, IIT Bombay has the highest 67835 Standards/ Patents in the Central Library followed by IIT Kanpur 3000, IIT Madras 1199, IIT Guwahati 524, , IIT Roorkee 5 and IIT Kharagpur and IIT Delhi, did not give response of it. In new IITs, IITBHU has the highest 80000 Standards/ Patents followed by IIT Gandhinagar 1707, IIT Indore 405, IIT Hyderabad 4 while IIT Patna, IIT Bhubaneswar, IIT Ropar, IIT Jodhpur, IIT Mandi did not give response of it. (Figure 5.1.9.8)

Full Text Databases

Highest no. of full text databases are provided by IIT Kharagpur 58, IIT Delhi 50, IIT Madras 10 and IIT Kharagpur, IIT Roorkee and IIT Guwahati did not give response of it. In new IITs, highest 50 full text databases available in the central library of IIT Gandhinagar followed by IIT Bhubaneswar 46, IIT Jodhpur 32, IIT Indore 17, IIT Mandi 15, IITBHU 13, while responses were not given by IIT Ropar and IIT Hyderabad. (Figure 5.1.9.9)

Bibliographic Databases

In old IITs, highest 14 bibliographic database are provided by IIT Madras followed by IIT Delhi 8, IIT Bombay 7, IIT Kharagpur 3, while IIT Guwahati, , IIT Roorkee, IIT Kanpur did not give response of it. In new IITs, highest 10 bibliographic databases are provided by IIT Gandhinagar followed by IIT Indore 5, IIT Bhubaneswar, IIT Mandi, IIT Jodhpur provided 4 and 3 bibliographic database are provided by IIT Ropar, IIT Patna, IIT Hyderabad, IITBHU did not give response of it. (Figure 5.1.9.10)

Library Personnel

In old IITs four are the librarians, seven are the deputy librarians, twenty one are the assistant librarians, nine are the Junior Library Information Officer, twenty are the Senior Library Information Officer, Seven are the Junior Library Information Officer,

twenty three are the Senior library Information Assistant, fourteen are the Assistant Library Information Officer, forty six are the Graduate Trainees and seventeen are the other library staff.

While in New IITs, only one is the librarian, 5 are the deputy librarians and assistant librarians, no one is the Junior Library Information Officer, ten are the Senior Library Information Officer, one is the Library Information Officer, Eight are the Senior Library Information Assistant, two are the Assistant Library Information Officer, twenty one are the Graduate Trainees and nine are the other library staff. (Table 5.1.10)

Services offered by the Library

In old IITs, 7 (100%) central libraries offer lending services, reference service, CAS, reprographic service, web OPAC, user education, ILL, alerting service, online database search, CD-ROM database service and Document Delivery Service while 6 (85.71%) Digital library service, I R Service, Ask librarian and only 5 (71.43%) central libraries of old IITs offer remote access to e resources.

In new IITs, 9 (100%) central libraries offer web OPAC, online database search, CD-ROM database service, digital library service, I R Service and remote access to e resources while 8 (88.89%) libraries provide reference service, CAS, user education and alerting service, 7 (77.78%) libraries offer reprographic service, ILL and CAS, 6 (66.67%) provide lending service and only 5 (55.55%) libraries offer ask librarian service. (Table 5.1.14)

Current Awareness Services

In old IITs, 7 (100%) libraries offer monthly book addition and new arrivals service to their users while 6 (85.71%) libraries provide email alert service, 3 (42.86%) provide

SMS alerting service and 2 (28.57%) libraries provide Bulletin Board Service and Newspaper clipping.

In new IITs, 9 (100%) libraries provide email alert service while 8 (88.89%) libraries offer new arrivals service, 7 (77.77%) offer Newspaper clipping service to their users, 6 (66.67%) libraries offer monthly book addition, 4 (44.44%) libraries provide bulletin board service and 3 (33.33%) provide SMS alerting service. (Table 5.1.15)

Add-on Services

In old IITs, 7 (100%) libraries provide Library Web-blog Portal 6 (85.71%) offer Wi-Fi Services and 5 (71.43%) offer Mobile based Services to their users. In old IITs IIT Bombay is also providing other type of add-on service that is shelf-checkout.

In new IITs, 9 (100%) central libraries offer Wi-Fi Services to their users while 7 (77.78%) libraries provide Library Web-blog Portal and 3 (33.33%) provide Mobile based Services. (Table 5.1.16)

Objective 3: To find out the infrastructure required for the implementation of ICT applications in the libraries.

Computers availability in the Library

In old IITs, IIT Kharagpur has the highest numbers of computers that is 160 followed by IIT Madras (150), IIT Bombay (70), IIT Delhi (70), IIT Roorkee (70), while in new IITs, 70 are provided by IIT Bhubaneswar, 60 by IIT BHU, 30 by IIT Jodhpur, 24 by IIT Indore, 23 by IIT Gandhinagar, 14 by IIT Mandi and lowest no. of computers are provided by IIT Hyderabad and IIT Ropar that is 10. (Figure 5.1.20.1)

Server Machines availability in the Library

In old IITs, highest (12) numbers of server machines are provided by IIT Bombay followed by IIT Roorkee (7), IIT Guwahati and IIT Kanpur (5), IIT Kharagpur (3) and

IIT Madras (2) while in new IITs, IIT Bhubaneswar (6) followed by IIT Hyderabad and IIT Gandhinagar (3) and lowest numbers of server machines are provided by IIT Patna, IIT Indore and IIT Mandi that is 1. (Figure 5.1.20.2)

Photocopy Machines

In old IITs, IIT Kanpur and IIT Delhi are providing 4 photocopy machines for the users followed by IIT Kharagpur that is 3, IIT Bombay, IIT Madras, IIT Guwahati, are providing 2 photocopy machines and only IIT Roorkee is providing only 1 photocopy machine for their library users. In new IITs, IIT Bhubaneswar is providing 3, IIT Hyderabad, IIT Indore and IIT BHU are providing 2 while IIT Patna, IIT Gandhinagar, IIT Ropar, IIT Jodhpur and IIT Indore are providing only 1 photocopy machine for the library users. Only IIT Mandi Central Library is not providing the photocopy machine for their users. (Figure 5.1.20.3)

Flatbed Scanners

In old IITs, IIT Bombay and IIT Roorkee are providing 5 flatbed scanners followed by IIT Kharagpur that is 3, IIT Madras that is 2, while IIT Kanpur, IIT Delhi, IIT Guwahati have no facility of flatbed scanner. In new IITs, IIT Patna, IIT Gandhinagar, IIT Jodhpur and IIT Mandi are providing only 1. IIT Hyderabad, IIT Bhubaneswar, IIT Ropar, IIT Indore and IIT BHU have no facility of flatbed scanner. (Figure 5.1.20.4)

Overhead Scanners

It is analysed that in old IITs, IIT Madras, IIT Kanpur, IIT Delhi, IIT Roorkee have 2 overhead scanners whereas IIT Kharagpur, IIT Guwahati have only 1. In the new IITs, IIT Hyderabad and IIT Indore are providing 4 overhead scanners while IIT Bhubaneswar has 3 whereas IIT Patna, IIT Gandhinagar, IIT Ropar and IIT Mandi

have only 1. Only IIT Bombay and IIT Jodhpur have not the overhead scanner. (Figure 5.1.20.5)

Barcode Scanners

In old IITs, IIT Kanpur has the highest (15) numbers of barcode Scanners followed by IIT Delhi (10), IIT Kharagpur and IIT Guwahati, IIT Bombay (4), IIT Madras (2) and IIT Roorkee doesn't have barcode scanner. While in new IITs, IIT Bhubaneswar (6), IIT Gandhinagar, IIT BHU (5), IIT Hyderabad, IIT Jodhpur, IIT Indore (3), IIT Mandi (2) while IIT Ropar has only one barcode scanner. IIT Patna doesn't have barcode scanner. (Figure 5.1.20.6)

Handheld Scanners

In old IITs, IIT Kanpur and IIT Delhi have the highest (10) no. of handheld scanners followed by IIT Madras, IIT Guwahati (2) while IIT Kharagpur, have only 1 handheld scanners. IIT Bombay, IIT Roorkee don't have handheld scanners.

In new IITs, IIT Bhubaneswar has the highest (5), IIT Ropar, IIT Indore have only 1 handheld scanners. IIT Patna, IIT Hyderabad, IIT Gandhinagar, IIT Jodhpur, IIT Mandi and IIT BHU don't have handheld scanners. (Figure 5.1.20.7)

Laser Printers

In old IITs, IIT Bombay has the highest (14) numbers of laser printers followed by IIT Delhi (10), IIT Kharagpur (8), IIT Madras (6), IIT Roorkee (5) while IIT Kanpur has 2 laser printers. IIT Guwahati central library doesn't have laser printers.

In new IITs, IIT BHU (10), IIT Kharagpur (8), IIT Bhubaneswar (7), IIT Gandhinagar (6), IIT Mandi (4), IIT Indore (3) while IIT Hyderabad, IIT Ropar, IIT Jodhpur have 2 laser printers. IIT Patna central library doesn't have laser printers (Figure 5.1.20.8)

LCD/Projectors

In old IITs, IIT Kharagpur, IIT Madras, IIT Kanpur, IIT Delhi, IIT Roorkee have 2 LCD/Projector while IIT Bombay, IIT Guwahati have 1.

In New IITs, IIT BHU have 2 LCD/Projector while IIT Patna, IIT Hyderabad and IIT Mandi have 1. IIT Gandhinagar, IIT Bhubaneswar, IIT Ropar, IIT Jodhpur, IIT Indore don't have LCD/Projector in their library. (Figure 5.1.20.9)

Objective 4: To find out the usage of open and commercial software for library management.

Library Management Software

All the IITs are using library management software. (Table and Figure 5.1.22) In old IITs, 5 (71.43%) central libraries that are IIT Kharagpur, IIT Kanpur, IIT Delhi, IIT Guwahati and IIT Roorkee are using Libsys software while IIT Bombay is using Koha and Libsult Software and IIT Madras is using VTLS.

In new IITs, 5 (55.55%) central libraries that are IIT Hyderabad, IIT Gandhinagar, IIT Bhubaneswar, IIT Mandi and IIT BHU are using Koha library management software while IIT Patna, IIT Ropar and IIT Indore are using Libsys library management software and IIT Jodhpur is using NewGenLib Library management software. (Table 5.1.21)

Digital/Institutional Repository Software

All the IITs are using digital/institutional repository software. In old IITs, all the central libraries are using DSpace digital/institutional repository software while IIT Madras is also using E-Print Archive.

In new IITs, all the central libraries are using DSpace digital/institutional repository software. (Table 5.1.22)

Objective 5: To investigate the usage of social networking sites for sharing and communicating information.

Use of Social Networking Sites

2 old central libraries of IITs are using social networking sites while in new, 4 central libraries are using Social Networking Sites. (Table 5.1.29)

2 (28.58%) old central libraries are using Facebook while only one (14.27%) is using YouTube and one (14.27) is using Blog. In new IITs, 4 (44.44%) are using Facebook, 2 (22.22%) are using YouTube, blog and 3 (33.33%) are using Twitter. (Table 5.1.30)

Purpose of Using Social Networking Sites

In old IITs, 3 (42.86%) central libraries are using for linking with library users, for promotional activities and user education programme, and 3 (42.86%) central libraries are also using for creating awareness about library collection and services while only 2 (28.57%) central library are using for getting feedback/sharing the problems to the users.

In new IITs, 4 (44.44%) central libraries are using for linking with library users, 4 (44.44%) central libraries are using for creating awareness about library collection and services whereas 2 (22.22%) are using for the promotional activities and users education programme and 3 (33.34%) for getting feedback/sharing the problems to the users. (Table 5.1.31)

Objective 6: To find out the major problems and issues in implementation of ICT in libraries.

Problems during Implementation of ICT Applications

In old IITs, Librarians (28.57%) of IIT Madras and IIT Guwahati face the problem at the time of implementation of ICT Applications while five (71.43%) old IIT

Librarians (IIT Kharagpur, IIT Bombay, IIT Kanpur, IIT Delhi and IIT Madras) say that there is no problem while implementing the ICT Applications.

In new IITs, 5 (55.55%) respondents (IIT Patna, IIT Hyderabad, IIT Gandhinagar, IIT Mandi and IIT BHU) are facing problems during Implementation of ICT Applications in the Central Libraries of Indian Institutes of Technology while four respondents say that there is no problem while implementing the ICT Applications. (Table 5.1.32)

Different Problems during Implementation of ICT Applications

In old IITs, one respondent says that facing problem due to scarcity/paucity of funds, two respondent say that because of increasing cost of hardware and software, non-availability of consultancy services and in selection of open vs. commercial software.

In new IITs, four respondents say that facing problems due to increasing cost of hardware and software while only one respondent say that facing problem because of scarcity/paucity of funds, non-availability of consultancy services, selection of open vs. commercial software, lack of ICT infrastructure, inadequate trained professionals, implementation of latest device and gadgets, lack of co-operation and co-ordination among staff, lack of support from higher authority and server vs. cloud computing technology. (Table 1.33)

6.3 Summary of the findings from the questionnaires of user

Distribution and Receiving of Questionnaire

The results shows that highest response rate was 100% from many old and new IITs like IIT Kanpur, IIT Delhi, IIT Guwahati, IIT Roorkee, IIT Gandhinagar, IIT Hyderabad, IIT Bhubaneswar, IIT Jodhpur and IIT (BHU). Lowest responses were received from IIT Bombay (85.00%) in old IITs and IIT Indore (70.00%) in new IITs in comparison to all. (Table 5.2.1)

Gender wise Respondents

It is found that in old IITs, 81.19% respondents are male and 18.81% respondents are female where as in new IITs, 84.24% respondents are male and only 15.76% respondents are female. (Table 5.2.2)

Designation of Respondents

In old IITs, highest (43.06%) numbers of respondents are post graduate while 36.63% of respondents are under graduate and lowest numbers of respondents are research scholars in old Indian Institutes of Technology. In new Indian Institutes of Technology, highest (42.42%) numbers of respondents are under graduate whereas 38.99% are post graduate and lowest numbers (18.59%) of respondents are research scholars. (Table 5.2.3)

Age wise Respondents

In old IITs, highest 246 (60.90%) of respondents are between 20-25 years old, 80 (19.80%) respondents are more than 26 years old and lowest 78 (19.30%) respondents are less than 20 years old whereas in new IITs, highest 281 (56.77%) respondents are 20-25 years old, 122 (24.65%) respondents are less than 20 years old and lowest 92 (18.58%) respondents are more than 26 years old. It is clear that most of the respondents are from 20-25 years age from both old and new IITs. (Table 5.2.4)

Frequency of users visit in the library

In old IITs, highest 159 (39.36%) number of users visit library daily, followed by 124 (30.69%) users visit when they need, 69 (17.08%) number of users visit library twice a week, 41 (10.15%) number of users visit weekly and lowest 11 (2.72%) number of users visit library monthly.

In new IITs, highest 196 (39.59%) number of users visit library when they need followed by 149(30.20%) number of users visit library daily, 73 (14.75%)

number of users visit library twice a week, 49 (9.90%) number of users visit weekly while lowest 28 (5.66%) number of users visit library monthly. (Table 5.2.5)

Reasons for not visiting library frequently (daily or twice a week)

In old IITs, highest 99(56.25%) number of users do not visit library frequently because information is available on desktop followed by 79 (44.89%) number of users do not visit due to shortage of time, 44 (25.00%) number of users do not visit library frequently to do research work, 25(14.20%) number of users do not visit library frequently because required information is not available in library and 11 (6.25%) number of users do not visit library frequently due to inconvenient library hours, busy on old schedule etc. For old IITs, $X^2 = 18.209$, $p = 0.792$ (≤ 0.05 non-significant), There is no significant difference in reasons for not visiting the library frequently.

In new IITs, highest 144 (52.75%) number of users do not visit library frequently because information is available on desktop followed by 124 (45.42%) number of users do not visit due to shortage of time, 62 (22.71%) number of users do not visit library frequently to do research work, 46(16.85%) number of users do not visit library frequently because required information is not available in library and 24 (8.70%) number of users do not visit library frequently due to inconvenient library hours, busy on old schedule etc. For new IITs, $X^2 = 64.26$, $p = 0.0006$ (≤ 0.05 significant), There is a significant difference in reasons for not visiting library frequently. (Table 5.2.6)

Purpose of visit to the Library

In old IITs, highest 208 (51.49%) users visit for reading subject books followed by 154 (38.12%) for borrowing and returning books, 152(30.71%) for consulting reference books, 146 (29.49%) visit for completing their class assignments, 119 (29.46%) for purpose of reading general books, 97 (19.59%) number of users visit

library for purpose of getting reference service, 89 (22.03) number of users visit library for purpose of reading newspapers and magazines and lowest 57 (11.51) number of users visit library for other reasons that are good ambience, for preparing competitive exam, peaceful place & better environment, AC, to study in peace, quite place to work, to do research work, to complete thesis work, to read story book, to use computers, Wi-Fi and internet. For the old IITs, $X^2 = 105.126$, $p = 2.5e-7$ (≤ 0.05 significant), There is a significant difference in purpose of visit to the Library.

In new IITs, highest 273 (55.15%) numbers of users visit for reading subject books followed by 271 (54.75%) number of users visit for borrowing and returning books, 170 (34.34%) number of users visit for reading newspapers and magazines, 144(29.09%) number of users visit for reading general books, 129 (31.93%) number of users visit for completing class assignment, 61 (15.35%) number of users visit library for any other reason like good ambience, for preparing competitive exam, peaceful place & better environment, AC, to study in peace, quite place to work, to do research work, to complete thesis work, to read story book, to use computers, Wi-Fi and internet and lowest 51 (12.62%) number of users visit for getting reference service. For new IITs, $X^2 = 103.867$, $p = 0.0001$ (≤ 0.05 significant), There is a significant difference in purpose of visit to the Library. (Table 5.2.7)

Information Communication Technology based services

In old IITs, highest 300 (74.26%) users of library are agree with the use of online library catalogue, 200 (49.50%) numbers of users use reservation of book service, 199 (49.28%) library users use online access of electronic resources, 156 (38.61%) number of users use automatic issue and return of book service, 134 (33.17%) number of users agree with the use of digital reference service, 93 (23.02%) number of users use remote access service of the library, 86 (21.29%) numbers of users use in house

digital collection service, 85 (21.04%) numbers of users use online user education service, 78 (19.31%) numbers of users use instant messaging service of library, lowest 60 (14.85%) numbers of users use library for CD-ROM access on campus network. For the old IITs, $X^2 = 92.979$, $p = 0.0007$ (≤ 0.05 significant), There is a significant difference in information communication technology based services.

In new IITs, highest 298 (60.20%) users of library agree with the use of online library catalogue, 234 (47.27%) numbers of users use reservation of book service, 206 (41.62%) number of users use automatic issue and return of book service, 182 (36.77%) library users use online access of electronic resources, 128 (25.85%) number of users use remote access service of the library, 127 (25.66%) number of users agree with the use of digital reference service, 126 (25.45%) numbers of users use instant messaging service of library, 93 (18.79%) numbers of users use online user education service, 89 (17.99%) numbers of users use library for CD-ROM access on campus network while lowest 81 (16.36%) numbers of users use in house digital collection service. For the new IITs, $X^2 = 140.334$, $p = 0.0000$ (≤ 0.05 significant), There is a significant difference in information communication technology based services. (Table 5.2.8)

Use of Social Networking Sites in the Library

In old IITs, only 164 (40.60%) users of IITKGP, IITB, and IITM are using social networking sites while 240 (59.40%) number of users of IITK, IITD, IITG and IITR do not use social networking sites. In new IITs 222 (44.85%) users of IITP, IITH, IITBBS and IITRPR are using social networking sites while 273 (55.15%) number of users of IITGN, IITJ, IITI, IIT Mandi and IITBHU do not use social networking sites. (Table 5.2.9)

In New IITs, majority 118 (71.95%) of users use Facebook followed by 98 (59.76%) number of users use YouTube for their activities, 39 (23.78%) number

of users use Twitter while lowest 26 (15.88%) number of users use RSS feed in the old IITs. In new IITs most 168 (75.67%) number of users use Facebook followed by 141 (63.51%) number of users use YouTube for their activities, 47 (21.17%) number of users use Twitter while lowest 43 (19.37%) number of users use RSS feed. (Table 5.2.10)

Satisfaction with the digitized collection

Majority 374 (92.57%) of users said that they are satisfied with the digitized collection of central libraries of old IITs while 30 (7.43%) number of users are not satisfied with the digitized collection of old IITs. In old IITs, highest 59 (98.33%) number of users of IIT Delhi are satisfied with digital collection. For the old IITs, $X^2 = 11.38$, $p = 0.772$ (≤ 0.05 non-significant), There is no significant difference in satisfaction with the digitized collection.

In new IITs, most 441 (89.09%) number of users said that they are satisfied with the digitized collection of central libraries while 54 (10.91%) number of users are not satisfied with the digitized collection. In IITG 58 (96.67%) number of users are satisfied with digital collection. For the new IITs, $X^2 = 140.334$, $p = 0.3097$ (≤ 0.05 non-significant), There is a no significant difference in satisfaction with the digitized collection. (Table 5.2.11)

Satisfaction Level with the digitized collection

In old IITs, highest 161 (43.05%) number of users said that digital collection is highly useful while 158 (42.25%) number of users agree with the digital collection is moderately useful where lowest 55 (14.70%) users said that digital collection is slightly useful for library users. For the old IITs, $X^2 = 13.34$, $p = 0.3446$ (≤ 0.05 non-significant), There is a no significant difference in opinion about the use of digital collection.

In new IITs, majority 197 (44.67%) number of users are saying that digital collection is moderately useful whereas 175 (41.72%) number of users said that digital collection is highly useful and 69 (15.65%) number of users said it is slightly useful. For the new IITs, $X^2 = 25.62$, $p = 0.596$ (≤ 0.05 non-significant), There is a no significant difference in opinion about the use of digital collection. (Table 5.2.12)

Satisfaction to the Library Services

In old IITs, almost 384 (95.05%) number of users are satisfied with the services of central libraries while 20 (4.95%) number of users are not satisfied with the services of libraries. For the old IITs, $X^2 = 9.02$, $p = 0.172$ (≤ 0.05 non-significant), There is a no significant difference in in satisfaction to the library services.

In new IITs, majority 449 (90.71%) number of users are satisfied with the services of central libraries while 46 (9.29%) number of users are not satisfied with library services. For the new IITs, $X^2 = 12.93$, $p = 0.114$ (≤ 0.05 non-significant), There is a no significant difference in satisfaction to the library services. (Table 5.2.13)

Satisfaction Level about the Library Services

In old IITs, majority 173 (45.05%) of users are satisfied with the library services, 116 (30.21%) number of users said that they were fully satisfied with library services while 95 (24.74%) number of users are partially satisfied with the services of libraries. For the old IITs, $X^2 = 32.91$, $p = 0.001$ (≤ 0.05 significant), There is a significant difference in opinion about the library services.

In new IITs, majority 172 (38.31%) number of users are satisfied with the library services, 139 (30.96%) number of users said that they were fully satisfied with library services while 138 (30.76%) number of users are partially satisfied with the

services of libraries. For the new IITs, $X^2 = 46.98$, $p = 0.0001$ (≤ 0.05 significant), There is a significant difference in opinion about the library services. (Table 5.2.14)

Satisfaction with the relevant collection available in Library

In old IITs, 374 (92.57%) number of users are satisfied for the availability of relevant collection in the library while 30 (7.43%) number of users said not satisfied for the availability of relevant collection in the library. For the old IITs, $X^2 = 10.98$, $p = 0.0890$ (≤ 0.05 non-significant), There is a no significant difference in satisfaction with the relevant collection available in library.

In old IITs, 428 (86.46%) number of users are satisfied for the availability of relevant collection in the library while 67 (13.54%) number of users are not satisfied for the availability of relevant collection in the library. For the new IITs, $X^2 = 22.02$, $p = 0.0049$ (≤ 0.05 significant), There is a significant difference in satisfaction with the relevant collection available in library. (Table 5.2.15)

Satisfaction level with relevant collection available in the Library

In old IITs, 193 (51.60%) number of users said good for the availability of relevant collection whereas 102(27.27%) number of users said relevant collection of library is very good, lowest 79 (21.12%) number of users said that relevant collection of library is excellent. For the old IITs, $X^2 = 10.21$, $p = 0.597$ (≤ 0.05 non-significant), There is a no significant difference in opinion with the relevant collection available in the Library.

In new IITs, 211 (49.30%) number of users said good for the availability of relevant collection whereas 121 (28.27%) number of users said relevant collection of library is very good, lowest 96 (22.43%) number of users said that relevant collection of library is excellent. For the new IITs, $X^2 = 21.56$, $p = 0.157$ (≤ 0.05 non-significant), There is a no significant difference in opinion with the relevant collection available in the Library. (Table 5.2.16)

Use of Available E-resources in the Library

In old IITs, majority 254 (62.87%) number of respondents were using the available E-resources in the Library while 150 (37.13%) number of respondents were not using Available E-resources in the Library. For the old IITs, $X^2 = 46.00$, $p = 2.95e-08$ (≤ 0.05 **significant**), There is a significant difference in use of available E-resources in the library.

In new IITs, majority 333 (67.27%) number of respondents were using the available E-resources in the Library while 162 (32.73%) number of respondents were not using Available E-resources in the Library. For the new IITs, $X^2 = 52.32$, $p = 1.46e-08$ (≤ 0.05 **significant**), There is a significant difference in use of available E-resources in the library. (Table 5.2.17)

Used E-resources in the Library

The In old IITs, 150 (59.06%) number of users use e-general for their study and research, 132 (51.97%) number of users use E-books, 72 (28.35%) number of users use E-database, 64 (25.18%) number of users use E-thesis for research purpose, 47 (18.50%) number of users use E- scholarly content and 3 (1.18%) number of users use E-resources for their various activities like previous year question papers, conference papers and technical reports. For the old IITs, $X^2 = 38.39$, $p = 0.1399$ (≤ 0.05 **non-significant**), There is a no significant difference in use of available E-resources in the library.

In new IITs, 202 (60.66%) number of users use e-general for their study and research, 144 (43.24%) number of users use E-books, 91 (27.33%) number of users use E-thesis for research purpose, 86 (25.83%) number of users use E-database, , 67 (20.13%) number of users use E- scholarly content and 13 (3.90%) number of users use E-resources for their various activities like previous year question papers, conference papers and technical reports. For the new IITs, $X^2 = 157.33$, $p = 7.75e-16$

(≤ 0.05 significant), There is a significant difference in use of available E-resources in the library. (Table 5.2.18)

Problems faced while using the e-resources of the library

In old IITs, 200 (49.50%) respondents were facing problem while using E-resources, whereas 204 (50.50%) number of users were not facing any type of problem while using E-resources in the library. For the old IITs, $X^2 = 12.13$, $p = 0.592$ (≤ 0.05 non-significant), There is a no significant difference in problems faced while using the e-resources of the library.

In the new IITs, 205 (41.41%) respondents were facing problem while using E-resources, whereas 290 (58.59%) number of users were not facing any type of problem while using E-resources in the library. For the new IITs, $X^2 = 12.13$, $p = 1.01e-05$ (≤ 0.05 significant), There is a significant difference in problems faced while using the e-resources of the library. (Table 5.2.19)

Different types of Problems while using the e-resources of the Library

In old IITs, 77 (38.50%) numbers of respondents said that they face problem in reading from desktop screen while using the e-resources of the library, 75 (37.50%) users face problem due to unorganised information, 69 (34.50%) users face problem due to inadequate resources, 41 (20.50%) users face problem due to poor connectivity of internet and 3 (1.50%) users face problem due to other reasons like rush at minor time, no discussion room Wi-Fi problem sometimes login account base facilities are out of order. For the old IITs, $X^2 = 60.48$, $p = 0.0001$ (≤ 0.05 significant), There is a significant difference problems faced while using the e-resources of the library.

In new IITs, 11 (55.15%) numbers of respondents said that they face problem due to inadequate resources, , 98 (47.80%) users face problem due to poor connectivity of internet, 76 (37.07%) users face problem due to difficulty in reading

from screen while using the e-resources of the library, 75 (36.59%) users face problem due unorganised information and 3(1.46%) users face problem due to other reasons like rush at minor time, no discussion room Wi-Fi problem sometimes login account base facilities are out of order Lack of study room. For the new IITs, $\chi^2 = 59.59$, $p = 0.0022$ (≤ 0.05 significant), There is a significant difference in problems faced while using the e-resources of the library. (Table 5.2.20)

6.4 Testing of Hypotheses

The hypotheses were formulated according to the objectives of the research to answer the research problem. They were tested using tables and figures with the help of MS-Word and MS-Excel.

H₁: Old Central Libraries of IITs have state-of-art infrastructure and resources to support modern library services based on ICT.

From the tabular and graphical representation of table no. 5.1.20 and figures 5.1.20.1, 5.1.20.2, 5.1.20.3, 5.1.20.4, 5.1.20.5, 5.1.20.6, 5.1.20.7, 5.1.20.8 and 5.1.20.9 show that all old central libraries of IITs have state-of-art infrastructure and resources to support modern library services based on ICT. Hence above hypothesis is proved and accepted.

H₂: Most of Central Libraries of IITs are utilizing ICT in development and management of library collection.

From the tabular and graphical representation of table 5.1.9 and figures 5.1.9.1, 5.1.9.2, 5.1.9.3, 5.1.9.4, 5.1.9.5, 5.1.9.6, 5.1.9.7, 5.1.9.8, 5.1.9.9 and 5.1.9.10 show that most of the central libraries of IITs are utilizing ICT in development and management of library collection. Hence this hypothesis is proved and accepted.

H₃: Some of the Central Libraries are utilizing open source software for various purpose like Institutional repositories, content management etc.

From the tabular representation of tables 5.1.21, 5.1.22 show that all the libraries are utilizing open source software for various purpose like institutional repositories, content management. Hence aforesaid hypothesis is proved and accepted.

H₄: Most of the old Central Libraries are utilizing emerging technology for the library activities and services.

The above hypothesis has been proved and accepted in the table 5.1.17, 5.1.18, 5.1.23, 5.2.28 that most of the old central libraries are utilizing emerging technology for the library activities and services.

6.5 Conclusion

Indian Institutes of Technology are the national and reputed institutions in India. These institutions are playing vital role in promotion of engineering education and research. The libraries are changing their shape and size due to information technology. To cope up information need of the users, library and information centres are modernising their infrastructure, collection and services. Information technology is used as tool by the library professional for collection, organisation, process and dissemination of knowledge. To create new services and update existing services, one has to develop proper ICT based infrastructure in the libraries and information centres. They are offering state of art infrastructural and other facilities to the faculty members, research scholars and students. Each institution has their own library with modern information communication technology infrastructure to provide library resources and services. ICT has changed the traditional library infrastructure into modern infrastructure.

Information technology (IT) entered into libraries, especially academic and research libraries, during the 1960s. Libraries employed Information Technology to speed up their daily actions and reduce their functioning cost. In digital era, bulk of

reading materials are available in the electronic form which can be accessed through internet as well as intranet. Modern information communication technology infrastructure is very essential for the library functioning and services. These electronic resources can be created by two methods. One is the content created in the digital form, another the print resources can be converted in the electronic form. Electronic information resources have ample opportunities in the collection development, creation of new services and up-gradation of existing information services. For optimum utilisation of electronic resources, modern library and information centres should develop adequate ICT infrastructure.

Study explores that central library of IIT Kharagpur has the highest (160) numbers of computers followed by IIT Madras (150) and lowest (10) no. of computers are provided by IIT Hyderabad and IIT Ropar. IIT Bombay has highest (12) numbers of server machines followed by IIT Ropar (7), IIT Bhubaneswar (6), IIT Kanpur and IIT Guwahati (5) while IIT Patna, IIT Indore and IIT Mandi have lowest (1) number of server machines. Study reveals that maximum numbers of sitting capacity is provided by IIT Kanpur (2000) followed by IIT Kharagpur (1500) and minimum is provided by IIT Hyderabad (50) and IIT Mandi (50). All the central libraries of IIT provide software facilities in the library in which majority (62.50%) of central libraries of IIT are using Libsys software. Majority of librarians agreed that open source softwares are sufficient for management of the library activities and services. Survey explores that all libraries are using D-Space digital/institutional repository software and IIT Madras is also using the E-Print Archive software. Majority of libraries have CCTV followed by smart cards and RFID to protect their library. Majority of libraries are using Linux followed by Windows NT. Majority (75.00%) of libraries are using Local Area Network (LAN). IIT Bombay is providing

the highest bandwidth capacity that is 2.7 GBPS followed by central library of IIT Kharagpur, IIT Patna and Jodhpur are providing 1 GBPS. All the central libraries of IITs are providing the facility of plagiarism checking for their research scholars.

Social networking sites have attracted to the millions of users in their professional as well as personal life. These are being used by academically for the purpose of linking with one to another. They are using for the means of communication to their friends and relatives. This study provides important information on libraries of academic institution on social networking sites. The result shows that the central libraries of IITs are using Facebook, YouTube, Blog and Twitter for linking with library users, creating awareness about library collection and services for getting feedback/sharing problems to the users and they are also using for promotional activities and users education programme. Central libraries of IITs are mostly using Facebook and least used Blog and YouTube.

In present scenario, information communication technology, ICT infrastructure, digital library, library automation and networking are playing vital role in the libraries. ICT infrastructure in new IIT Libraries of India is still in different stages of development. The new Indian Institutes of Technology (IITs) are not equally developed in comparison to old Indian Institutes of Technology. Inadequate sitting capacity, lack of facility in infrastructure than old IITs should be improved and increased. Hence, there is need to change in newly established central libraries of IITs. A novel idea and suitable policy should be enclosed by the new IIT library authorities.

The study suggests that new IITs central libraries must increases the hardware as well as software facility to enable the users to maximize the usage of ICT-based resources and services and also increase the number of sitting capacity for users. The

study concludes that some central libraries of IITs need to proper ICT infrastructure for the library users to utilize the resource and services.

Through the analysis of user's data, it is found that majority of the users of both old and new IITs visit library for reading subject books. Almost all the users are utilizing information communication technology based services like online library catalogue, online access of electronic resources, digital reference service etc. In old IITs, only 164 (40.60%) users of IITKGP, IITB and IITM are using social networking sites while in new IITs, 222 (44.85%) users of IITP, IITH, IITBBS and IITRPR are using social networking sites like Facebook, YouTube, Twitter and RSS Feed. Majority of users of old and new IITs are satisfied with the digitized collection of central libraries. In old and new IITs, most of the users are satisfied with the relevant collection available in the library. In both the IITs, majority of respondents are using the available e-resources in the library like e-journals, e-books, e-theses, e-databases etc.

6.6 Suggestions

In view analysis of data, findings and personal observation of librarians and users of central libraries of Indian Institutes of Technology, the following suggestions are made and suggestions are also incorporated users' reaction.

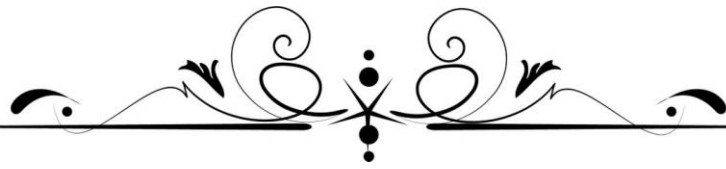
- IITs should develop adequate sitting capacity according to the registered users in the libraries.
- IITs should develop sufficient collection for users which includes more e-journals, general books, interdisciplinary subject books, technology based books, recreational books, biographies, autobiographies, books related to entrepreneurship and novels should be available in the library in print as well as electronic format.

- It is observed through the study that in new IITs, only one librarian is working out of nine IITs, so that more library professionals should be recruited for the smooth library functioning.
- The study explored that very less IITs are using QR code technology, so that all the libraries should use QR code for the promotion of the library activities and services.
- The study suggests that mobile based services should be created by the libraries for library users.
- IIT Indore, IIT Mandi and IIT BHU should create a library network for sharing the resources and services.
- All the library may also use social networking sites for offering promotional activities, sharing information and feedback.
- IIT Libraries should provide a discussion room 24×7, so that user can discuss at any time and library should also provide sufficient space for the study.
- Library should provide high bandwidth internet connection for their users.
- Orientation programs should be organized by the librarian at regular basis on various information communication technology resources and services available for their users.
- Users of IIT libraries require remote log-in facility, remote booking, so that user can do these things from their place.
- IIT libraries should acquire books as per number of students, so that user can get books without any problem.
- Libraries should offer an email alert or SMS alert service regarding books suggested by the professors for particular subject.

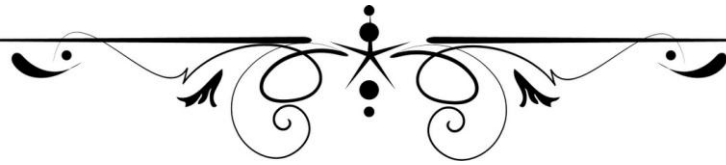
- Automatic issue and return of books should be provided through digital media to the users of IIT library. So that users don't have to stand in a big queue while issuing or returning of books.
- Most of the students are unaware about the various services provided by the library. They should be provided awareness program about the library facilities and services.
- Research oriented services may be started by the libraries to their users like self- plagiarism checking, downloading articles and books.
- IIT library should provide open and digitized collection and they should also be provided app based content access.
- Library should be user friendly, there should be a help desk for new comers because most of the new comers are not aware about the resources and services of the library and they do not know that how to find relevant documents properly.
- Resource sharing of the digital content should be permitted through subscription policies.
- A good user-friendly website should be developed which includes all the relevant information regarding the library policies, available digital resources (properly organized) would greatly help and encourage the students to utilize the resources properly.
- Library should include video lectures of faculty members in their institutional repository.
- IITs should use automatic card swipe entry for permanent students of the institute and outsiders should not be allowed.

6.7 Area of Further Research

1. Use of Open Access Resources by the of Central Libraries of Indian Institutes of Technology in India: A Study
2. Use of Radio Frequency Identification (RFID) by the of Central Libraries of Indian Institutes of Technology in India: A Study
3. Use and Impact of Cloud Computing by the of Central Libraries of old Indian Institutes of Technology in India: A Study
4. Use of Research Data Management by the Central Libraries of old Indian Institutes of Technology in India: A Study
5. Use and Impact of Library Management Software by the Central Libraries of Indian Institutes of Technology in India: A Study
6. Use and Awareness of Information Communication Technology Applications by the users of Indian Institutes of Technology in India: A Study
7. User Satisfaction towards Information Communication Technology Applications in the Central Libraries of Indian Institutes of Technology in India: A Study
8. Impact of Information Communication Technology Applications in Central Libraries of National Institutes of Technology in India: A Study
9. User Satisfaction towards Open Access Resources by the Research Scholars of Indian Institutes of Technology in India: A Study
10. User Satisfaction towards E-Resources by the Users of Central Universities of North India: A Study



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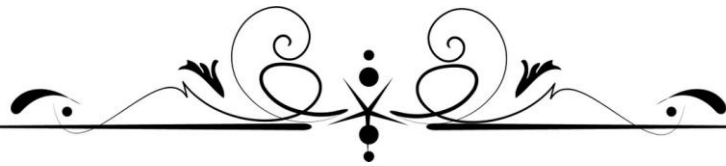
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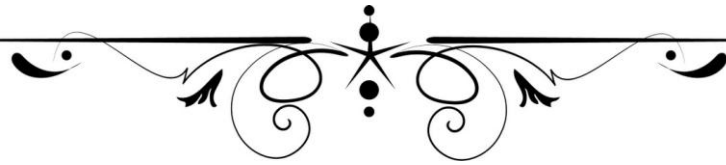
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Appendices



QUESTIONNAIRE FOR LIBRARIAN

To,

Subject: Request for filling up the enclosed questionnaire.

Dear Sir/Madam,

I am a Research Scholar, enrolled in Ph.D. under the supervision of **Dr. Sharad Kumar Sonkar**, Assistant Professor in the Department of Library and Information Science (DLIS), **Babasaheb Bhimrao Ambedkar University (BBAU), A Central University, Lucknow, U P.** The department has assigned me a topic of my research work i.e. *Current Trends in Information Communication Technology Applications in the Central Libraries of Indian Institutes of Technology in India: A Comparative Study between Old and New IITs.*

Therefore, I would like to request your good self to kindly spare few minutes to fill up this questionnaire. Please note that all data and information provided by you will be kept confidential and shall be used only for research purpose.

I know that your time is precious but spending few minutes will help me to complete this research, which is otherwise not possible.

Please tick mark [✓] on appropriate answers wherever required and use a separate sheet if needed.

Thanking you in anticipation.

Anjali Verma

Research Scholar

DLIS, BBAU, Lucknow.

Mob. No.- 9580618206, 7270979725

Email-anjaliv.7376@gmail.com

Section 1: Personal Profile

- (1) **Gender:** Male [] Female []
- (2) **Age Group:** Less than 25[] 26-30[] 31-35[] 36-40 [] >40 []
- (3) **Qualification:** Post Graduate [] M. Phil.[] Ph.D. [] Any other.....
- (4) **Professional Experience (in years):** <5 [] 6-10[] 11-15[] 16-25[] >25 []
- (5) **Designation:**

Section 2: About the Library

- (1) **Name of the Library (if any)** :
- (2) **Year of Establishment of Library** :
- (3) **Sitting Capacity for Users** :
- (4) **Total No. of Users** :
- (5) **Library Collection (Please write below)** :

Sl.	Collection		Print Form (No.)	E-Form (No.)	CD-Rom (No.)	Online Database (No.)		Total
						Full	Bibliographic	
(i)	Books							
(ii)	Periodicals	Indian						
		Foreign						
(iii)	Bound volume							
(iv)	Online Databases							
(v)	Theses							
(vi)	Dissertations							
(viii)	Standards/Patents							
(ix)	Others							
Total Collection								

(6) Please specify the details of Library Personnel

Sl.	Designation	No.	Sl.	Designation	No.
(i)	Librarian		(ii)	Deputy Librarian	
(ii)	Assistant Librarian		(iv)	Senior Library & Information Assistant	
(v)	Junior Library & Information Assistant		(iii)	Professional Assistant	
(vii)	Semi Professional Assistant		(vi)	Graduate Trainee	
(ix)	Any other (please Specify)				

Section 3: ICT Based Practices in Library

(1) Does your library provide ICT based best practices? Yes [] No []

If yes, please specify, (Multiple Choices)

- (a) E-mail Alerts [] (b) E-Referencing []
 (c) Online SMS/Instant messaging [] (d) SMS Services []
 (e) Any other.....

(2) Does your Library use Listservs for the collection development? Yes [] No []

If yes, please specify, how it helps in the collection development? (Multiple Choices)

- (a) Identifying and reviewing new sources []
 (b) Finding experts on a subject []
 (c) Learning about new electronic sources on the Internet []
 (d) Discuss collection policy issues []
 (e) Provide extensive bibliographies []
 (f) Announce conferences and employment opportunities []
 (g) Consult with colleagues in the same field []
 (h) Any other.....

(3) Does your Library provide automated following module? Yes [] No [] If

yes, please specify, (Multiple Choices)

Sl.	Module	Functions	Yes	No	Functions	Yes	No
1	Acquisition	Recommendation			Processing		
		Ordering			Receiving		
		Any other					
2	Circulation	Issue Return			Reservation		
		Fine Collection			Membership procedure		
		Overdue Notice			Any other		
3	Cataloguing	Data entry through books			Data entry through cards		
		Data entry through Accession Register			Direct through Recommendation		
		Direct Through forms			Any other		
4	Web OPAC	Bulletin Board			Edit Profile		
		Book Recommendation			Suggestions		
		Any other					
5	Serial Control	Ordering			Processing		
		Receiving			Receiving Request		
		Indexing			Abstracting		
		Any other					
6	Any other						

If not automated, please specify the reasons: (Multiple Choices)

- (a) Lack of computer facilities [] (b) Lack of trained manpower []
 (c) Management is not interested [] (d) Library collection is very less []
 (e) Inadequate of fund [] (f) Any other.....

(4) Which of the following services are offered by your library on the basis of ICT?

(Multiple Choices)

- (a) Lending Service [] (b) Reference Service []
 (c) Current Awareness service [] (d) Reprographic Service []
 (e) Inter Library Loan [] (f) User Education / Orientation []
 (g) Alerting Service [] (h) Document Delivery Service []
 (i) Web OPAC [] (j) Online Database search Service []
 (k) CD- ROM Database Service [] (l) Digital Library Service []
 (m) Institutional Repository [] (n) Ask Librarian []
 (o) Remote access to e-resources [] (p) Any other.....

(5) Which of the following Current Awareness Services provided by your library?

(Multiple Choices)

- (a) Bulletin Board Service [] (b) SMS Alerting Service []
 (c) Newspaper clipping [] (d) Email Alert Service []
 (e) Monthly book addition [] (f) New arrivals []
 (g) Any other

(6) Does your library provide any of the add-on services to the library users? (Multiple Choices)

- (a) Library Web-blog / Portal [] (b) Mobile Based Service []
 (c) Wi-Fi Services [] (d) Any other.....

(7) Which of the following technology is/are used in the library for ICT based services?

(Multiple Choices)

- (a) Internet [] (b) Cloud computing [] (c) RFID []
 (d) Smart card [] (e) Barcode technology []
 (f) QR codes tech. [] (g) Any other.....

(8) Do you have any mobile based applications for library services? Yes [] No []
[] If yes, please mention the name.....

(9) Are you able to manage ICT based services? Yes [] No [] If yes, please specify the level of expertise,

- (a) Preliminary [] (b) Middle []
 (c) Advance [] (d) Any other.....

(10) Do you need any technical training to manage the ICT applications in the library?

Yes [] No []

Section 4: IT Infrastructures

(1) Please provide the details of available equipment and instruments in the Library:

Sl.	Items	Numbers	Sl.	Items	Numbers
(i)	Computer		(ii)	Server machine	
(iii)	Photocopy Machine		(iv)	Flatbed Scanner	
(v)	Overhead Scanner		(vi)	Barcode Scanner	
(vii)	Hand-held Scanner		(viii)	Laser Printer	
(ix)	Digital Camera		(x)	LCD Projector	
(xi)	CD/DVD Writer		(xii)	Storage devices	
(xiii)	UPS Back- up Facility		(xiv)	Others (Please specify)	

(2) Does your library use any Library Management Software? Yes [] No [] If yes, please specify the name,

- (a) Koha [] (b) Libsys [] (c) SOUL []
 (d) VTLS [] (e) Any other.....

(3) Do you think that open source software is sufficient for management of the library activities and services? Yes [] No [] If no, please specify the reasons, (Multiple Choices)

- (a) No technical support available [] (b) To much technical expertise required []
 (c) Volatile in nature [] (d) Source code not available []
 (e) Difficulties in installation [] (f) Any other.....

(4) Does your library use any digital/institutional repository software? Yes [] No [] If yes, please specify the name,

- (a) D-Space [] (b) Greenstone []
 (c) E-print Archive [] (d) Any other.....

(5) Which kind of security system do you use in your library? (Multiple Choices)

- (a) CCTV [] (b) Smart card [] (c) RFID []
 (d) Biometrics [] (e) Any other.....

(6) Which antivirus is being used in your library for protecting computers?

- (a) McAfee [] (b) Avast [] (c) Kaspersky []
 (d) K7 [] (e) Any other.....

(7) Which browser do you prefer in your library for the application software?

- (a) Google Chrome [] (b) Mozilla Firefox []
 (c) Internet Explorer [] (d) Any other.....

(8) Which of the following network system software is used in your library?

- (a) UNIX [] (b) LINUX []

(c) WINDOWS NT (d) Any other.....

(9) Do you have own Library Network? Yes No If yes, what kind of network structure do you have?

(a) LAN (b) MAN
 (c) WAN (d) Any other.....

(10) Which type of internet connectivity is available in your library?

(a) Broad Band (b) Wi-Fi
 (c) Li-Fi (d) Any other.....

(11) What is bandwidth capacity of internet in your library? (Please mention).....

Section 5: Social Networking Sites

(1) Does your library use social networking sites? Yes No If yes, Please specify, (Multiple Choices)

(a) Face book (b) YouTube (c) Blog
 (d) Flicker (e) Twitter (f) Instagram
 (g) Google Plus (h) LinkedIn (i) Any other.....

(2) What are the purposes of using Social Networking Sites? (Multiple Choices)

(a) Linking up with library users
 (b) Promotion activities and users education programme
 (c) Creating awareness about library collection and services
 (d) Getting feedback/sharing the problems from the users
 (e) Any other.....

Section 6: Problems and Issues

(1) Do you face problems during implementation of information communication technology applications in the library? Yes [] No [] If yes, what type of problems do you face? (Multiple Choices)

- (a) Scarcity/Paucity of Funds []
- (b) Lack of ICT Infrastructure []
- (c) Inadequate Trained Library Professionals []
- (d) Increasing Cost of Hardware and Software []
- (e) Lack of co-operation and co-ordination among staff []
- (f) Lack of support from higher authority []
- (g) Non Availability of Consultancy Services []
- (h) In Selection of open vs. Commercial software []
- (i) Server vs. cloud computing technology []
- (j) Implementation of latest device and gadgets []
- (k) Any other.....

Suggestions/ Comments to implementation of emerging Information Communication Technology in libraries:

.....
.....
.....
.....
.....
.....
.....
.....

Thank you so much for your kind help. After filling up please return to

Anjali Verma
Research Scholar
DLIS, BBAU,
Lucknow
Email-anjaliv.7376@gmail.com
Mob. No.- 9580618206,
7270979725

Signature
(Seal of the Library/Librarian)

QUESTIONNAIRE (For Library Users)

Dear Sir/Madam,

I am requesting your good self to kindly spare few minutes to fill up this questionnaire on the topic “Current Trends in Information Communication Technology Applications in the Central Libraries of Indian Institutes of Technology in India: A Comparative Study between Old and New IITs.” All information/data provided by you will be remained confidential and shall be used for thesis/research purpose only.

I solicit your kind co-operation please.

Thanking you

Please tick mark [] to indicate answers wherever mentioned.

1) User Profile

Name (Optional): Designation:

Name of Institute: Course and Department:

Sex: Male/Female [] Age: E-mail Id.:

2) How often do you visit the library?

(a) Daily [] (b) Twice a week [] (c) Weekly []

(d) Monthly [] (e) When needed []

3) In case, you do not use the library frequently (daily or twice a week) please indicate the reasons. (Multiple Choices)

(a) To do research work [] (b) Shortage of time []

(c) Required information not available [] (d) Information available on desktop []

(e) Inconvenient library hours [] (f) Any other (please specify).....

4) Please indicate the purpose of visit the library: (Multiple Choices)

(a) To borrow and return the books [] (b) To read general books []

(c) To read newspapers/magazines [] (d) To read subject books []

(e) To consult reference books [] (f) To get reference service []

(g) To complete class assignments [] (h) Any other (please specify).....

5) Does your library provide following types of Information Communication Technology

based services? Yes [] No [] If yes, which type of services are used by you? (Multiple Choices)

- (a) Instant messaging [] (b) Automatic issue and return of books []
- (c) Online library catalogue [] (d) Online access of electronic resources []
- (e) Reservation of books [] (f) CD-ROM access on the campus network []
- (g) Digital reference Service [] (h) In-house digital collection []
- (i) Remote access [] (j) Online user education/orientation programs []
- (k) Any other (please specify).....

6) Does your library offer social networking sites? Yes [] No [] If yes, then which social networking site/sites are mostly used by you? (Multiple Choices)

- (a) Face book [] (b) YouTube []
- (c) RSS feed [] (d) Twitter []
- (e) Any other (please specify)

7) Are you satisfied with the digitized collection of your library? Yes [] No []

8) What is your opinion about use of digital collection in the library?

- (a) Highly useful [] (b) Moderately useful []
- (c) Slightly useful [] (d) Not at all useful []
- (e) Any other (please specify)

9) Are you satisfied to the library services? Yes [] No [] If yes, please specify,

- (a) Fully satisfied [] (b) Partially Satisfied []
- (c) Satisfied [] (d) Not satisfied []

10) Are you satisfied with the relevant collection available in your Library?

Yes [] No [] If yes, please specify,

- (a) Excellent [] (b) Very good []
- (c) Good [] (d) Poor []

11) Do you use E-resources provided by your library? Yes [] No [] If yes, which type of e-resources do you use? (Multiple Choices)

- a) E-journals [] b) E-Databases [] c) E-Books []
- d) E-Theses [] e) E- Scholarly Content [] f) Any other (please specify).....

12) What kind of problems do you face while using the e-resources of your library? (Multiple Choices)

- (a) Inadequate resources [] (b) Poor connectivity of internet []
- (c) Unorganized information [] (d) Difficult to read from screen []
- (e) Any other (please specify).....

13) Please give your valuable suggestions to improve and apply Information
Communication Technology in the Library Services?

.....
.....

Thank you so much for your kind help.

After filling up please return to

Anjali Verma
Research Scholar
DLIS, BBAU, Lucknow
Email-anjaliv.7376@gmail.com
Mob. No.- 9580618206, 7270979725