COLLECTION MANAGEMENT AND USE OF E-RESOURCES IN SCIENCE RESEARCH INSTITUTE LIBRARIES IN PUNE METROPOLITAN AREA

A Thesis

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BY

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DECLARATION

I hereby declare that the thesis entitled "Collection Management and Use of E-Resources in Science Research Institute Libraries in Pune Metropolitan Area" completed and written by me has not previously formed the basis for the award of any degree or other similar title upon me of this or any other Vidyapeeth or examining body.

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CERTIFICATE

This is certify that the thesis entitled "Collection Management and Use of E-Resources in Science Research Institute Libraries in Pune Metropolitan Area" which is being submitted herewith for the award of the Degree of Vidyavachaspati (Ph.D) in Library and Information Science Faculty of Moral and Social Sciences o Tilak Maharashtra Vidyapeeth, Pune is the result of original research work completed by Ms. Namrata N. Shinde under my supervision and guidance. To the best of my knowledge and belief the work incorporated in this thesis has not formed the basis for the award of any degree or similar title of this or any other university or examining body upon her.

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Acknowledgements

Abstract

The present research work is an attempt to study Collection Management and Use of e-resources in Science Research Institute Libraries in Pune Metropolitan Area. Science research libraries are playing a vital role in supporting research activities in their parent organization by supplying scientific and technical information to their users. In this study main focus is on assessing collection management and use of e-resources in science research libraries in Pune. Researcher has conducted survey of 18 libraries for survey where e-resources collection is available, used, well growing and facing challenges in e-resources management. Researcher also surveyed 628 users of these selected science research institutes libraries. Data collected from science research libraries helps to find out status of present library collection, acquisition, management of e-resources. It also helps to assess libraries efforts for training library staff and users, and other issues like e-resources preservation, copyright, difficulties in e-resources management, services provided by libraries using e-resources, etc. Data is collected from users to assess user's awareness about e-resources, information searching techniques, difficulties in using e-resources, etc. In the present study, e-resources term is used for all the electronic resources like e-books, e-Journals, databases, e-thesis, reports, patents, Internet resources, etc.

Descriptive method is used to carry out this research. Questionnaire technique is used to collect the data. Two types of questionnaires are prepared– one for collecting data from librarians to understand and status of e-resources and its use. The other questionnaire for users to assess use of e-resources by them. Along with questionnaire, the researcher has also conducted interviews of few prominent institute's librarians. The researcher has deduced findings from the analysis of collected data from the survey. It is confirmed from the finding that libraries are managing e-resources very well and use of e-resources is increasing day by day. It is also found that there is considerable amount of research on e-resources conducted in different sectors of higher education. Collection management and use of e-resources in science research libraries in Pune is not conducted so far.

The present study is completed in eight chapters. A brief content of all of the chapters is:

Chapter 1- Introduction:

This chapter deals with general introductory information on research plan and covers development of S&T in India, science and research libraries in Pune Metropolitan area, e-resources in science research libraries and collection management of e-resources. It also gives information about the need of study, objectives of the study, hypotheses, scope and limitations, research methodology, etc.

Chapter 2- Literature Review:

In this chapter, the researcher reviewed the published and available literature related to study. The literature published in different form and format were gathered from the different information sources, analyzed, synthesized and reported under different facets. Review of the literature was found very useful for the present study to build research plan, hypothesis and research method selection as well as supporting statements in research study.

Chapter 3- Development of Science Institutes in India: An overview

This chapter provides brief review of development of science research institutes in India.

Chapter 4-e-Resources Available in S&T:

This chapter highlights the availability of the major important e- resources in science stream with their brief information for use of academic and research workers. In this chapter prominent and most useful e-resources are discussed which are useful to the users for using best resources in their field for gathering information.

Chapter 5-e-Resources Management and Its Impact:

This chapter provides information on the management of e-resources in the research libraries. It has also been discussed about the impact of e-resources on the researcher, libraries, publishers, etc.

Chapter 6- Profile of Science Research Institutes:

This chapter provides brief profile of the selected science research institutes in Pune. It provides information of institutes on their aims, objectives and area of research of

science research institutes. The information presented in this chapter is collected from the research institute as well as using the information given on web sites of research institutes.

Chapter 7A- Data Analysis: Librarians Questionnaire:

This chapter presents the analysis of the data collected from the librarian's questionnaire. After systematic analysis of the data, researcher presented data using tables and charts wherever required.

Chapter 7B- Data Analysis: Users Questionnaire

This chapter represents data analysis of data collected from the user's questionnaire. Analyzed data is presented systematically using tables and charts.

Chapter 8- Findings, Suggestions and Conclusions:

This chapter highlights the observations found from the data collected. Based on this data suitable suggestions are presented for better management of e-resources. It also gives scope for further research in this area.

A draft policy for collection development, management and preservation is also discussed in this chapter based on IFLA standards. Best practices in e-resources management and e-resources management practical guidelines are also narrated in this chapter.

Few remarkable findings of the study are –

- All science research libraries in Pune are having good collection of print and e-resources. But electronic collection in science research libraries is increasing fast and have e-journals, e-books, databases, Ph. D theses in their collection. Use of internet resources is also increasing fast.
- All the libraries have acquired e-resources and databases either full text or bibliographical as per their users' needs. In full-text databases Science Direct, Indian Standards, ACM Digital Library are common and in bibliographic databases Web of Science, Scopus, J-Gate and SciFinder are common in these libraries.

- Written collection development policy is basic need for the development of good collection in libraries, but only 22 % libraries have written library collection development policy for acquisition and management of e-resources, and 78% libraries don't have written collection development policy.

- It is observed that 72% libraries do not have separate budget for procurement to e-resources and only 27.78% libraries have separate budget for subscription to e-resources. 78% libraries have sufficient budget for subscription of e-resources whereas 22% libraries do not have sufficient budget for subscription.

- 89% libraries provide campus-wide access to e-resources, 61% libraries provide access to the library on library computers, 39% libraries provide access through the internet using ID and password and 33% libraries provide Wi-Fi enabled access in their campus.

- It is very positive sign that in most of the research libraries (72%) are managing and developing digital/institutional repository.

- Almost 89% libraries still fully depend upon publisher for preservation of purchased online e-books and e-journals. 94% libraries are not using Electronic Resource Management System (ERMS) for managing e-resources.

- Librarians are strongly agreeing on the issues of lack of funds (61%), lack of awareness about e-resources among users (55.56), lack of technical support (50%), Lack of infrastructure (55%) and technological obsolescence (55.55%). They disagree on the problems, like lack of trained staff in library (61.11), lack of demand of e-resources from users (66.67%), lack of usage (72.22%) and lack of autonomy in decision-making process (50%).

- e-Resources are more popular than print resources. 25% users are using only e-resources. More than half of the users (56%) are using both the resources i.e. print and e-resources for their research.

- Elsevier, Springer, Wiley, Taylor and Francis, Nature, Cambridge, Blackwell, American Chemical Society, Royal Society of Chemistry, Institute of Physics, etc.; these publishers are major and popular in the field of science.

- Major problems faced by the users are slow internet speed (49%), desired/required journals are not subscribed in library (43%), lack of knowledge regarding availability of electronic resources (33%), lack of information searching skills (21%), lack of remote access (15.76%), failure of library staff to keep users aware of availability of electronic resources (14.49%), limited terminals (14.33%).

Major Suggestions are:

- ➢ Libraries have to prepare written collection development policy for e-resources and update it from time to time. Collection development policy includes the guidelines for selection, deselection, vendor selection, acquisition, processing, renewal, preservation and weeding, etc.

- ➢ All the libraries need to come together to form library network at local level which will enable easy sharing of resources. Similarly for actively sharing resources, holding list and union catalogue need to be prepared.

- ➢ It is suggested to organize regular training programmes for staff and users, to understand the features of e-resources for effective use.

- ➢ It is suggested that special orientation for awareness of copyright and plagiarism must be organized for avoiding IPR issues. Libraries need to conduct special awareness programme on copyright laws from time to time. Further it is suggested that libraries need to put copyright information on their website to make users aware of it.

- ➢ It suggested that libraries have to prepare digital preservation programmes for their e-resources. Science libraries can come together to develop such preservation programme collectively.

- ➢ Some libraries have old valuable print collection in their library. To preserve and provide access to old and valuable print collection, libraries need to digitalize it and provide access through digital repository or any other convenient way. Libraries can use open source content management software to manage and provide access to their digitized collection.

- ➢ Science research libraries are special libraries and are having fine collection on their subject. They can start various services like Document Delivery Service, Reference Service, outside side membership, translation service for outside users to generate more revenue.

This study is thus concluded by giving scope for future study, satisfying objectives and proving hypothesis true. Science libraries are spending major portion of their budget on e-resources. Procurement of e-resources is increasing day by day due to its tremendous advantages and users demand for e-resources. e-Resources has made impact on users, libraries as well as publishers.

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Abbreviations

Abbreviations	Full Form of the Terms Used
AcSIR	Academy of Scientific and Innovative Research
AICTE	All India Council of Technical Education
AIDS	Acquired Immune Deficiency Syndrome
ALA	American Library Association
CD	Compact Disc
CLOCKSS	Controlled LOCKSS
CSIR	Council of Scientific and Industrial Research
DESIDOC	Defence Scientific Information & Documentation Centre
DGPS	Differential Global Positioning Systems
DRDO	Defence Research and Development Organisation
DVD	Digital Versatile Disc
E-books	Electronic Book
E-documents	Electronic Documents
E-journals	Electronic Journal
E-Publications	Electronic Publication
e-resources	Electronic Resources
GDP	Gross Domestic Product
GPS	Global Positioning System
HIV	Human Immunodeficiency Virus
HTML	Hypertext Mark-up Language
IC	Information Centre
ICAR	Indian Council of Agricultural Research
ICMR	Indian Council of Medical Research
ICT	Information and communication technology
IFLA	International Federation of Library Associations and Institutions
IISER	Indian Institute of Science Education and Research
IIT	Indian Institutes of Technology
INDEST	Indian National Digital Library in Engineering Sciences and Technology
IP	Internet Protocol

ISBN	International Standard Book Number
JPG	Joint Photographic Experts
KRC	Knowledge Research Centre
LAN	Local Area Network
LOCKSS	Lots of Copies Keep Stuff Safe
MHRD	Ministry of Human Resource Development
NDL	National Digital Library
NIC	National Informatics Centre
NISCAIR	National Institute of Science Communication and Information Resources
NISSAT	National Information System for Science & Technology
OCLC	Online Computer Library Center
PARAM	Parallel Machine
PC	Personal Computer
PDF	Portable Documents Files
Ph. D	Doctor of Philosophy
R&D	Research and Development
RAM	Random Access Memory
RDF	Resource Description Framework
RFID	Radio-Frequency Identification
RTF	Rich Text Format
S&T	Science and Technology
SGML	Standard Generalized Mark-up Language
SKOS	Simple Knowledge Organization System
TXT	Text
UGC	University Grants Commission
URL	Uniform Resource Locator
USD	US Dollar

Chapter 1: Introduction

1.1 Introduction:

Socio-economic development of any country entirely depends upon its advancement in science and technology. The countries, which are advanced in science and technology, are economically developed and powerful. All thenations are continuously making efforts in conducting research in science and technology. Global investment in S&T and innovations estimated around USD 1.2 trillion as of 2009 (Department of Science and Technology, 2017). In India, significant budget has allotted for the growth of S&T. In 10th Five Year Plan, total expenditure on S&T was Rs. 23641.26 crore and this has been increased to Rs.75304 crores in 11th Five Year Plan (Planning Commission, 2013). Many R&D and education institutions like Indian Institutes of Sciences, Indian Institute of Technology, Indian Institute of Science Education and Researchetc., have been established for conducting and encouraging original research in science and allied areas. Various information systems and programs have been developed like NISSAT, NIC, ICAR, DESIDOC, NISCAIR, CSIR, etc., for advancement in R&D and S&T. All the educational and R&D organizations, institutes are well supported by information systems, which support the information need of researchers, scholars and R&D scientists.

1.2 Science and Technology in India: Brief Review

Since independence, continuous efforts have been taken by the Indian Government for the development of science and technology by initiating various R&D activities. Planning Commission's, Science and Technology Division which is central division for all activitiesassociatedwith Science and Technology Plan formulation. For the development of country, global innovations in S&T are main driving factors. Various policies are prepared by the Government of India to accelerate growth and development in S&T. India's Scientific Policy Resolution (1958) resolved to foster, promote and sustain cultivation of science and scientific research in all its aspects. Efforts have been taken to establish infrastructure for scientific research. Technology Policy (1983) emphasized technological competence and self-reliance for the growth of S&T. The Science and Technology Policy (2003) highlighted the need for

investments in R&D. It also emphasized, to integrate socio-economic development programs with national R&D systems, to solve the national problems as well as creation of national innovative system. India has been declared from 2010-2020 as the "Decade of Innovation." The Indian government has constructed a "National Innovation Council of Science and Technology Innovation Policy 2013", to bring fresh prospective in the Indian context. Indian Government is now encouraging private sector investors to invest in R&D activities. Public Private Partnership helps to invest in innovative and ambitious projects of Government. Private sector investments are helpful to translate R&D outcome to commercial outcomes, economically.

In India, total expenditure on R&D is less than 2% of the GDP (Planning Commission, 2013). But continuous efforts are taken by the Government of India to increase investments in R&D for enhancing science technology. The monitory support for science and technology sector has strengthened due to Government policies. As a result of this, India ranks 9th in position globally in scientific publications and 12th in position in the world in a patent filed S&T (Department of Science and Technology).

1.3 Science Research Libraries

All scientific and industrial research organizations in India are well supported by information facilities through libraries, KRCs, ICs, etc. Almost all the science research libraries are supporting to higher education and research like IITs, IISERs, Defence R&D organizations like DRDO, Government laboratories like CSIR, state and central government departments, etc. Basic function of all these libraries is to support their parent organization in achieving the mission and vision of their parent organization. Users of these science libraries are mostly researchers, scholars, R&D and S&T staff, forecaster, IPR, Planners community etc. The information needs of researchers vary, but they need particular and pinpointed information for carrying out R&D. For any research, the primary need is to get access to the quick and accurate information.Research starts with available information and generates new information and knowledge which is result of R&D. New information gives new visions to researcher and it is the foundation for further research and the cycle continues. Many a times, delay in information to R&D community leads to duplication in research and causes wastage of funds. The success of any research depends upon collection and

dissemination of scientific and technical information which support R&D. Throughout the world, continuous research process is undertaken in science and technology area to develop innovative products for human life. New information is generated from research and scientific activities. Providing access to newly generated information, knowledge to users and directing research group to access needed information is a challenging task for libraries. Libraries, information and knowledge centers are attached to every research and development institutes which helps their users to get required information at right time. Libraries provides essential information required for research using information resources available throughout the world. It is now essential to strengthen libraries and information centers attached to scienceand research organizations, higher education institutes for procurement of library resources and its proper management.

Libraries attached to R&D institutes are treated as special libraries even though they are part of academic or research institutes. Special libraries are dealing with information sources in specific subject areas for their users and are also restricted to particular area with narrow subject interests for supporting information needs. They are dealing with micro areas of a particular subject. They develop collection as per institutes goals, vision and mission as well as user's requirements. These libraries build excellent collection in their areas. Users of sciences research libraries are always busy in their research activities and libraries have to provide current and required information to the users, at their desktop. Along with traditional services, libraries understand information need of their users and libraries keep them informed about latest development in their subject areas by providing various services like Current Awareness Service, Selective Dissemination Services, Document Delivery Services, etc. Most of the science research libraries are advanced and automated libraries. These libraries use ICT for acquisition, processing, disseminating information to the users for generating new knowledge.

1.4 Science and Research Libraries in Pune Metropolitan area.

Pune city is popularly known as "Oxford of the East" and "cultural capital of Maharashtra" because maximum R&D institutes established in the Pune city. Pune city is a well-known educational hub for Indian as well as International students as it has a wide range of educational and research institutes performing in various domain

of science and other disciplines. It is noticed that, under the umbrella of Government of India about 25 major research institutes are established in Pune which are related to different scientific research areas. These are listed alphabetically in the table 1.1.

Table 1.1 Science Research Institutes and Libraries in Pune Metropolitan area

Sr. No.	Institute Name	Ministry of Govt.	Core Research Area
1	Agharkar Research Institutes (ARI)	Department of Science and Technology, Government of India.	Life Science
2	Armament Research and Development Establishment (ARDE)	Ministry of Defence, Government of India.	Weapons Technology
3	Automotive Research Association of India (ARAI)	Ministry of Heavy Industries and Public Enterprises, Government of India.	Automotive
4	Botanical Survey of India: Western Regional Centre Pune	Ministry of Environment, Forest and Climate Change, Government of India.	Botany
5	Central Bee Research Centre (CBRC)	Khadi & Village Industries Commission, Ministry of Micro, Small & Medium, Enterprises Government of India.	Beekeeping
6	Central Institute of Road Transport. (CIRT)	Ministry of Shipping & Transport, Government of India.	Training, Testing and Consultancy
7	Central Water Power Research Station	Ministry of Water Resources, River Development and	Hydraulics, Coastal Engineering,

	(CWPRS)	Ganga Rejuvenation Government of India.	Mathematical Model and Civil Engineering
8	Centre for Development of Advanced Computing (C-DAC)	Ministry of Electronics and Information Technology, Government of India.	High Performance Computing, Super Computing and Linguistic Computing
9	Centre for Materials for Electronics Technology (C-MET)	Ministry of Electronics & Information Technology (MeitY), Government of India.	Electronics
10	Defence Institute of Advance Technology (DIAT)	Ministry of Defence, Government of India.	Defense Related Techniques in navigation systems, wireless sensors, Efficient Propulsion System, Weapons systems
11	High Energy Material Research Laboratory (HEMRL)	Ministry of Defence, Government of India.	Defense Research and Development
12	Hindustan Antibiotics (HA)	Department of Chemicals and Petrochemicals, Government of India.	Drug Manufacturing
13	Indian Institute of Science Education and Research (IISER)	Ministry of Human Resource Development, Government of India.	Pure Science
14	Indian Institute of Tropical Metrology (IITM)	Ministry of Earth Sciences, Government of India.	Tropical Metrology
15	India Meteorological	Ministry of Earth Sciences,	Meteorology

	Department (IMD)	Government of India.	
16	Inter-University Centre for Astronomy and Astrophysics (IUCAA)	University Grants Commission (UGC)	Astronomy and Astrophysics
17	National AIDS Research Institute (NARI)	Indian Council of Medical Research.	HIV
18	National Centre for Cell Science (NCCS)	Department of Biotechnology, Government of India.	Biotechnology
19	National Centre for Radio Astrophysics (NCRA)	Department of Atomic Energy, Government of India.	Astronomy and Astrophysics
20	National Chemical Laboratory (NCL)	Council of Scientific and Industrial Research.	Chemical Sciences
21	National Institute of Naturopathy	Department of Ayush, Government of India.	Naturopathy
22	National Institute of Virology (NIV)	Indian Council of Medical Research.	Virology
23	National Research Centre for Grapes	Indian Council of Agricultural Research.	Grapes
24	Regional Ayurveda Institute for Fundamental Research	Department of Ayush, Government of India.	Ayurveda
25	Research and Development Establishment (R&DE)	Ministry of Defence, Government of India.	Military Engineering

Thus, in all about 25 prominent research institutes devoted to different science disciplines are well established in Pune city. These research institutes are also having libraries and information/knowledge center for providing information services to their parent bodies and scientific users.

1.5 Resources Available in Science Research Libraries:

Science research libraries are playing a vital role in supporting research activities in their parent organization by supplying scientific and technical information to their users. Users need is for getting information on very specific topic and most of the time urgent demand for information. These libraries have developed rich treasure of resources like books, journals, theses, patent, conference proceedings, standards, reports, etc. through which they can satisfy users' needs expeditiously. In the beginning all these libraries' collection was based on print media but now they are equally strong in print, digital and electronic resources. The latest technologies trends are visible in special libraries to perform well in information handling.

Advancement in ICT has made significant impact on the publication trade. Huge information is publishing in print and electronic form. In information world, information is acquired, gathered, edited, published and accessed in print and electronic forms like e-books, e-journals, databases, DVDs, CDs, different websites, etc. along with traditional print. Electronic information has its own advantages over the print resources like 24/7 access, quick and fast publications, hyper linking access and its utilization. Maximum publishers in S&T areas are publishing their scientific publications in electronic form due to many fold advantages similarly many databases like Science Direct, Web of Science and Scopus provides access to thousands of journals together in electronic form.

Many publishers and vendors are offering economical journal packages to libraries like consortia. Most of the libraries prefer to purchase online resources through various consortia which helps them to get access at economical and discounted prices. In consortia, libraries having common interest, join together to form consortia for economic benefits. Few consortia of IIT libraries, IISER libraries, CSIR libraries etc. are established. In India, at national level many initiatives have been taken to form consortia like MHRD which has formed e-ShodhSindhu which gives current as well as archival access to more than 15,000 core peer-reviewed journals and many

citations, factual and bibliographic databasesin various disciplines. Technological development and availability of online resources have changed the way of research done by the researcher and the services provided by the libraries to the research community. Availability of e-journals and other resources from the user's desktop has been an important reason for the decreasing number of users visiting the research libraries. National Digital Library (NDL) is a major national project under MHRD for integrating national and international digital libraries at single portal. This has help to provide access and preserve the intellectual content of the nation to users' community.

Generally, a significant portion of science research libraries budget is spent on subscribing to e-resources like online journals, databases, procuring e-books, CDs/DVDs and other digital collections. Users are also recommending and directing libraries towards e-resources procurement for getting the latest as well as quick access to information generated for R&D use.

For providing better access to e-resources, every library is managing e-resources in the best and economical ways. Due to lack of proper collection management, the library may result in a precarious situation where a lot of money is spent for procuring and installing digital media and resources, but without leading to the desired access to users.

1.6 Collection Management of e-Resources:

Collection management deals with systematic organization of acquired resources either in print or digital. Many times, collection management and collection development terms are used as synonyms. Collection development includes the selection of resources as per institutes priorities, user's need and budget. Collection management includes collection development and collection maintenance which include selection, acquisition, preservation, weeding and cancellation of serials/journals and providing access to it.

According to Harrods's Glossary, "Collection management is the process of planning, stock acquisition program not simply to cater for immediate needs, but to build a coherent and reliable collection over several years, to meet the objectives of the service. The term demands depth and quality of stock and includes associated activity towards exploitation of the collection through publicity, staff training, etc."

The boom of E-Publications has made a significant impact on library's collection, development and management activities. Electronic resources are playing significant role in information dissemination in science research libraries. Many documents are now available in electronic form and users are also demanding and prefer use of e-documents, hence libraries in digital era need to acquire more and more electronic resources. Collection management of e-resources is different than print resources. The basic difference in electronic and print resources is the ownership of the resources. Once purchased print resources, its ownership is with the library, but same is not the case with e-resources. Subscription of e-resources means libraries only get right to access the e-resources but ownership belongs to the publisher only. Collection management of e-resources not only involves selection, procurement, arrangement and use, but new issues like fair use, licensing, challenges in the long-term digital preservation and archiving, copyright, infrastructure requirement, technically expert staff, etc. The issues involved in the procurement of resources, cataloguing, shelving and circulation of the print and e-resources are very much different. Electronic resources are available in various form and to get access to the information it requires proper infrastructure. Hence libraries have to check the availability of appropriate infrastructure before its procurement. The library set trial access for the e-resources before procurement so that the user can access it and if it is useful, then only the library goes ahead for the procurement.

1.7 Background of Study:

Keeping in mind the important process of e-resources and its usage in research libraries, researcher has decided to study the e-resources management in libraries as well as its use among the researcher in research institutes. The increasing use of e-resources forced researcher to understand the user's perception and libraries views in managing e-resources and challenges faced by them. Hence the study of e-resources management and use of e-resources by scientific users is preferred in this study. It is also visualized that almost all specialized libraries are moving towards procurement of e-resources and managing them is a challenge. The area of e-collection development and management is new and specific studies need to be conducted in this area. Similarly, users and professionals opinions are also to be assessed.

1.8 Statement of Research Problem:

The researcher has selected the research problem "Collection Management and Use of E-Resources in Science Research Institute Libraries in Pune Metropolitan Area" in which focus is on mainly management of e-resources for future use and ways and means for proper preservation and maintenance of e-resources and use of e-resources by the users from scientific organization.

1.9 Need for the Study:

Libraries associated with science institutes plays important role in providing scientific and technological information to the scientist. Research/Special libraries have to provide exact, pinpointed information quickly to the researcher. In the era of digital resources, only printed documents are not sufficient to fulfill scientific user needs, at the same time large number e-documents are available in the field of S&T. Someof the journals are now only available in electronic form. The scientist/researcher mostly depends upon electronic resources for their information needs due to fast accessibility. Almost 80 % of the research libraries budget is spent on primary information resources either in print or different form of electronic resources. But management of electronic resources is little tedious than print resources as its nature is different than print. The present study analyzes the resources in science research libraries including e-resources as well as the use of e-resources in Science Research Libraries in Pune Metropolitan area.

1.10 Objectives of Study:

The following objectives have been fixed for this research study.

1. To identify Science Research Libraries funded or established under the aegis of Central Government in Pune Metropolitan Area.

2. To assess the collection of Science Research Institute Libraries including e-resources.

3. To assess the use of e-resources by users in Science Research Institute Libraries.

4. To identify issues and problems while consulting e-resources by users.

5. To record few prominent e-resources useful in Science Research Institute Libraries.

6. To suggest best practices to enhance the use of e-resources by Library users of Science Research Institutes and management of e-resources in Science Research Institute.

1.11 Hypotheses:

1. Use of e-resources by the users is increasing in Science Research Institute Libraries.

2. e-Resources collection is also increasing in science research libraries.

1.12 Scope and Limitations:

The scope of the study is limited to the libraries attached to Science Research institutes under the umbrella of central government of India (either funded or promoted by Government of India) located in Pune Metropolitan Area. Science Research Institute Libraries outside the Pune city are not considered for the survey. Various Government websites are used to identify Science Research institutes in Pune for example http://www.dst.gov.in/, https://www.drdo.gov.in/, http://dhi.nic.in/, http://envfor.nic.in/, http://kvic.org.in, http://www.asrtu.org, http://cwprs.gov.in/, http://meity.gov.in/, http://chemicals.nic.in, http://mhrd.gov.in/, http://www.moes.gov.in/, https://www.ugc.ac.in/, http://www.icmr.nic.in/, http://www.dbtindia.nic.in/, http://dae.nic.in/, www.csir.res.in, http://ayush.gov.in/ , www.icar.org.in etc. There are nearly 25 Science Research Institutes under the umbrella of the central government in Pune Metropolitan Area which are having libraries. Out of 25 Science Research Institute libraries, six institute libraries have only print collection and don't have electronic resources in their library collection but action is initiated. Hindustan Aeronautics Ltd. (HAL) is the only Institute which does not have proper library facilities as the institute ishaving only production unit. Earlier there was library facility available in HAL but now suspended. Similarly,the following libraries do not hold e-resources in their holding.

1. Botanical Survey of India: Western Regional Centre Pune
2. Central Bee Research Centre (CBRC)
3. Centre for Materials for Electronics Technology (C-MET)

4. India Meteorological Department (IMD)

5. National Institute of Naturopathy (NIN)

6. Regional Ayurveda Institute for Fundamental Research

Hence the study is conducted among 18 libraries out of 25. The reason is HAL do not have proper library and other 6 do not having e-resources.

Table 1.2 Availability of e-resources in libraries

Sr. No.	Physical Collection Only	Physical and e-resources Collection	No libraries
1	Botanical Survey of India: Western Regional Centre Pune	Agharkar Research Institutes (ARI)	Hindustan Antibiotics (HA)
2	Central Bee Research Centre (CBRC)	Armament Research and Development Establishment (ARDE)	
3	Centre for Materials for Electronics Technology (C-MET)	Automotive Research Association of India (ARAI)	
4	India Meteorological Department (IMD)	Central Institute of Road Transport. (CIRT)	
5	National Institute of Naturopathy (NIN)	Central Water Power Research Station (CWPRS)	
6	Regional Ayurveda Institute for Fundamental Research	Centre for Development of Advanced Computing (C-DAC)	
7		Defence Institute of Advance Technology (DIAT)	
8		High Energy Material Research Laboratory (HEMRL)	
9		Indian Institute of Science Education and Research (IISER)	

10		Indian Institute of Tropical Metrology (IITM)	
11		Inter-University Centre for Astronomy and Astrophysics (IUCAA)	
12		National AIDs Research Institute (NARI)	
13		National Centre for Cell Science (NCCS)	
14		National Centre for Radio Astrophysics (NCRA)	
15		National Chemical Laboratory (NCL)	
16		National Institute of Virology (NIV)	
17		National Research Centre for Grapes (NRCG)	
18		Research and Development Establishment (R&DE)	

Hence researcher has selected core 18 libraries for survey where e-resources collection is available, used, well growing and facing challenges in e-resources management. Thus, the population of the research study is 18.

1.13 Research Methodology

The selection of research methodis depends on the research problem. Descriptive method is used to carry out this research. Questionnaire technique is used to collect the data. Two types of questionnaires are prepared– one for collecting data from

librarians to understand and status of e-resources and its use. The other questionnaire for users to assess use of e-resources by them.

Along with questionnaire, the researcher has also conducted interviews of few prominent institute's librarians. These interviews helped in understanding the librarian's views about e-resource management, various problems faced and their ways to solve the issues of e-resources. The discussions were very helpful for the researcher. The data collected is statistically analyzed and presented in suitable tabular or graphical format in chapter numbers 7A and 7B.

1.13.1 Population and sampling of libraries:

There are 25 librariesidentified in Pune under umbrella of central government undertaking. The researcher has selected all 25 libraries for its survey. After conducting survey, it is noticed that only 18 libraries are having e-resources as detailed in table 1.2. All the 18 institutes are surveyed to assess e-collection. Thus 100% selection of population is considered by the researcher for surveying the libraries status in relation to e-resources collection and management. Thus, out of 25 libraries, excluded print collection libraries and institutes not having libraries, only 18 libraries are considered as population and response is 100%.

1.13.2 Population and Sampling of Users:

The population of scientific users of 18 research institute libraries under survey is about 6275 as detailed in following table 1.3

Table 1.3 Users Population

Sr. No.	Institute Name	Total PG Students	Sample Population of PG Students	Researcher Scholar/ Scientific Staff	Sample Population Scientific Staff	Faculty Population	Sample Population of Faculty
1	Agharkar Research Institute	50	5	50	5	40	4
2	Armament Research and	100	10	500	50	-	-

	Development Establishment						
3	Automotive Research Association of India	262	26	461	46	9	1
4	Central Institute of Road Transport.	-	-	85	9	9	1
5	Central Water Power Research Station	-	-	256	26	-	-
6	Centre for Development of Advanced Computing	700	70	600	60		
7	Defence Institute of Advance Technology	495	50	116	12	80	8
8	High Energy Material Research Laboratory	-	-	300	30	-	-
9	Indian Institute of Science Education and Research	353	35	80	8	140	14
10	Indian Institute of Tropical Metrology	9	1	243	24	-	-
11	Inter-University Centre for Astronomy and Astrophysics	10	1	36	4	23	2
12	National AIDs Research Institute	15	2	-	-	20	2
13	National Centre for Cell Science	-	-	125	12	32	3
14	National Centre for Radio Astrophysics	6	1	20	2	20	2
15	National Chemical Laboratory	33	3	194	19	63	6
16	National Institute of Virology	43	4	17	2	38	4
17	National Research Centre for Grapes	-	-	45	4	17	2

18	Research and Development Establishment	-	-	580	58	-	-
	Total	2076	208	3708	371	491	49

Selected 18 science research institutes in Pune are having Post Graduate student's strength of 2076. The strength of researcher/ scholar and scientific staff is 3708 and strength of regular faculties is 491. This is the population of different type of users. The total population is 6275.

Since the population of users is known and fixed i.e. 6275, the researcher referred to Krejcie and Morgan table, in which sample size of 364 for 7000 population is preferred for survey. The researcher has considered 10% sample of population i.e. 628which is higher than Morgan table. Hence researcher has considered 628 users randomly selected for survey from the 18 institutes.

Table 1.4 Krejcie and Morgan table

Table 3.1

Table for Determining Sample Size of a Known Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	1000000	384

Note: N is Population Size; S is Sample Size   Source: Krejcie & Morgan, 1970

(Source: Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and psychological measurement*, *30*(3), 607-610.)

1.13.3 Structure of Librarians Questionnaire

This questionnaire circulated among libraries to assess status of e-resources consists

of 3 parts – A, B and C. Total questions asked in all parts are 112 covering to assess institute profile, library status, efforts for e-resources management, e-resources budget, selection and management of e-resources, orientation to users etc.

Table 1.5 Structure of Librarians Questionnaire

Part	Area Covered	Questions
A	Institute Profile	8
B	Library Profile	14
C	E-resources Collection Management	
I	Budget	5
II.	Selection	5
III.	Licensing Agreement	10
IV.	Acquisition	9
V.	Management	20
VI.	Training	6
VII.	Promotions of E-resources	3
VIII.	Renewal	5
IX.	Preservation	9
X	Open Access Publications	2
XI.	Technical Issues	12
XII.	Copyright	4
XIII.	Challenges	1
XIV.	Services	1

The researcher has taken more efforts for collection of data and personally visited to all research institute libraries in Pune. This has also helped the researcher to interact with the librarians and understand their views regarding e-resources management and layout of libraries in managing in e-resources for providing better services to the users.

1.13.4 Structure of Users Questionnaire

The users questionnaire consists of parts A to O (15 Parts). Total questions asked in all parts are 71. The details are as below: -

Table 1.6–Structure of Users Questionnaire

Part	Area Covered	Questions
A	Personal Information	8
B	Awareness about e-resources	3
C	Preferences	3
D	Searching	8
E	Use of electronic resources	7
F	Access	11
G	Frequency	5
H	Purpose	3
I	Download	2
J	Reading	5
K	Library – e-resources	1
L	User Trainings	4
M	Open Access Resources	6
N	Difficulties Faced	2

O	Library Services	3

1.14 Brief Review of Previous Research

The researcher has made efforts to survey the previous studies conducted in the area of e-resources management. During literature search, researcher has observed that few related studies are conducted previously and presented in the different form like papers, articles, reports, case studies, dissertations, etc. Following studies, researcher has noticed in literature search process.

1. Garg, R. J., & Kumar, V. (2017). Factors affecting usage of e-resources: scale development and validation. *Aslib Journal of Information Management*, *69*(1), 64-75.

2. Hamlett, A. (2016). Keeping Up with the Flow: Electronic Resource Workflow and Analysis. *The Serials Librarian*, *70*(1-4), 168-174

3. Kaur, U. G. (2016). Awareness and use of electronic information resources in the research institute libraries of Mohali, Punjab. *Journal of Library, Information and Communication Technology*, *8*(1-2), 1-7.

4. Borgman, C. L., Darch, P. T., Sands, A. E., Pasquetto, I. V., Golshan, M. S., Wallis, J. C., &Traweek, S. (2015). Knowledge infrastructures in science: data, diversity, and digital libraries. *International Journal on Digital Libraries*, *16*(3-4), 207-227.

5. Sohail, M., &Alvi, A. (2014). Use of web resources by medical science students of Aligarh Muslim University. *DESIDOC Journal of Library & Information Technology*, *34*(2), 125-130.

6. Vasishta, S. (2013). Electronic Resources Management: A Case Study of Strategic Planning at PEC University of Technology, Chandigarh. *International Journal of Information Dissemination and Technology*, *3*(1), 52-57.

7. American Library Association. (2013). Guidelines for the introduction of electronic information resources to users. *Reference and User Services*

Association. Retrieved from http://www.ala.org/Template.cfm?Section=reference&template=/ContentManagement/ContentDisplay.cfm&ContentID=26884

8. Johnson, S., Evensen, O. G., Gelfand, J., Lammers, G., Sipe, L., &Zilper, N. (2012). *Key issues for e-resource collection development: a guide for libraries.* IFLA. Retrieved from http://www.inasp.info/uploads/filer_public/2014/08/29/ifla_electronic_resource_guide.pdf

9. Alwarammal, R., &Chinnadurai, D. (2013). Use of Digital Resources by the Faculty Members of Engineering Colleges in Tamil Nadu, India: A Survey. *International Research: Journal of Library and Information Science*, *3*(2).

10. Sethi, B. B., & Panda, K. C. (2012). Use of e-resources by life scientists: a case study of Sambalpur university, India. *Library Philosophy and Practice (e-journal). Paper*, *681*.

11. Tyagi, S. (2011). Scientists' perception of use of electronic information resources: a case study of Pharmacopoeial Laboratory for Indian medicine (PLIM). *Library Philosophy and Practice*.

12. Kumar, S., & Singh, M. (2011). Access and use of electronic information resources by scientists of National Physical Laboratory in India: A case study. *Singapore Journal of Library and Information Management*, *40*, 33-49.

13. Verma, S., Bhatnagar, T., Mahawar, K. L., & Bhatnagar, R. (2009, October). Use of Electronic Resources in the Library of Sikkim Manipal Institute of Technology (SMIT), Sikkim: A Study. In *International Conference on Academic Libraries (ICAL), Delhi* (pp. 4-5).

14. Bajpai, R. P., Mal, B. K., & Bajpai, G. (2009, October). Use of e-resources through consortia: A Boon to Users of Indian University Libraries. In *International Conference on Academic Libraries (ICAL): 5th to* (p. 501).

15. Whittaker, M. (2008). The challenge of acquisitions in the digital age. *portal: Libraries and the Academy*, *8*(4), 439-445.

16. O'Neill, A., &Whitby, S. (2006). Stepping out: the changing role of e resources librarians. *Health Information & Libraries Journal*, *23*(s1), 54-57

17. Sadeh, T., & Ellingsen, M. (2005). Electronic resource management systems: the need and the realization. *New Library World*, *106*(5/6), 208-218.

18. Ali, N. (2005). The use of electronic resources at IIT Delhi Library: a study of search behaviours. *The Electronic Library*, *23*(6), 691-700.

19. Thornton, G. A. (2000). Impact of electronic resources on collection development, the roles of librarians, and library consortia.*Library trends*, 48(4), 842-856.

20. Meeting the E-resources Challenge: An OCLC report on effective management, access and delivery of electronic collections. Retrieved from https://www.oclc.org/content/dam/oclc/reports/pdfs/OCLC-E-Resources-Report-UK.pdf

Researcher also searched in the database of Shodhganga and following few related studies noticed to be reported in it.

1. Use and user study of e resources in medical and engineering college libraries in Goa (2017). Dhuri, Keshav Ramesh

2. Use of resources by teachers and science faculty of grant in aid universities of Gujarat state (2016). Jodhani, Varsha K.

3. Use of e-resources by chemists and physicians in university of Haryana, Punjab, Chandigarh an analytical study (2015). Sakhi, Rani

4. Collection management of electronic information resources: an analytical study of selected university libraries in Andhra Pradesh (2013). Agrapu, Dharani

5. CSIR laboratories libraries in Delhi and Lucknow: development and use (2013). Gupta, Vibha

6. Management of electronic resources in NBA accredited engineering college libraries in Andhra Pradesh (India): a survey (2013). Rao, Nagavolu Venkata

7. Professional attitudes of librarians towards information and communication technology: a survey of engineering college libraries in north coastal Andhra Pradesh (2013). Venkatasubbara, Medepalli

8. Use pattern of electronic information resources in the college libraries in Kerala: an analytical study (2013). Vijayakumar A

9. Marketing of library and information products and services in academic libraries of Uttarakhand - a study (2012). Verma, Naresh Chandra

10. Collection building through e-resources in university libraries in India: an evaluation of UP state University libraries in digital environment (2011). Mal,B. K

It is observed from different literaturereview analysis that there is no study reported which is related to selected study and is a different nature of study.

1.15 Structure of Research Studies

The complete research study is completed in eight chapters:

Chapter 1- Introduction:

This chapter deals with general introductory information on research plan and covers development of S&T in India, science and research libraries in Pune Metropolitan area, e-resources in science research libraries, collection management of e-resources. It also gives information about the need of the study, objectives of the study, hypotheses, scope and limitations, research methodology, etc.

Chapter 2- Literature Review:

In this chapter, the researcher reviewed the published and available literature related to study. The literature published in different form and format were gathered from the different information sources, analyzed, synthesized and reported under different facets. Review of the literature was found very useful for the present study to build

research plan, hypothesis and research method selection as well as supporting statements in research study.

Chapter 3- Development of Science Institutes in India: An overview

This chapter provides brief review of development of science research institutes in India.

Chapter 4-e-Resources Available in S&T:

This chapter highlights the availability of the major important e- resources in science stream with their brief information for use of academic and research workers. In this chapter prominent and most useful e-resources are discussed which are useful to the users for using best resources in the field for gathering information.

Chapter 5-e-Resources Management and Its Impact:

This chapter provides information on the management of e-resources in the research libraries. It also discussed the impact of e-resources on the researcher, libraries, publishers etc.

Chapter 6: Profile of Science Research Institutes:

This chapter provides brief profile of the selected science research institutes in the Pune. It providesinformation of institutes on their aims, objectives and area of research of the science research institutes. The information presented in this chapter is collected from the research institute and as well as using information given on the web sites of research institutes.

Chapter 7A - Data Analysis: Librarians Questionnaire

This chapter presents the analysis of the data collected from the librarian'squestionnaire. After systematic analysis of the data, researcher presented datausing tables and charts wherever required.

Chapter 7B - Data Analysis: Users Questionnaire

This chapter represents the data analysis of the data collected from the user's questionnaire. Analyzed data is presented systematically using tables and charts.

Chapter 8 - Findings, Suggestions and Conclusions:

This chapter highlights the observations found from the data collected. Based on this data suitable suggestions are presented for better management of e-resources. It also gives scope for further research in this area.

A draft policy for collectiondevelopment, management and preservation is also discussed in this chapter based on IFLA standards as well as best practices in e-resources management are also narrated in this chapter.

Bibliography:

Appendices-1: Science and Research Libraries in Pune Metropolitan area

Appendices-2: Librarians Questionnaire.

Appendices-3: Users Questionnaire.

Summary

Scientific research is driving force for development of any country. Hence all the countries are supporting to scientific research. In India after independence science research is well supported by the Indian Government by providing funds and other facilities requires for research. Hence India performing well in S&T in present days. All the research institutes are well supported by libraries and information center which provides information required for the research. Current and accurate information is need for any research activity. Electronic resources are providing current information and plays vital role in the S&T research.The primary function of the research libraries is to accelerate the research activities of the institute by providing scientific information on time. e-Resources playsan essential role in the science research libraries and scientific research. Libraries are acquiring more e-resources and learning new skills for managing e-resources effectively. The present study is mainly focused on the collection management and use e-resources in science libraries by users. This introductory chapter is presents research design by the researcher.

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3. Planning Commission. (n.d). *Science & Technology- Through the Plans*. Retrieved November 12, 2017, from http://www.planningcommission.nic.in/sectors/science.html

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2.1 Introduction:

Literature review is a basic step in any research activity and needed at all stages of research work. Literature review is nothing but systematic, critical and in-depth review of all kind of literature available on a particular topic. It includes books, research articles, scholarly communications, documents available on internet, etc. Literature review provides basic framework and guidelines for the research work. It helps researcher to understand the topic in depth and provide proper guidelines for the present work. It helps in avoiding duplication in research and use for justifying statements in research study. Literature review also suggests the method of study useful for which research has been conducted and satisfying the research query. It plays an important role in supporting evidence for the result deduced from the study. Literature review helps in finding out the gaps in the research and indicates the area for future research work. Without literature review research reporting is not possible with valid proof for statements made in the study.

2.2 Facets for Literature review:

Researcher has identified following facets to support the main study. The literature published in different forms of literature and formats are searched, gathered, compiled, organized, synthesized and used in the research study for supporting the facts. The sub topics/ facets are:

1. Role of Libraries in Science Research.

2. Use of e-Resources in Science Libraries.

3. Need for Collection Management of e-Resources.

4. Collection Management of e-Resources in Libraries.

5. Guidelines for Collection Management of e-Resources.

6. Best Practices in Electronic Resources Management

The data collected from different sources is organized and reported in present literature review.

2.2.1. Role of Libraries in Science Research

"Roles of the Librarian in a Research Library in the Digital Era: Challenges and the Way Forward" by Ilesanmi (2013) described the role of librarians in collection development, organization of knowledge, preservation of resources, user services, personnel management etc. ICT application has provided various opportunities to perform these functions. Author also suggested that all the libraries need to enhance the capacity building of the staff, which increases their productivity. Research libraries need to get enough funds to maximise their products and services.

Council on Library and Information Resources (2008) discussed various key issues of research libraries. It has explored the vision of library in 21st century, challenges of research libraries and recommendation for overcoming the difficulties. Libraries in 21st century might be mirror image of researcher's work, and it may be organized according to the researcher's work. It also emphasized that libraries are not earning entity but spending entity in their organization, it is part of their parent organization and not entirely free to set their own goals and objectives. The suggestions given by this Council are very effective and almost cover all aspects of research libraries and its management.

In the communication "Embedded Librarianship in S&T Environment" authors Bansal and Arora (2014) discussed the importance of S&T development in country and efforts taken by the government to encourage the research in the S&T. Authors addressed the need for embedded librarians for providing specialized and personalized service to researchers by understanding their need in depth. Embedded librarianship brings out the librarians from the traditional library and put them in close coordination and collaboration with the researcher where librarians can show their information expertise, which puts direct impact on the research and teaching. Authors also explained the role of embedded librarians in science and technology environment.

Embedded Librarians need to take extra efforts to understand the need of project and help the users at each step.

Federer (2016) in his study entitled "Research data management in the age of big data: Roles and opportunities for librarians" discussed and pointed tremendous increase in scientific research and opportunities for librarians and other information professionals to get involved with the research team for the management, analysis and preservation of research data. Because of many social and technological factor, growth of science data gets increased tremendously. This data can be now economically available by using cloud solutions. Big data is available freely and widely. Many repositories are storing and providing access to the data at the same time researchers also willing to share their data. Libraries can play a vital role in scientific data management getting involved in the research from the planning stage. Author also of opinion that common stage in the data management process which are planning, data collection or acquisition, data analysis or interpretation, data preservation, curation and data sharing is needed.

"Knowledge Discovery in the Digital Library: access tools for mining science" in this publication authors Dumouchel & Demaine (2006) explained the role of research libraries in data-mining of the scientific literature for knowledge discovery. Knowledge discovery is the process of identifying meaningful, unknown relationships between concepts, enabling broader inquiry of scientific literature. Only potential user can give those relationships meaning and research libraries act as a mediator by providing access to the scientific information, to the potential users. Authors also discussed the theories investigated by Canada Institute for Scientific and Technical Information (CISTI) for knowledge discovery techniques to its collection. These theories are Linked Literature Analysis – to find out the hidden relation among the concept which are casually related and Main Path Analysis which identifies the evolution of search field based on citations.

"Knowledge infrastructures in science: data, diversity, and digital Libraries" in which Borgman (2015) discussed the role of digital libraries in knowledge infrastructures for science. Through "The Transformation of Knowledge, Culture, and Practice in Data-

Driven Science: A Knowledge Infrastructures Perspective" project they compared four science sites - two big science astronomy sites with two "little science" sites that span physical sciences, life sciences and engineering, and on dimensions of project scale and temporal stage of life cycle. Authors findings were based on interviews, ethnographic fieldwork, document analysis, and historical archival research about scientific data practices, conducted over the course of more than a decade. Authors observed two big science sites, invested in digital libraries at the initial research design for data management but smaller site invested small amount in later stages. In big sites they invested on information professionals whereas in small sites they were managing themselves. As big sites invested more on digital libraries, they were more concerned with the release and reuse of data. Authors also emphasized the need of expertise in digital libraries and data science.

Stating the changing role of e-resources librarians, O'Neill and Whitby (2006) in their study "Stepping out: the changing role of e-resources librarians" explained the e-resources librarians (ERL) role in various clinical projects like Do Once And Share (DOAS), Patient information, Trust Internets and intranets conducted in the Shrewsbury, UK. In DOAS the jobs of the librarians are very different than the traditional library jobs. It involved establishing a database of maternity guidelines and clinical pathways, doing literature searches on related topics, tracking down useful reports, missing appendices and badly referenced articles, locating passwords to subscription-based websites, contacting potential stakeholders and raising awareness about the project amongst other librarians. In patient information e-resources librarians are not only collecting and organising the patent information but also providing training for writing patent. Trust Internets and intranets, e-Resource librarians are guiding the web developers to develop customer focused website. e-Resources librarians also develop their skills and knowledge in clinical research as per their requirements.

Lafia, et al. (2016) in their study "Spatial discovery and the research library" explained the joint research which is undertaking by the Centre for Spatial Studies at the University of California, Santa Barbara (UCSB) and the UCSB Library for the

betterment and enabling the discovery of research data and publications. The research suggests a framework for an integrated data discovery mechanism and it also displays the way of linking publications and associated data sets directly or through metadata on Esri's open data platform. The process of linking data to publications through spatially referenced metadata and persistent identifiers add value to the research product and its publications through spatially referenced metadata and persistent identifiers which adds research products and increases their discoverability across disciplinary boundaries.

Due to fast technological development many electronic materials are becoming outdated like microfilm, microfiche, floppy, etc. To maintain access to digital information, transfer information from one digital format to another as per the requirement of technology is needed. Digital preservation helps in preservation of data. Digital preservation is maintained and making accessible information and other heritage available in digital form. Only the digital material having ongoing value needs to be preserved. Digital preservation's different aspects which discussed by Sethunath and Kumar (2012). The concept of digital preservation, strategies for digital preservation, marinating information and digitally preserved material was well explained. Author also gives how to key line to share responsibilities, manage programs, tools for digital preservation and technical aspect for digital preservation.

Summary:

S&T field is very prompt in all knowledge area. The literature available in the area is growing very fast including print and e-resources. Role of libraries in providing right information at right time is need of time. Information need of the researcher is fulfilled by the S&T libraries for conducting research. Role of the libraries is very important in disseminating knowledge to the users. Role of special libraries in digital era is quite different and challenging. Librarians have to manage and collect e-resources ae well as provide information services based on e-resources. The libraries nature is like embedded librarianship in digital era in which all the skill sets required for the managing e-resources and information services is main task.

Knowledge discovery from e-resources is an essential aspect in digital environment. In digital era role of libraries and librarians is data mining from information warehouses /big data. Knowledge/information discovery is essential work of libraries. The need is expertise in digital libraries and data science to manage e-resources.

2.2.2 Use of e-Resources in the Science Libraries

"The use of scholarly electronic journals at the Indian Institute of Science: a case study in India:" Moghaddam and Talawar (2008) explained the use of scholarly electronic journals at the Indian Institute of Science. In the survey, authors distributed 700 questionnaires randomly among the users. The results of the survey indicated that growing interest in electronic journals among users at the IISc is increasing. The data analysis showed 97.7% users are aware of availability of electronic resources in their institutes. The study revealed that electronic journals from the Elsevier were used more (63.9%) of the total usage and Sage Publications recorded the lowest usage of rate (2.5%) the total usage. Nature, Science and Proceedings of the National Academy of Sciences were the most popular research journal among the users of IISc. The study also revealed that users are using e-resources mostly for research needs, often used for "education", sometimes used for "current information", and least used for "recreational" and 'win award'. Users access electronic journals to access "full text" of the research papers, users often use them for "journal abstract" sometimes for "articles reference" and least for "alerting services". PDF and HTML format of the electronic journals were mostly preferred format among the users. Users prefer to read on the monitor instead of reading its print out. Research staff, research and postgraduate students are using electronic journals daily.

Sohail & Alvi (2014) conducted a study on usage of e-resources "use of web resources by medical science students of Aligarh Muslim University". For data collection authors distributed structured questionnaire to 120 students out of them 92 dully filled questionnaire they received from the users. The findings of the study indicated that 31.13% users were using web resources for improving knowledge and finding the information quickly. 32.60% MBBS, MD/MS and PG Diploma students

were using web resources. 76% student found web resources reliable. 26% students search web resources link through search engine. For using web resources 63% students take assistance from their friends. MEDLINE and Science Direct were most consulted e-resources by medical students.

Ali (2005) in his study, "The use of electronic resources at IIT Delhi Library: a study of search behaviors" found that 95% users were aware about electronic information services and 65% users were using the electronic resources regularly. Google is the popular search engine among their users followed by Yahoo, Infoseek, Excite, Hotbot. Mostly used search method is keyword followed by author, subject and title of the article that IIT Delhi library users used. Mostly users used Boolean logic and truncation search facilities, but lack of printing facilities, lack of availability of enough computer terminals, lack of trained library staff were the problems users were facing while using e-resources. Most of the users were using e-resources for study, research and keeping them abreast about latest development in their field. It also indicated that 60% users were facing problems while using e-resource. 57% users are satisfied with the available electronic resources. Author also gave valuable suggestions to improve the use of e-resources in the IIT Delhi library.

Sethi and Panda (2012) in their study "Use of E-resources by Life Scientists: A Case Study of Sambalpur University, India." conducted a survey to identify the use of e-resources among the life scientists in Sambalpur University. The studies revealed that majority of the scientists were using e-resources actively for research, teaching and professional development. Scientists were using their department computer lab and central library for accessing e-resources. The highlight that e-resources plays important role in research and users demand for e-resources are ever increasing. Library has to subscribe more current e-resources as well as back volume of the e-resources.

Egberongbe (2011) conducted survey to find out the use and impact of electronic resources at the University of Lagos. Author found that electronic resources made

great impact on productivity of the teachers and students and they are using e-resources for accessing information available worldwide for teaching, learning, and research. It is also observed from the study that unfamiliarity of electronic resources and lack of good infrastructures are major reasons for discouraging e- Resources use. Author gave valuable suggestions to improve use of electronic resource.

Lessick, et.al (2016) in their study "Research engagement of health sciences librarians: a survey of research-related activities and attitudes." indicated that research libraries are actively engaged in supporting research activities. Authors conducted online survey of the Medical Library Association members. The analysis of the data showed that 79% of respondents read articles at least once in a month, research studies was applied to practice by 58% users, 44% had conducted research, 62% reported acting on research had enhanced their libraries; 38% had presented findings and 34% had authored research articles. Authors also suggested that practitioner can use published result and result from their research to take practice decision and altimetry to improve service.

Bajpai, Mal & Bajpai (2009) in their study "Use of e-resources through consortia: A Boon to Users of Indian University Libraries" reveled that role of UGC-INFONET and INDEST- AICTE Consortium initiative for the university library users. Due to budget crunch and increasing price of the e-resources, libraries are facing problems. To solve these problems libraries are sharing resources through the consortia purchase. UGC-INFONET and INDEST- AICTE Consortium are providing scholarly resources including peer reviewed journals, databases, abstracts proceedings, etc. These resources are increasing the level of higher education in the country. Authors also discussed the resources included in the both consortia.

Garg, & Kumar (2017) in their study "Factors affecting usage of e-resources: scale development and validation identified five factor which affect the usage of the e-resources: training modes, awareness, influencers, utilitarian benefits, and experiential and hedonic benefits through comprehensive literature search and 20 times which are defining these five factors were generated through group discussion with students and

library staff. Though this study conducted in business school, it is applicable to most of the streams of knowledge.

"Scientists' Perception of Use of Electronic Information Resources: A Case Study of Pharmacopoeial Laboratory for Indian Medicine (PLIM)" by Tyagi (2011) conducted survey to understand the scientist's information resource usage, reading pattern and use of information technology. Analysis of the survey based on the 30 questionnaires which were distributed among the users. The results of the survey indicated that users prefer online resources over print collection. The database without hyperlink to full text and journal without hyperlinks from bibliographic databases have lower usage. It is also observed that scientists are using e-resources mainly for research purpose. e-Resources provide updated and speedy information which help s scientist in their research work more than print resources.

Kaur (2016) conducted a survey for assessing "Awareness and use of electronic information resources in the research institute libraries of Mohali, Punjab" and for investigating awareness and use of e-resources, to check level of user's satisfaction regarding information resources in the research institutes of Mohali, Punjab. The analysis of the data showed most of the users are aware and use e-resources very well. While accessing e-resources majority of the users facing common problems like slow access speed and it was suggested to provide high bandwidth internet facility to deal with slow internet speed.

"Access and use of electronic information resources by scientists of National Physical Laboratory in India: A case study" a survey conducted by Kumar & Singh (2011) to understand usefulness of the e-resources and the search methods/techniques used for searching e-resources at National Physical Laboratory e-resources. Authors also tried to find out the satisfaction level from the users and awareness about availability of the e-resources and the problems faced while using the e-resources. Authors had distributed 75 questionnaires randomly among the scientist of NPL. The data analysis indicated that scientists are using e-information for the research at a great extent. Title field, simple search are the most used search techniques by the scientist and most of them use self -known methods for accessing e-resources. e-journals, but e-resources

and internet resources are preferred by scientist. Scientist are facing problems of low internet connectivity suggested to provide high bandwidth. It was also recommended to develop automated library system and to increase e-resources procurement and improved library services based on e-resources.

Verma et al. (2009) conducted a survey in Sikkim Manipal Institute of Technology (SMIT), Sikkim "Use of Electronic Resources in the Library of Sikkim Manipal Institute of Technology (SMIT), Sikkim: A Study" for understanding sources adopted by users for leaning internet, categories of information user access from internet web, role of library cooperation and consortia in use of e-resources, understand usefulness of e-resources over print. Attempt was made to find users satisfaction about library collection and the problem they are facing while accessing e-resources. The finding from the data analysis showed that faculties are using e-resources for updating their knowledge and taking help from the knowledgeable person and discussing with colleagues. Lack of adequate e-resources, lack of knowledge of using OPAC are the problems faced by the users. Some suggestions like increase in library collection, conducing orientation programmes for increasing awareness among the users were given.

Alwarammal, & Chinnadurai (2013) conducted survey on "Use of e-resources by the faculty members of engineering colleges in Kerala: A survey" to get awareness, availability of usage of e-resources by the faculty members of engineering colleges in Kerala. Author tried to find out the user's problems, their satisfaction while accessing e-resources. The survey was conducted in 15 engineering colleges in Kerala with the help of 375 online questionnaires. The analysis of the data showed that most of the faculties are aware of e-resources. Most of the engineering colleges have good collection of the e-resources, and most of the users are using desktop computers for using e-resources. Users are facing problems like password not known, poor internet connectivity, access restricted to the campus only, virus threat, etc. The survey also showed that almost all the users are satisfied with the facilities provided for accessing e-resources.

Summary:

From the LR it is noticed that e-resources are abundantly available in S&T area, most of the users are aware about the availability of e-resources and its use is also increasing by S&T users for carrying out research. It is also noted that e-resources are very well accepted by scientific users due to its benefits.

The studies pointed out that use of e-resources in science discipline is increasing as well as more availability of e-resources in S&T areas is visible. HTML, PDF and txt formats are preferred by users. The problems users facing are lack facilities and trained library staff for electronic information retrieval. e-Resources are used more for research, teaching, learning and R&D activities.

2.2.3 Need for Collection Management of e-Resources

Verminski and Blanchat (2017) in their book entitled "Fundamentals of Electronic Resources Management" explained that library collection practices were initially developed for managing print collection in which print resources were moved in linear flow from one stage to the next stage of the workflow. But electronic resources are different in nature; moving in cyclical stages and life cycle of the electronic resources vary from resource to resource. For managing e-resources effectively, there is a need of proactive, anticipatory management techniques to be adopted. Authors also explained the need of continually updated, reviewed, and revised e-resources workflow to identify and remove the weakness involved in the process.

"Electronic resource management systems: the need and the realization", Sadeh and Ellingsen (2005) discussed factors like exponential growth in the e-resources, important role of the e-resources in library collection, library budget spent on e-resources, variations in cost packages offered by vendors in the market, frequent changes in the business model of e-resources and lack of availability automated tools for managing electronic resources etc. Librarians are dealing with spreadsheets and e-mail messages and variety of independent system to manage the e-resources. There is a need for true integration of system which supports various aspects of the e-resource life cycle and its effective management.

Whittaker (2008) in his study "The Challenge of Acquisitions in the Digital Age" discussed the various challenges faced by acquisition librarian in digital world. The librarians have to be familiar with licensing models, system requirements, file compatibility, authentication, proxy servers, and interface design. Librarians are not only need to be web-savvy but also need themselves to be kept updated with new technological changes, such as social networking tools. Author also discussed the variations in pricing models, preservation of the networked resources and electronic materials, finding values of subscribed e-resources, bargaining with publisher's service providers for libraries, industry-wide, national, and international standards for sharing works, etc. are the different problems in acquisition in digital age. Libraries are spending large amount of budget on the e-resources to justify needs of them. Librarians need to develop the good collection and its utilization. Libraries needs to develop best collection management system for e-resources. In the study, the major trends of digital acquisition in the digital age are also discussed in brief.

"E-terminology: Why do I need to know what you mean"? written by Parker and Dollar (2005) in which authors discussed the need of standard terminology or consistent vocabulary to explain how online periodical content is packaged and made available to libraries. Without use of standard terminology it is very difficult to communicate among the library profession is who are involved in the e-resources management process. Hence there is an urgent need to use standard terminology for managing e-resources. Authors have discussed different terminologies involved in the e-resources management process. Standardization of terminology for librarians is also equally important to extract the essential meaning of terminology to the users.

Summary:

From the above literature review it noticed that collection of e-resources in libraries is increasing and collection management of e-resources is a complex in nature than the print resources and its management involve various complex factors. Proper collection management plan for the print resources is not sufficient and appropriate but e-resources also needed to be developed special collection management plan for e-resources and review it frequently to remove flaws in the system. Thus, there is a need

to consider proper e-resources collection development and its management for effective use.

2.2.4 Collection Management of e-Resources in the Libraries

Electronic resource management is a complex issue due to various factors like major portion of budget involved in acquiring electronic resources, various business models available from vendors/publishers, changing technology, copyright and licensing, etc. In S&T libraries more, collection is now acquired in e-form.

Hamlett (2016) in her work "Keeping Up with the Flow: Electronic Resource Workflow and Analysis", explained the status of Baruch College, CUNY in documenting and analyzing the electronic resources workflow. Author also described the importance of e-resources and background research for the understating the process, preparation of the framework for analysis of life cycle of the electronic resource management. The background research needed to conduct multiple interviews of the staff, faculties and the stakeholder for getting clarification of the workflow process which help to understand the gap in the process and provide suggestion to improve the process.

Anderson (2014) in his article "Electronic resource management systems: a workflow approach.' divided electronic resources management into 5 parts - 1. Knowledge base – metadata of subscription, subscription information, links to e-journal or e-books etc. Means knowledge base conation information regarding e-resources rather than the actual content. 2. Budget. 3. Administrative and contact information - like ID's and passwords of electronic resources. 4. Licensing – i.e. legal agreement between services providers and library. 5. Report – budget reports, serial check-in reports, usage statistics of various e-journals and databases. All the libraries have look into five types of work. Every library uses various techniques and tools to manage their workflow depending upon their work level. The author explained the role of 'Electronic Resource Management System (ERMS) in brief.

"Electronic Resources Communications Management" communicated by Feather (2007) in which author explained communications involved in the electronic

resources management which is complex in nature, especially involved in acquisition and management. Lack of efficient communication may badly affect the e-resource management. The author has categorized the communication within the e-resource management unit into four types - i. Darts- it contains all information required to perform task, ii. Lobs – communications that bounce back and forth between individuals in order to accomplish a task, inform, or make a decision. iii. Shadow – this type of communication is occurred and stored in the e-resources unit. e.g. filing papers, archiving emails etc. iv. Spotlights – It is one-way communication from library staff to the outside world in the e-resource management unit e.g. Notices from library like listing of newly arrived books. For successful management of electronic resources, all types of communication are required.

Vasishta (2013) discussed different aspects of electronic resources management in PEC University of Technology, Chandigarh. The study revealed that PEC University of Technology has written collection development policy for electronic resources, which ensures the criteria for selecting and the methods of accessing electronic resources are as per the users' need. Universities provides access to more than one thousand electronic journals through INDEST Consortia. Libraries are providing IP based access to their e-Journals through the library websites. URL was integrated with the OPAC for access. They also provided good infrastructure for accessing e-resources. The study also discussed the barriers faced by libraries in the process of procurement of e-resources.

Bhardwaj (2013) in his work "Leveraging Access to e-resources through Gateway: A Case Study at St. Stephen's College, Delhi." described the importance and need of gateway in college libraries for managing and providing access to e-resources. Gateway is a platform where number of e-resources from various databases can be searched through single search window. Author explained the steps involved in construction of the gateway like preliminary preparation, planning and designing, development of online gateway, testing and implementation. Open archive initiatives and protocol metadata initiatives (OAI-PMH), Z39.50 standards, architecture and features of the knowledge gateway were also discussed. College libraries could

develop gateways for their libraries by using open source software which are available freely for use.

"Impact of electronic resources on collection development, the roles of librarians, and library consortia" written by Thornto (2000) examined the benefits and issues of consortia. Consortia helps the participant libraries to get the electronic resources at better prices but at the same time, rights of individual library in selection of electronic resources become less impact full. Author also explained the case study of Ohio LINK library to discuss the impact of consortia on participant library.

"Digital preservation of electronic resources" communication of Gaur and Tripathi (2012) explained the need, issues, and challenges in digital preservation. Authors discussed the role of national libraries, library consortia in digital preservation by giving examples of German National Library, British library, Welcome Trust and the Medical Research Council, etc. The efforts of Open Archival Information System, Portico, LOCKSS, CLOCKSS, PANDORA, PubMed, etc were discussed. Leading Publishers like Springer, Taylor and Francis, Blackwell, Elsevier, Nature, etc already started efforts towards archive the e-resources.

Arora (2009) in his communication "Digital Preservation: an overview" described various digital preservation strategies and need for selection of digital strategies as per data type, situations or intuition. Author also explained OAIS Reference Model and initiative taken by OCLC and ARI for metadata preservation. For reliable preservation hybrid solution- microfilming and digitization was also explained.

"What are we really doing to market electronic resources?" in which Kennedy (2010) analyzed the literature published in library science on marketing techniques for electronic resources. Author analyzed 24 documents published from 1994-2009 and analyzed the literature qualitatively to find out libraries' goals, targeted groups, budgets, and assessments of their marketing plans. Author discovered 38 unique techniques of the electronic resources for management and preservation. Author suggested patron training in a group setting, flyers/brochures, e-mails to patrons, and surveys are the four most popular techniques, and also pointed out that libraries are

not very clear about their marketing plans but they have to identify target of their marketing efforts. Budget for marketing plan was variable among the library and assessment was the weakest part of the plan. This work gives an idea for marketing of the e-resources among all the libraries.

"The e-resource management and the Semantic Web: applications of RDF for e-Resource discovery" by George (2009) in which author presented some essential concepts of semantic web and resource description framework which is key enabling language of the Semantic web. Semantic web technology helps digital library and repositories to publicize their e-resources by using interoperable standards and technologies. Such technology has capacity to retrieve the information in heterogeneous and distributed e-resource environments. Semantic web is also helpful for resolving the digital library problems like semantic interoperability and advanced metadata integration. George discussed the application of resource description framework including Dublin Core, FOAF, SKOS and RDF along with the practical examples and recent implementations.

Kirchhoff (2008) in her work entitled "Digital preservation: challenges and implementation" explained the need of reliable long-term preservation of scholarly digital content. There are three types of digital preservation - Near-term preservation which can be assured with backup, midterm preservation that can be protected byte replication i.e. preservation information is stored in two or more computers at two or more locations which can be online at the same time. If one system fails another system can be immediately replaced the first system and ensure continuous service for users. For long term preservation of information files, systems or websites are created in multiple copies and stored in various locations. But for long-term preservation, it requires management policies and activities to ensure the enduring usability, authenticity, discoverability, and accessibility of content over very long term. She also explained case study of Portico organization providing long-term digital preservation.

Waheed (2012) discussed various issues related to e-books collection management and challenges faced by libraries in developing countries. The author proposed some practical steps for creation of e-books locally, author also discussed National Digital Library program launched by Higher Education Commission of Pakistan and its role in providing access to e-books.

Summary:

Literature review on collection management of e-resources in the libraries discussed various facets involved in the e-resources management. For successful management of e-resources in libraries, they have to deal all facets effectively. Proper workflow management, skilled library personnel and support of the advanced technologies plays vital role in the e-resources management process.

2.2.5 Guidelines for Collection Management of e-Resources

Editors of IFLA (2012) in their document "Key Issues for e-Resource Collection Development: A Guide for Libraries", provide guidelines for the collection development, selection and evaluation, licensing, and review/renewals of all types of e-resources in any library. IFLA guidelines advise libraries to develop clear collection development policy for the selection and management of e-Resource. The e-resources collection development policy acts as guidelines for all aspects of e-resources procurement and management as per the need of the library. The issues like selection and evaluation of e-resources, licensing considerations for e-resources and review and renewal process are discussed in detail. IFLA guidelines are very useful to all the libraries for collection management of the e-resources.

OCLC in its document, "Meeting the e-resources Challenge: An OCLC report on effective management, access and delivery of electronic collections", provides workflow for e-resources management. The workflow involves task like select, acquire, describe, discover, access and renewal. Under each task, they give process involved in the task and its challenges. It also narrates the case studies to explain the tasks involved in the workflow.

"Guidelines for the Introduction of Electronic Information Resources to Users", in which American Library Association provides the guidelines for publishing new e-resources to potential users. These guidelines help any type of library for publicizing any type of e-resources by providing checklist, contains suggestions and recommendations that libraries may adopt as per their requirements. Guidelines are provided under heading 1. Planning, Policy, and Procedure. 2. Testing, Compatibility and Remote Access 3. Staff. 4. User Education/Instruction. 5. Publicity. and 6. Assessment and Evaluation.

Kwantlen Polytechnic University Library along with Association of College and Research Libraries provided e-resource management guidelines for libraries in higher education. The scope of these guidelines is to help librarians for selecting appropriate resources, setting priorities and maintaining consistency. These guidelines explain in detail selection principles for e-resources, evaluation process of e-resources, procedures for acquiring new e-resources, Retention/ Renewal and Licensing of e-resources.

Dhawale et al. (2012) in their study "Collection Development and Management policies: A Critical Review of Existing Policies" highlighted best practices to be used for collection development and management in the library. They have prepared model policy for collection development and management based on critical study and review of the existing national and international polices like Library of Congress, IFLA, ALA, UGC, and AICTE and presented in their paper. The need of forming collection development in the library and regularly updating the existing collection development policies were discussed in their paper.

Mangrum and Ellen Pozzebon (2012) performed the content analysis to understand how libraries are dealing with the challenges in the collection development in digital era. 'Use of collection development policies in electronic resource management discussed the role collection development polices in past, present and future. Author found that most of the libraries cover all the traditional elements of collection development. But only 50% of the libraries mentioned license agreement but not in depth but as a general statement.

Summary:

From the above literature review on guidelines for collection management of e-resources**,** it is noticed that standard guidelines are available for managing e-resources. These guidelines are very useful for all libraries for managing its e-resources effectively. Libraries can modify the guidelines as per their own requirement to suit their library environment. Every library has to draft a collection and management policy for e-resources and also update regularly.

2.2.6 Best Practices in Electronic Resources Management

Weir, et al. (2010 November) presented a paper "Innovative practices in electronic resources and acquisition management" at the Charleston Conference held in 2010. The conference was focused on the innovative practices. Innovative practices of five professionals from different type of universities and various parts of the U.S. Authors offered theoretical as well as practical view of e-resource management and provided time and money saving solutions. In the paper "Innovative practices in electronic resources and acquisition management" Denise Pan (2010, November) suggested to apply technology and organizational management theories for improving workflow process and enhance infrastructure facilities. Denise discussed the use of blogs for communication and wikis to facilitate collaboration. To manage budget crunch and insufficient staff, the solution provided like reorganizing teams, cultivating new workplace culture, retraining staff, and leveraging technologies etc. Regina Koury. (2010, November) in "Innovative practices in electronic resources and acquisition management" discussed the use of google doc as solutions to tracking resources and usage stats without an ERM. From the usages statistics it is noticed that google doc used for sharing with anybody at any time is possible. Geoff Timms (2010, November) in "Innovative practices in electronic resources and acquisition management" discussed the initiative taken by Mercer University's Jack Tarver Library during a flat-line budget year to cut serial resources while maintaining a positive relationship with teaching faculty. In budget crunch authors suggested consortia purchase which helps in saving some libraries money. Kelly Smith in

"Innovative practices in electronic resources and acquisition management" (2010, November) discussed use of process mapping to assess and improve e-resources workflow.

Hartwigsen (2017) in "ERM Policies, Best Practices, and Procedures" discussed the electronic resources management policy statement which provides best practices and best procedures for selecting and activating access to new e-resources in the institutes zone. Author discussed 3 models, Model 1 – locally acquired, licensed, and managed by the individual libraries, Model 2 - activate, maintain, and in some cases, order e-resources that will be shared by some or all of the libraries in the NZ. Model 3 - Mixed Central & Local.

Rinck (2017) conducted interview of Ill Emery, Graham Stone, and Peter McCracken, editors of TERMS (Techniques in E-Resource Management) 2.0, which was published, as 'Coming to TERMS with Electronic Resource Management: An Interview with Jill Emery, Graham Stone, and Peter McCracken.' Emery, Stone, and McCracken who worked on TERMS project. In interview the discussions were on incitation and development of TERMS Project, TERM1.0 and TERM 2.0. The objective of the TERM project was to define life cycle of electronic resources and develop some best practices which can be used for management of electronic resources at any institution. In TERM 2.0 they included section like investigating new content for purchase or addition; acquiring new content; implementation; ongoing evaluation, and access and annual review; cancellation and replacement review and preservation etc. This is of great helps for all types of libraries in management of electronic resources.

Bhatttacharjee and Gautam (2014) in their paper 'Best Practices for Managing e-resources in Academic Libraries' described the best practices in electronic resources for management. Best practice implemented with help of ICT aids maximizing usage of electronic resources in academic libraries with the help of modern ICT. Best practices like digital library, institutional repository, electronic thesis and dissertations, library consortium, dynamic library website/library portal, CD Mirror Server Facility, Local Area Network and User Feedback Mechanisms were discussed in their paper.

Kataria and Ram (2013) in their paper titled "Dynamics of managing electronic resources: Electronic resource management system (ERMS) initiatives" explained that management of electronic resources is complex process and so it needed better system which can help libraries to handle e-information and e-resources workflow. Various electronic resources management systems like CUFTS, TDNet Open ERAM Old, EBSCO's ERM Essentials, Ex Libris Verda, Gold Rush, HERMIS, Innovative Interfaces ERM, 360 Resource Manager and Source Manager were discussed.

"Best practices in cooperative collection development: A report prepared by the Center for Research Libraries Working Group on Best Practices in cooperative collection development" by Shelton (2004) is based on interviews of 18 successful programs from three different categories of cooperative effort i.e. selection of print; electronic acquisition; and access, storage, and preservation. The questions were asked to understand barriers, best practices opportunities, and lessons learned in cooperative collection development

Nous and West (2015) in their work "Go, Team! Using Teams to Manage Electronic Resources", discussed the journal management at the University at Albany University. In Albany University work of journals management is divided into two teams; one to implement batch loading e-journal records and a second to deal with ongoing management and related policies. As work is divided into two groups, they are able to streamline the process, coordinate policies and procedures, reduce duplication of work among the groups, improve communication and build best practices.

Hosburgh (2014) in Managing the electronic resources lifecycle: Creating a comprehensive checklist using techniques for electronic resource management (TERMS) describe that for managing various stages of e-resources effectively it is very helpful to have detailed guide in hand. Such guide can be extremely helpful for new professionals in managing e-resources. An e-resources acquisition checklist helps librarians to cover of evaluation, acquisition, and renewal/cancelation of e-resources. Author also discussed the detailed life cycle of the e-resources management.

Summary:

From above literature review it is notice that libraries are spending major portion of their budget on e-resources now and to justify the cost economic libraries need to put down the cost but enhance the usage statistics of the e-resources. To enhance the use of e-resources libraries can use best practices for use of e-resources. Libraries can plan best practices as per their libraries' requirements. In S&T stream lot of resources are now available electronic form and it is increasing day by day. It is also noticed that knowledge in S&T in electronic resources are increasing very fast. Growing knowledge accelerate the scientific research. Libraries are playing important role in scientific research by providing timely accurate information required for the research. Most of the users of science libraries are comfortable with the e-resources and they are using them for satisfying their information needs. To provide better services to the users, e-resources are very helpful. Hence libraries need to manage e-resources collection effectively. Many guidelines are now available for collection management of e-resources, but libraries can prepare their own guidelines for their library as per the requirement. Libraries can adopt best practices in arranging e-resources which increase the use of e-resources and help in justifying the budget spent on e-resources.

From the literature review it is also noticed that awareness, use of e-resources and collection management of e-resources are main factors librarians need to consider. Many scholars suggested best practices for e-resource collection development and management of e-resources.

It is also observed that few studies are now considered by professional and understand the need of e-resources by academic users but e-resources acquisition, collection development and e-resource management is not reflected in literature review. Hence researcher decided to undertake a study on e-resource collection and its management in S&T libraries where more e-resources are available and procured.

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Chapter 3: Development of Science Institutes in India: An Overview

3.1 Introduction:

The social and economic growth of any country entirely depends upon its progress in science and technology. Government of India has initiated to promote higher education, science and technology in India. In 1951, Indian Institutes of Technology, Kharagpur was established in order to promote technical education in India, later more IIT's were established in Mumbai, Madras, Kanpur and Delhi. India has started developing Indian space programme in 1960 and conducted its first nuclear test explosion on 18 May 1974 at Pokhran. Advancement in S&T helped to increase agriculture production, prevent diseases by generating new curing medicines and provision for advanced medical facilities, better transport facilities, better security using technologies etc. These development leads in increasing living standard of the human beings. The countries those are advanced in S&T are economically developed and leading in world. Most of the nations have developed well-planned policies for science and technology research. India has also recognized the importance of scientific research and initiated several and remarkable efforts for development of science and technology since beginning. This has lead to achievements in India's space and nuclear programme, information and communication technology services, automotive and pharmaceuticals industries, and many other areas. Due to the continuous efforts in science and technology, India's relative position of scientific publications has upgraded. In 2010, Indian Science output had reached 3 % of the global output, India's share in publications is only 0.5 % which is less than Asian countries like China and South Korea. (Planning Commission, 2013). To compete with other developed nations, India has to increase its investment in the scientific research and development from 1% GDP to 2% of GDP or more than that. (Department of Science & Technology, 2013). This is possible only managing with additional efforts and investment of private sectors in R&D. Importance of S&T, R&D is now more essential.

3.2 Development of Science Institutes in India: Before Independence:

Before Independence, there was no clear policy for the development of the S&T. There were few scientific institutions, but no efforts were taken to develop science and technology. But some leading scientist C.V. Raman, S. Ramanujan, S.N. Bose, M.N. Saha etc. in the pre-independence era that have received international reputations for their original scientific work. University of Calcutta, University of Bombay, and University of Madras were established in 1857, keeping the main motto of providing trained personnel for colonial civil services. These universities offered very less science course, and no much research work was carried out at initial stage. The Indian Association for the Cultivation of Science was established by Mahendralal Sirkar, in Calcutta where C.V. Raman's discovery of the Raman Effect developed and also received Nobel Prize for this discovery in 1930.

Indian Institute of Science, is the leading scientific research institution in India which was established in 1909 by the partnership between Industrialist Mr. Jamsetji Nusserwanji Tata, the Maharaja of Mysore, and the Government of India. M.N. Saha has developed an institute of nuclear physics in Calcutta before independence. In 1914 The Indian Science Congress Association (ISCA) was established by Professor J. L. Simonsen and Professor P.S. MacMahon. The objective of The Indian Science Congress Association (ISCA) was to bring all researcher together in annual meeting and help to stimulate scientific research in the country.

India also established Board of Scientific and Industrial Research, and in 1942, Council of Scientific and Industrial Research (CSIR) was constituted. Tata Institute for Fundamental Research was established in 1945 for advanced study in basic research of nuclear science and mathematics. Before 2nd World War, fewer efforts were taken to develop scientific research in the country. Fundamental science research was carried out in the universities and few industries carried out industrial research to some extent. But during World War II, to meet requirements of the civilians and military, the large number of products got manufactured. Efforts have taken to replace imported material with Indian substitute.

3.3 Development of Science Institutes in India: After Independence

India is well aware of importance of Science and Technology for its national growth and lot of efforts has been taken by the Indian government for development of scientific and technological research since its First Five Year Plan. Greater emphasis was given to providing extra facilities for encouraging scientific and industrial research. Efforts have been taken for upgrading traditional skills to make it competitive, relevant in the central areas S&T. The Science and Technology Division of the Planning Commission is the central division which is responsible for entire affairs related to S&T including plan formation, i.e., five years plan and annual plans. The main S&T departments are Department of Science and Technology (DST), Department of Scientific and Industrial Research (DSIR) including the Council of Scientific and Industrial Research (CSIR), Department of Atomic Energy (DAE)- R and D Sector, Department of Biotechnology (DBT), Department of Space (DOS) and Ministry of Earth Sciences (MoES) established for R&D and S&T. The Division of the Planning Commission provides proper suggestions and advices to the science and technology departments for the formation of various S&T plans and its implementations.

Basic research is carried out in the different departments of the universities. The research in the universities is providing technical men power for research work and running industries. University Grants Commission help to offers basic facilities for pure research and other institutes like, Council of Scientific and Industrial Research, Indian Council of Agricultural Research and Indian Council of Medical Research sponsor various project related to the applied research in the universities. Central Scientific Ministries/Departments/Agencies are developing various policies, schemes for strengthening scientific development. Many new subject-specific research institutes have been established and old institutes are strengthened by given world-class facilities. New central universities are developed, and old is reinforced by providing grants and modern infrastructure. Various schemes like Kishore Vaigyanik Prothsahan Yojana, Olympiads, Inspire Fellowship, etc. have been launched to attract and retain young talent in the scientific research. Objective specific approaches and policies have been developed to achieve the targeted goals. As per the requirement approach of the science, policies have been changes. The objective of India's

Scientific Policy Resolution (SPR) was "Foster, promote and sustain" the "cultivation of science and scientific research in all the aspects. The necessity to develop technical competence and self-reliance was highlighted in the Technological Policy Statement (1983). The Science and Technology Policy (2003) brought Science and Technology together and focused on the need for investment in R&D. Science, Technology and Innovation Policy (2013) aims to bring fresh perspectives to bear on innovation in the Indian context. 2010-2020 Decade is the "decade of the Innovations" for India. (Planning Commission, 2013)

3.4 Present Status of Scientific Institutes in India

India is one of the leading countries in the field of basic science research. Development in the field of Science and Technology plays important role in the development of the nation. The Department of Science & Technology (DST) work in promoting research in new areas S&T. DST work as central department for organising, coordinating and promoting S&T activities in the country. R&D institutes are growing fast in India. There is 33% growth of R&D institutes during 2010 to 2015. R&D institutes increased from 4288 to 5710 from 2015. (National Science & Technology Management Information System (DST-NSTMIS). The Science and Technology Division of the Planning Commission is policy forming body for six major S and T agencies/Departments.
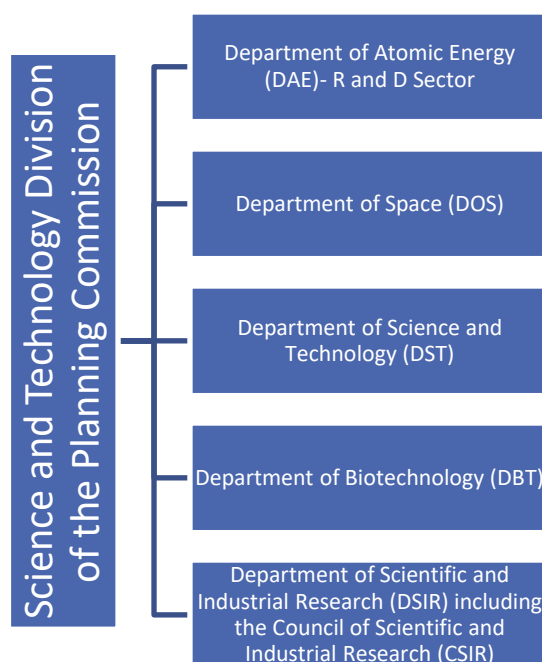
Fig. 3.1 Central Government Science and Technology Departments

- ✓ **Highlights of Indian Science Developments**

The data presented below is retrieved from statistics provide by Department of Science and Technology on their website (http://www.nstmis-dst.org/statistics-Glance-2017-18-2.pdf).

- In India, Gross expenditure on R&D (GERD) has been consistently increasing. It was 24,117.24 crores in 2004-05, Rs. 85,326.10 crores in 2014-15 and estimated to beRs. 1,04,864.03 crores in 2016-17.

- During the year 2014-15, India's Gross Expenditure on R&D(GERD) was 0.69%. The share in Gross Expenditure on R&D (GERD) of Central Government 45.1%, State Governments 7.4%, Public Sector Industries 5.5%, Higher Education 3.9% and Private Sector Industries contributing 38.1% during 2014-15.

- During 2014-2015, among the major 8 central government agencies, DRDO share in 7.8% of R&D expenditure was 37.8% followed by DOS (16.6%), DAE (11.6%), ICAR (11.4%), CSIR (9.5%) and DST (7.7%), DBT (2.9%) and ICMR (2.4%).

- The support for central government agencies has increased from Rs. 1,358.04 crores in 2009-10 to Rs 2002.12 crores in 2014-15.

- As on 1st April 2015, nearly 5.28 5.28 lakhs personnel were employed in the R&D.

- Indian rank 3[rd]in terms of number of Ph. D.'s awarded in S&T after China and USA.

- In India, the number of, researcher per million population increased from 110 to 218 during 2000 to 2015.

- India scientific publication is increasing over the years. As per the SCOPUS database, research output increased by 68% from 62,955 in 2009 to 1,06,065 in 2013.

- India's growth rate of scientific publication as per the SCOPUS was 13.9% during 2009-2013.

- As per SCI database, India share in the global publications increased from 2.2% in 2000 to 3.7% in 2013

- As per Scopus database, India ranked at 6th position in the world in scientific publications during 2013.

- Total 46,904 patents were filed in India, during the 2015-16.

India has realized the importance of international cooperation in S&T development, so initiated the establishment of agreements with other countries. Presently India has bilateral S&T cooperation agreements with 83 countries with active cooperation with 44 countries. In the recent year, India has the cooperation has strengthened significantly with Australia, Germany, France, Israel, Japan, Russia, Canada, EU, UK, and USA. India Africa S&T Initiative help to strengthen cooperation with African countries. (DST-International S & T Cooperation).

Fig. 3.2 S&T System in India (Source: http://www.dst.gov.in/st-system-india)
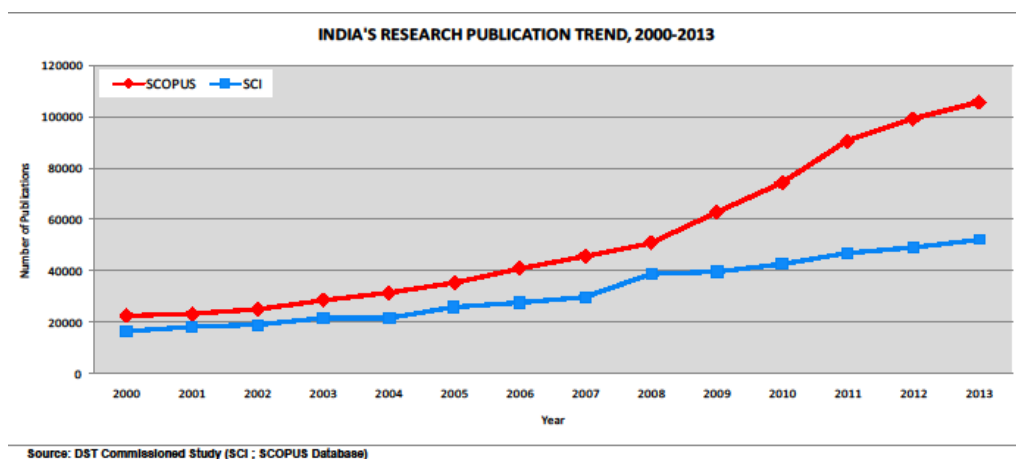
Fig. 3.3 India's Research Publication Trend, 2000-2013

(Source: http://www.nstmis-dst.org/statistics-Glance-2017-18-2.pdf)
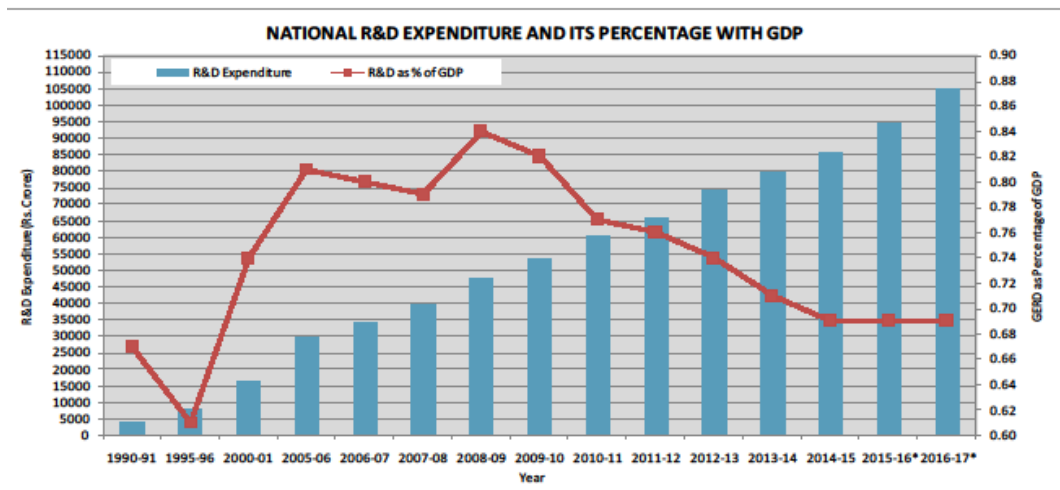
Fig. 3.4 National R&D Expenditure and its percentage with GDP

Source:http://www.nstmis-dst.org/statistics-Glance-2017-18-2.pdf)
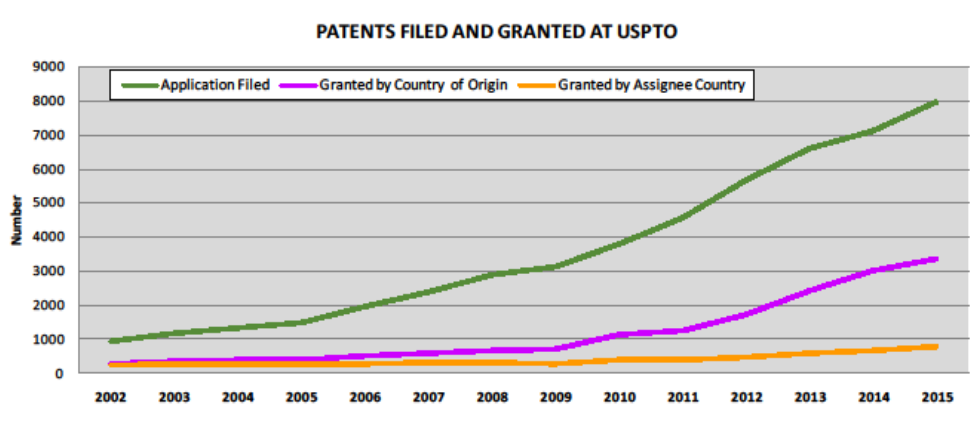
Fig. 3.5 Patent filed and granted at USPTO

(Source:http://www.nstmis-dst.org/statistics-Glance-2017-18-2.pdf)
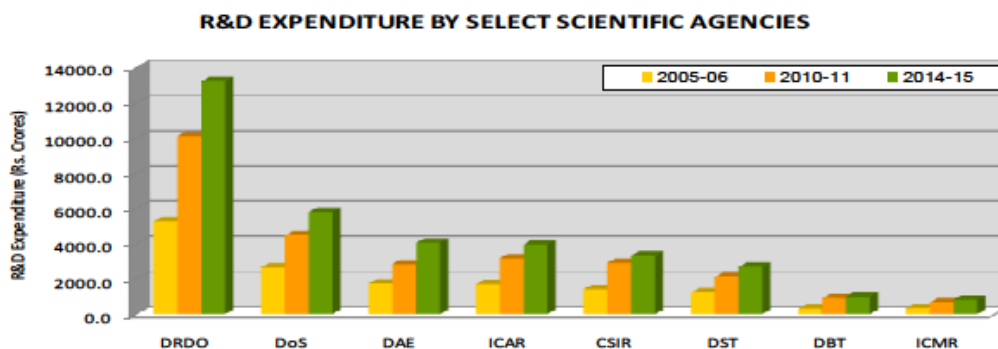
Fig. 3.6 R&D expenditure by selected scientific agencies

(Source:http://www.nstmis-dst.org/statistics-Glance-2017-18-2.pdf)

3.5 Progress of Indian Science Institutes in Five Years Plans

The brief review of the Indian Science Progress through the Five Years plan is given below. The information is retrieved from Planning commission, Govt. of India website i.e. http://planningcommission.nic.in

Expenditures of Central Scientific Ministries/Departments/Agencies during Five Year Plans

	1st Plan (1951-56)	2nd Plan (1956-61)	3rd Plan (1961-66)	4th Plan (1969-74)	5th Plan (1974-79)	6th Plan (1980-85)	7th Plan (1985-90)	8th Plan (1992-97)	9th Plan (1997-02)	10th Plan (2002-07)	11th Plan (2007-12)
Series1	4.61	47.00	71.60	130.80	383.85	1130.1	2599.0	6125.6	12067.	23641.	75304.

Fig. 3.7 Expenditures of Central Scientific Ministries/Departments/Agencies during Five Year Plans (Source of Statistics - http://planningcommission.nic.in/sectors/index.php?sectors=sci)

The development of S&T in India is briefly discussed as per five years plans from 1951, after independence.

3.5.1 First five-year plan (1951—1956)

The 1st five-year plan focused on development of laboratories and research institutes under which series of the research institutes and national laboratories were established all over the country. CSIR-National Chemical Laboratory, Poona, The National Physical Laboratory, New Delhi, The Central Glass and Ceramics Research Institute, Calcutta, The National Metallurgical Laboratory, Jamshedpur, The Central Drug Research Institute, Lucknow, The Fuel Research Institute, Jealgora, The Central Leather Research Institute, Madras, The Central Building Research Institute, Roorkee,

The Central Food Technological Research Institute, Mysore, The Central Electro-chemical Research Institute, Karaikudi, The Central Road Research Institute, Delhi, was established. Along with these in 1951, Indian Institutes of Technology was established to promote technical education in the country.

In 1948 the Atomic Energy Commission was set up to develop the group of scientists to work in the different areas of atomic energy under the chairmanship of Homi Bhabha. Department of Atomic Energy was established in 1955, Defense R&D Organization was created in 1958. The Indian National Scientific Documentation Centre was formed to provide S&T information and documentation services. National Research Development Corporation was established in 1953 for utilizing research in practical utilization by industries. In the first five-year plan, the University Grants Commission (UGC) was set up in 1956 for coordination, determination, and maintenance of standards of teaching, examination, and research in university education.

3.5.2 Second five-year plan (1956-1961)

The 2nd five-year plan is known for the industrial and technological progress of the country. The attention was given to strengthen the existing facilities and bring all research together to solve major issues in the various fields of national development. During this period, India had research departments in 33 universities, 14 CSIR Labs, 54 associations in the scientific and technological research, 88 research institutes and research centers etc. University Grant Commission provided financial support to the universities for the development of research facilities and higher technical education. In 2nd five years plan the Indian Institute for Medical Research, Calcutta and Central Laboratories for Scientific and Industrial Research, Hyderabad has started working under Council of Scientific and Industrial Research. The new institutes were established like Science and Industry Museum at Calcutta, National Biological Laboratory, Mining Research Station at Dhanbada and regional laboratory in Assam and Central Mechanical Engineering Institute near Calcutta, Vigyan mandirs which are rural scientific centers were established for providing help to disseminate scientific information among the farmers. For the development of S&T in 1958 Scientific Policy Resolution was passed. During this plan, Indian Council of Medical

Research sanctioned the number of the Institute for producing indigenous drugs. Indian Science Congress Association, the Indian Academy of Sciences, Bangalore, Indian Physical Society, the National Institute of Science, New Delhi and the Indian Chemical Society helped in disseminating scientific knowledge through academic journals and established the platform for the scientist for discussions and communications.

3.5.3 Third Five Year Plan (1961–1966)

The third five-year plan, focused on scientific and technological research for strengthening existing research Institutes, encourage basic research in the universities and technological research. During this plan, the efforts were taken to coordinate research work carried out at the national programme of scientific and technical research. The government had established Department of S&T for organizing, promoting, coordinating, S&T activities in the country. DST formulated policies for the Science and Technology in India. Institute of Petroleum, National Biological Laboratory, and a Regional Research Laboratory were established in the 3rd Five-year plan. Indian Agricultural Research Institute expanded its divisions in the Third Plan which bring a lot of research carried out in the agriculture which leads to devolvement various varieties of the crops and fertilizers in the country.

3.5.4 Fourth Five Year Plan (1969–1974)

During 4th Five-year plan, CSIR established Structural Engineering Research Centre, Regional Research Laboratory, National Geophysical Research Institute National Institute of Oceanography and Industrial Toxicology Research Centre. In 1961 movement of Department of Atomic Energy became part of the Plan programmes. According to Science and Technology Report (1969), the total expenditure (central government, state government, and private sector) expand from Rs. 27 crores to about Rs. 136 crores in during in 1958-59 to 1969-70. Bharat Heavy Electricals Limited was established in 1964, which is supporting to engineering and manufacturing companies for design, engineering, construction, manufacture, commissioning, testing, and servicing of various products and services for core sectors of the economy. In 1971 National Committee of Science and Technology (NCST) was established. One of the objectives of NCST was to include science and technology in socioeconomic

planning. NCST suggested many methodologies, and priorities and new structure for development of S&T. Leading achievement of NCST established new department, Department of Science and Technology.

3.5.5 Fifth Five Year Plan (1974–1978)

Coordinated research programme among different agriculture universities was strengthened during this five-year plan. In north-eastern region, new research complex was developed. New 21 agriculture universities were set up in 16 states of the country to strengthen educational programme. The research programme was restructured by specifying redefined time span, costs, and expected benefits. Special efforts were taken for conducting research developing the country's natural resources. The research project has started to work with international collaboration. During this five-year plan lot of investment is done in Bharat Heavy Electricals Limited for production of electrical generation, Hindustan Machine Tools for the manufacture of lamp machinery, printing machinery, tractors and watches and in Heavy Engineering Corporation for strengthening engineering programmes were taken over by the Government. In 1977 National Information System for Science & Technology (NISSAT) was launched with main aim to promote and support S&T growth in the country by developing National Information Network.

3.5.6 Sixth Five Year Plan (1980–1985)

During the 6th five-year plan, the first step was taken to for building National Information System for Science and Technology (NISSAT) and established four sectoral scientific information centers. The 6th Five-year plan was focused on to provide infrastructure facilities for research in oceanography and strengthening the sophisticated instrumentation. During this period lot of efforts were taken to strengthen basic research, multi-disciplinary research and newly emerging areas of the science. The various departments were established like Department of Ocean Development (July 1981), Department of Environment (1980), the Commission for Additional Sources of Energy (1981), the Department of Non-Conventional Energy Sources (Sept. 1982). In March 1981, Cabinet Committee on Science and Technology (CCST) was formed under the chairmanship of Prime Minister for giving policy guidance to all the matters related to the Science and Technology. Science Advisory

Committee to the Cabinet (SACC) which was constituted in March 1981 to keep connected with Planning Commission. In 1982 National Biotechnology Board (NBTB) was established for working as an inter-ministerial coordinating agency. To empower the employment of S&T personnel, National Science and Technology Entrepreneurship Development Board (NSTEDB) was developed. In May 1982, National Council for Science and Technology Communication (NCSTC) was established, and in 1983, Technology Policy Statement (TPS) was also announced. University Grants Commission helped certain higher education institutes to upgrade their infrastructure so they can conduct better research in S&T.

3.5.7 Seventh Five Year Plan (1985–1990):

The main focus of 7th Five Year plan was towards maximum utilization of the potential and the infrastructure which is already created for S&T development. Some of the available structure was strengthened and some were built in the essential areas. Department of biotechnology was set up in February 1986 under the chairmanship of Prime Minister. For dealing with high-temperature superconductivity Project Management Board was also established. Along with this Technology Information Forecasting and Assessment Council (TIFAC) and The Science Advisory Council to the Prime Minister (SAC-PM) was developed. A lot of research was conducted in the field of nuclear energy, biotechnology, ocean, etc.

The autonomous research institutes were established like the Institute for Plasma Research, Jawaharlal Nehru Centre for Advanced Scientific Research and Satyendra Nath Bose Centre for Basic Sciences. Autonomous bodies like Technology Information Forecasting and Assessment Council (TIFAC) was established. For popularisation of science, the national programme - Bharat Jana Vigyan Jatha was very effective. During this period six Science and Technology Enter-premiership Parks were set up. Significant achievements in space programmes noticed during this period, which were successfully launched like series of IRS satellites.

3.5.8 Eighth Five Year Plan (1992-1997)

During 8th Five-year plan continuous efforts were taken for developing precise and time-bound programmes in various disciplines of S&T. Science and Technology Advisory Committees were constructed for indication, formulation, and

implementation in most of the socio-economic sectors. State Science and Technology Councils, Science Advisory Committee to the Cabinet (SACC) and a Committee of Secretaries on Science and Technology (COS Sand T), Cabinet Committee on Science and Technology (CCST), has been established. Successful launching of INSAT 2A, 2B and 2C which were indigenously built satellites made significant achievements during this period. These satellites helped in providing various facilities like expansion of TV services in a diverse area, video conferencing, etc. 'Integrated Mission for Sustainable Development (IMSD) was launched for the formulation of location-specific development plans. National Institute of Ocean Technology (NIOT) was established at IIT Chennai for ocean research. National facilities and core groups were set up for promoting research in the leading areas of S&T. Financial supports to basic research was doubled in the 8th five-year plan.

3.5.9 Ninth Five Year Plan: (1997-2002)

During 9th Five-year plan government agencies other than Department of Space, DAE and DRDO invested 200 Crore on research and development programmes in IT and electronics annually. This help to establish technological base rather than the development of specific products. The significant achievement during the 9th Five-year plan was launching of the various satellite like IRS-1D, PSLV-C3, IRS-P4, Geo-stationary Satellite (GSAT) and series of INSAT satellite. Nuclear Power Corporation of India Limited was established by BARC during this plan. Jai Vigyan National S&T Missions for development of new generation vaccines were launched. National Bioresource Development Board (NBDB) was developed for setting policy framework for the useful application of biotechnology for R&D and proper utilization of bioresources. For encouraging new scientists, The Swarnajayanti Fellowships and the Kishore Vaigyanik Prothsahan Yojana was launched. Department of Scientific and Industrial Research initiated project-based support to the industries. During 9th plan, they offered support 35 projects. CSIR started the moderation of the modernization of various national laboratories. Future Air Navigation System developed GPS and DGPS and other airport modernization equipment. Development of Supercomputer PARAM, development of Cyclone Warning Radar and MST Radar, investment of diagnostic and therapeutic instruments for cancer therapy, Fiber optics

systems, Versatile OnlineInformation System (VOICE), etc. are some of the major achievements during the 9th plan.

3.5.10 Tenth Five-year Plan (2002-2007)

10th five-year plan, first time gave valuable recommendations to shift approach to use S&T for the development of the nation. Some basic issues like creating and maintaining strong science base, development of clean technologies, initiating mission mode programmes, boosting of S&T activities in the country were mentioned in both 9th and 10th five-year plan. Many programmes were designed based on these issues. Restructuring of government ministries/departments, R&D institutions, and National Laboratories etc. were commenced. Department of Atomic Energy participated in mega-science projects, and its contribution was recognized by the international scientific community. During the 10th five-year plan lot of development took place in various areas of Atomic Energy, Biotechnology, Earth Sciences.

DSIR started Technology Promotion Development and Utilization Programmes for promoting industrial research and technology development in the country and motivate applications in various segments of the economy, like academic and scientific institutions, industry or the society etc. The SERC support leads to publication of 500 research publications per year in Science Citation Index (SCI) journals. These efforts help to amplify the research capabilities of the academic as well as research institutes in the country. For developing cooperation in S&T with other nations, Inter-government agreements were signed in 16 countries, which includes Canada, Colombia, China, the EU, Islamic Republic of Iran, Italy, Laos, Thailand, Mozambique, South Korea, Serbia and Montenegro, Sudan, Sweden, Iceland, Switzerland, and USA. The research output of CSIR was very high during the 10th five-year plan. Maiden flight of SARAS, establishing first ever Traditional Knowledge Digital Library (TKDL) are some of them. During the 10th five-year plan, CSIR was granted 667 US patents, and 13000 basic research papers published in peer-reviewed journals. To attract and retain young people, to choose the carrier in science many efforts have been made in 10th five-year plan. Universities were strengthened to bring them to the global standards, IITs have provided grants for starting quality undergraduate courses, three Inter-University Centers were established, New world-class institutes like National Institute of Science and Research (NISER), Indian

Institutes of Science Education and Research, (IISER) were created to provide integrated M.Sc. courses. Talent search schemes like Olympiads and Kishore Vaigyanik Protsahan Yojana was started.

3.5.11. Eleventh Five Year Plan (2007–2012)

The government has given high priority for investment into R&D for getting maximum benefits for the society and knowledge generation which help in capacity building. In the 11th Five-year plan priorities are given to

i.   Build the national level mechanism which can develop policies and provide direction to the basic science research.

ii.   Strengthen the scientific infrastructure, establish scientific manpower and attract young people to choose their carrier in the science.

iii. Creating world-class research facilities.

iv.   Developing PP model in higher education particularly research in the universities and high technology areas.

v.   Develop industry-academic collaborations

vi.   Encouraging international collaboration with developed countries.

To meet above priorities, efforts were made. Some of them are

i.   Establishment of National Science and Engineering Research Board (SERB), National Innovation Foundation (NIF), Ahmedabad, National Center of Molecular Materials, Thiruvananthapuram, Institute for Advanced Studies in Science and Technology, Guwahati and Institute of Nano Science and Technology, Mohali.

ii.   Science and Engineering Research Council has supported various 1800–2000 new projects annually to promote research in basic science which resulted in in more than 7500 scientific publications.

iii. To encourage research and development in the university Consolidation of University Research, Innovation and Excellence (CURIE) and Promotion of University Research and Scientific Excellence (PURSE) and have been launched.

iv.   To support excellence in research, two hundred and seven JC Bose National Fellowships, 323 Boys cast, Fellowships and 155 Ramanujan Fellowships were

awarded. For attracting young talent in science from school level, INSPIRE scheme has been initiated. Various research facilities very developed like Clean room facilities at IISc, Bangalore, Centre for Knowledge Management of Nano Science and Technology (CKMNT) at ARCI, Hyderabad and Ultra High-Resolution Aberration-Corrected Transmission Electron Microscope (TEM) at Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore etc.

During the 10th and 11th Five-year plan India made collaborations with International partners and has taken significant initiatives relating to mega science programmes. They researched High Energy Physics, Astronomy, Thermonuclear Fusion and Synchrotron supported material science research. Huge development, innovations and research took place in all the central scientific ministries/departments/agencies during 11th Five-year plan. India's investment in R& D is very less as compared to other developed countries. In 2004-2005 India invested only 0.8 of the total GNP whereas same is 2% in developed countries.

3.5.12. Twelfth Five Year Plan (2012–2017)

Though many efforts have been taken for development of S&T, but still country have to achieve many goals. Hence, during 12th five year following objectives were set to accomplish in S&T.

- Develop new S&T innovation policy to involve public and private sectors for R&D to support socially and strategically relevant projects and mainstream the research related activities which could be affordable and sustainable for innovations.

- Ensure the participation of S&T national developmental processes.

- Increase the number of full-time scientists from 1.54 lakh to 2.50, as well increase the publication in the basic research from global share 3% to 5 %, and improve the global ranking, doubling the number of patents.

- Increase the R&D expenditure by attracting and involving corporates in R&D by developing policy and reforms processes.

- Provide more freedom to young scientist to pursue their ideas and mobility to work in industry, R&D and academic.

- Establish technological partnerships among states, through new model of technical solutions.

- To address national priorities in various developmental sectors, Initiate Grand Challenge Programmes and launch PAN-India missions. In the 12th Five-year plan, preference is given to energy and water.

- To establish a world class research institute to encourage Indian industries.

- For providing state of the art facilities to academic ambiance for researchers in universities and academic institutions, develop new Inter-Institutional Centers (IICs) and Inter-University Centers.

- In trans-disciplinary science and engineering develop new R&D institutions.

- Create Peta-scale supercomputing facilities and provide high-performance computing for various applications in weather prediction, computational biology, nuclear applications, aerospace engineering, finance and national security etc.

- By using new financial appraisal, new personnel policy and audit mechanisms bring in structural reforms in the S&T sector.

- Take active participation in global mega projects in the areas of contemporary scientific interest and technological relevance.

- Strengthen association with reputed foreign universities/educational agencies for dealing with scientific aspects of common and global interest.
  In sum it is stated that country has strengthen R&D, S&T innovative projects by establishing scientific institutes, organizations through the country during all five years plans.

3.6 Science and Technology Research in DRDO

Defence Research & Development Organisation (DRDO) was formed by merging of Technical Development Establishment (TDEs) and the Directorate of Technical Development & Production (DTDP) with the Defence Science Organisation (DSO) in 1958. DRDO worked under Department of Defence Research and Development of Ministry of Defence. DRDO aims to strengthen self-reliance in Defence Systems and tackle design & development for production of world-class weapon war systems and weapons for fulfilling the requirements of three defence services. DRDO is working

in various areas of defence like aeronautics, combat vehicles, armaments, instrumentation engineering systems, missiles, electronics, materials, naval systems, simulation, advanced computing and life sciences etc. DRDO created four research boards to promote talent in academic institutions, universities, R&D centres and industry. The DRDO provided essential facilities for supporting basic research and encourage cross-fertilization of ideas with R&D agencies in other sectors for developing the knowledge base in their respective field.

Life Sciences Research Board (LSRB) supported projects related to biological and bio-medical sciences, physiology, psychology, specialized high-altitude agriculture, bio-engineering, food science, and technology, etc. Naval Research Board (NRB) approves projected related to marine technologies. NRB has established Grants-in-Aid Scheme to encourage basic research by creating research facilities in IITs, universities, engineering colleges, higher technological institutions, and other research centers including industries. Aeronautical Research & Development Board (ARDB) supports projects related to Aeronautics and related areas. Armament Research Board (ARMREB) approved projects in the fields of high energy materials, sensors, ballistics and other armament related fields.
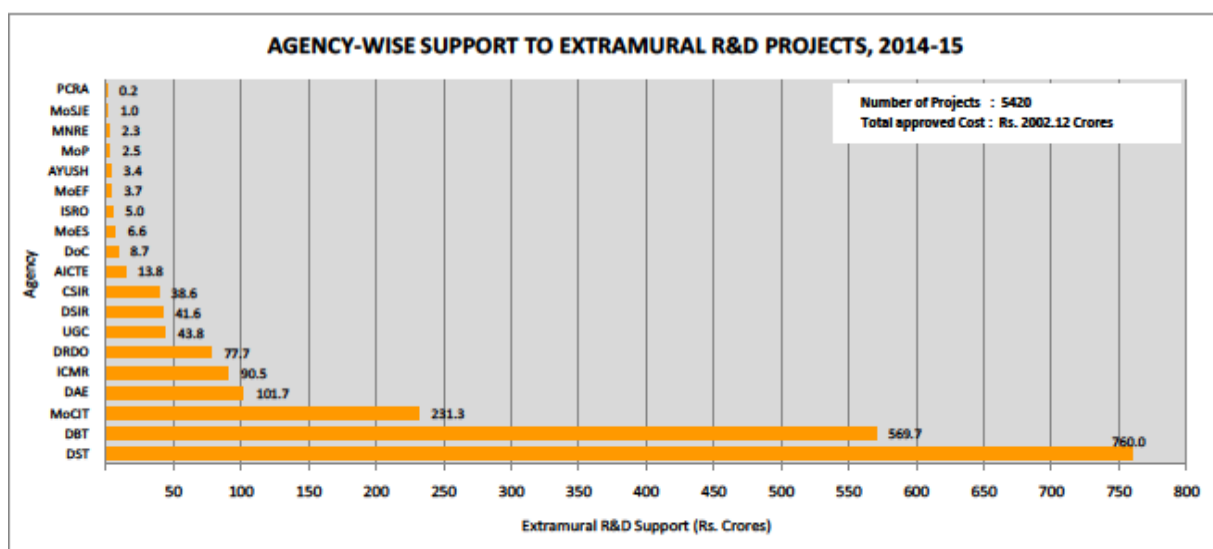
Fig. 3.8 Agency-wise support to extramural R&D Project, 2014-15
(Source: http://www.nstmis-dst.org/statistics-Glance-2017-18-2.pdf

During 2014-2015, DRDO spent 37.8% of R&D expenses. (http://www.nstmis-dst.org/statistics-Glance-2017-18-2.pdf).

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Summary:

Thus it is found that India made strong base for R&D and S&T in all sectors to strengthen the structure of country. Due to the strong and continuous support of Indian Government, India achieved the remarkable position in scientific research. India's share in world's total scientific publication increased and made an impact on the world. India has understood the importance of international collaboration for the development of S&T and starting collaborations with many countries; private sector also started investing R&D. This strengthen the research and science and technology and soon, in near future India becomes leading global player in sciences.

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Chapter 4: e-Resources available in S&T

4.1 Introduction:

For conducting scientific research various research institutes are established and most of the countries are supporting scientific research by providing financial support and facilities required for conducting research. R&D development needs information resources in different forms and formats. Accessibility to information resources in the S&T is an essential activity of libraries and information centres for the development of scientific research and advancements.

For any research basic requirement is access to accurate, current and timely information support. Before e-resources, print resources were providing information for carrying out research. Using information, researcher generates new knowledge and researchers publish it as research communication to establish monopoly in knowledge base. Similarly, other researcher notices the development in fields. In print publication the time span between information generation and access to the information by another scientists is more, and this is due to time taken to print the information sources like books, journals, etc. Similarly, due to geographical distances it also takes time to reach to users. In S&T information lost its value with the delay in time. Old information is not very useful in research. This problem was solved by the emergence of the e-Publication and use of ICT in libraries and all sectors.

4.2 e-Publications

Electronic publishing, has been broadly defined as non-print material that is produced digitally. Electronic publishing is an encompassing term for a variety of digitally produced information materials (Jones & Cook, 2000)

According to Wikipedia "Electronic publishing (also referred to as e-publishing or digital publishing or online publishing) includes the digital publication of e-books, digital magazines, and the development of digital libraries and catalogues."

"Electronic publishing (also refer to as e-publishing or digital publishing) includes the digital publication of e-books, EPUBs, and electronic articles and the distribution of

written-information digitally through CD-ROMs, DVDs, portable documents files(PDF), or online over the internet or other networks. (Obaid)

Advancement in ICT has brought major transformation in publication industry and libraries. Publication are slowly shifting from print to electronic publications. In electronic publications, input from submitting, editing, reviewing, distribution, access is carried out in electronic media only. In electronic publication, publication of resources and distribution of it among thousands of users is very fast. It is economical way to disseminate information to number of users at the same time. Due to tremendous advantages of e-publications, many publishers have preferred electronic publications over print publications. Many leading publishers in S&T publishes their resources only in electronic form and in the form of databases which provide access to the thousands of e-books and e-journals. In scientific research electronic publication helps to disseminates fast information to large research community.

Electronic publications have made huge impact on the library resources and library services. Since availability of the e-resources in S&T and users demand for the e-resources, libraries are acquiring more e-resources. ICT helped in providing access to the e-resources worldwide. ICT has also made a huge impact on library function right from collecting, acquiring, storing, retrieving and disseminating information materials and documents.

4.3 Advantages of e-Resources

The major advantages of e-resources are listed below: -

- Anytime, anywhere access: global access to e-resources - e-Resources can be accessed 24*7 from anywhere irrespective of geographical distance.

- Quickly and easily searchable:Can easily be searched small piece of information from large information store available on the web with the help of proper information search techniques.

- Speedy Access: Users can get information quickly on the web. Electronic versions of the information reach instantly then print versions to the users.

- **Interactive:** Users can use information and also appended their views on documents which are useful to others. Publisher of the information can edit/update information easily.

- **Hyper linking Facility:** The e-resources can be hyperlinked from documents to documents which are of similar interest. Most of the e-resources provide hypertext, links to related articles, and individual articles.

- **Alert Facility:** e-Resources provide email alerts on registration free of charges to users, when latest information is added to knowledge.

- **Attractive presentation:** e-Resources use audio-video material, graphics, animation (multimedia) which makes the content more expressive and increases the utility.

- **Inexpensive:** Many e-resources are available free on the web, some are open access also. Libraries can save money by subscribing to e-resources through consortia or resources sharing models. Compare to print media e-resources are found more economical.

- **Space saving:** e-Resources are stored on the publisher's server, and users access them from the publisher's server so it saves physical space of the library as well as space on the library server also.

- **Flexibility:** e-Resourcescan be published and distributed quickly irrespective of geographical location.

- **Save paper:** e-Resource helps to save papers and cutting of trees for paper and help in protecting.

Though e-resources have many advantages there are few disadvantages also-

4.4 Disadvantages of e-Resources

- e-Resources needs a computer technology and other electronic media to access the information effectively.

- Some users are not comfortable with reading on the computer screen.

- Slow internet connectivity may take time in accessing or downloading the contents.

- Users can't access the e-resources if server of the publisher is down or due to any other technical problems.

- e-Resources require uninterrupted power supply which sometimes is not possible especially in developing countries and medium libraries. However, these can be resolved by making proper management.

4.5 Importance of e-Resources in S&T

Scientific research depends upon accurate, current and timely availability of the information for the research. Output of any research is information and knowledge which is the base for the new research. By providing quick access to the information, e-resources accelerate the speed of the research. e-Resources are very important in the S&T as well as availability of e-resources in S&T is more as compared to other sectors. Some of the points are discussed below: -

- Accelerate the research by providing current information required for the research.

- Disseminate the research finding quickly among the researchers which may lead to new research.

- Indicating impact factor of the journals helps to suggest the researcher, selection of journals for publishing their research papers.

- Because of its inherent advantages of accessibility and visibility to researchers across disciplines, e-resources promotes interdisciplinary research in a better way.

- It helps in establishing collaboration by providing citations which aids to identify similar research group.

- As e-resources disseminate information quickly, it helps to avoid duplicate research.

4.6 e-Resources Available in S&T

In S&T area many e-Resources are available. Dhuri (2007) and Patil (2015) have discussed that prominent e-resources which are available in the field of S&T. The major selected resources are discussed below in alphabetical order. The detailed

information about the e-resources are collected from the links available over the internet.

❖ **Access Medicine**

McGraw-Hill Medical publisher's, Access Medicine is complete, authoritative, trusted and updated source of the information for medicine. Advisory Board guide the access medicine which include top medical top academic experts. Access medicine is useful for medical students, residents, physician assistants and nurse practitioners. Access medicine provides access to leading medical textbooks, instant videos, self-assessment which are helpful for decision making whenever required. It provides online solutions and online support to clinical practise and medical education by providing interactive information to users. (https://accessmedicine.mhmedical.com/ss/About.aspx)

❖ **American Institute of Chemical Engineers (AICHE)**

AICHE (American Institute of Chemical Engineers) is non-profit organization, established in 1908. AICHE provides leadership to the chemical engineering profession. AICHE having more than 50,000 members from over 100 countries from the industry, academia, and government. It publishes scholarly journal communications for the chemical engineers. (https://en.wikipedia.org/wiki/American_Institute_of_Chemical_Engineers)

❖ **American Institute of Physics (AIP)**

AIP is non-profit organisation established for advances, promotes and serves the physical sciences for the benefit of humanity. The objective of the AIP is to preserve physics for future generations. AIP publications involve 31 publications from various research areas of physics. AIP publications provide basic and applied interdisciplinary and emerging research for scientists, engineers and students. AIP publications provides access to the researcher across the physical science fields. (https://publishing.aip.org/about-aip-publishing)

❖ **American Physical Society (APS)**

American Physical Society (APS) is non-profit membership organisation work for developing and spreading knowledge of physics through outstanding research journals including education, scientific meetings, advocacy, outreach and international activities. APS is having over 55,000 members including physicists in academia, national laboratories, and industries from all over the world. APS headquarters are located at College Park, MD (Headquarters), Ridge, NY, and Washington, D.C. (https://www.aps.org/about/index.cfm)

❖ **American Society for Testing and Materials (ASTM International)**

ASTM International isan international standards organization established in 1898. ASTM develops and publishes technical standards for a wide range of materials, systems, products, and services. ASTM International is well known for their market relevancy and high technical quality. Nearly 12,575 ASTM standards are operated in the world published by ASTM. The membership of the ASTM is open to all. In 2015 ASTM members were more than 30,000. (https://en.wikipedia.org/wiki/ASTM_International)

❖ **Annual Reviews**

Annual Review Inc. is a non-profit publisher which has a collection of 46 review series in science and social science disciplines. Annual reviews are available online well as in print form to institutions, individual and consortia all over the world. Annual Reviews are providing comprehensive, timely collections of critical reviews written by well-known scientists. Each year Annual Reviews Volumes are published on 46 focused disciplines within the Biomedical, Physical, Life and Social Sciences including Economics. (https://en.wikipedia.org/wiki/Annual_Reviews_(publisher)

❖ **Association for Computing Machinery (ACM)**

ACM established in 1947, which is international learned society for computing. It is a not-for-profit professional membership group and world's largest scientific and educational computing society. ACM have more than 100,000 members from all over the world. ACM's raises awareness

of computing, educational, technical and social issues around the world. ACM Digital Library and the Guide to Computing Literature can be accessed through the ACM Digital Library Portal which consist of full-text of all the publications of the Association for Computing Machinery (ACM). Publications includes journals, conference proceedings, magazines, and SIG publications.

(https://en.wikipedia.org/wiki/Association_for_Computing_Machinery)

❖ **ASTM International Digital Library**

ASTM, Digital Library is a collection of nearly all ASTM publication including more than 1,500+ Manuals and Special Technical Publications, more than 17,000 journal articles, more than 35,600 chapters and papers. ASTM's Digital Library covers aerospace, chemical, environmental, biomedical, civil, geological, industrial, materials science, health and safety, mechanical, petroleum, soil science nuclear and solar engineering means almost all aspects of the engineering disciplines.
(https://en.wikipedia.org/wiki/ASTM_International)

❖ **Biological Abstracts**

Biological Abstracts is created by Clarivate Analytics published since 1926. It provides abstracts from peer-reviewed academic journal, articles in the field of biology, biotechnology, biochemistry, botany, pharmacology, pre-clinicaland experimental medicine, agriculture, zoology, and veterinary medicine. It can be accessed through Web of Science, EBSCO and Ovid.
(https://en.wikipedia.org/wiki/Biological_Abstracts)

❖ **Bureau of Indian Standards** (**BIS**)
Bureau of Indian Standards (BIS) established in 1986 under by the Bureau of Indian Standards Act, 1986. BIS publishes standards in various disciplines. Information about published standards is available on website of BIS.
(http://www.bis.org.in/bis_overview.asp)

❖ **Chemical Abstracts**

Chemical Abstracts is product of American Chemical Society. Chemical Abstracts Service provides abstracts of currently published scientific documents. Approximately 8,000 journals, dissertations, conference proceedings, technical reports, and new books, in nearly 50 different languages. It also covers Patent specifications from 27 countries and two international organizations. From 2010 chemical abstract is available only in electronic form. (http://www.worldcat.org/title/chemical-abstracts/oclc/1553947)

❖ **Cochrane:**

Cochrane is non-profit and non-government organisation. Cochrane is formed to organise medical research finding, to help health professionals, patients, and policy makers. Cochrane has 53 review groups from various research group form the world. It also having around 30,000 volunteer experts from all over the world. Cochrane group conduct systematic reviews of health-care interventions and diagnostic tests and publishes them in the Cochrane Library. (https://en.wikipedia.org/wiki/Cochrane_(organisation))

❖ **EBSCO**

EBSCO Information Services is one of the largest private companies which provide resources to users from various fields like medical, corporate, academic, law, public library, and government. EBSCO provides different products for different types of services and subject fields. For example, EBSCONET – is e-resources for Management, EBSCO provides payment based online research service with 375 full-text databases, subject indexes, a collection of 600,000-plus e-books historical digital archives and point-of-care medical references. Likewise, EBSCO Discovery Service (EDS) help to search a portfolio of magazines and journals. (https://www.ebsco.com/about/resources)

❖ **Elsevier**

Elsevier is one of leading companies in the publication of scientific, medical and technical, social sciences and humanities print and electronic resources. It

was established in1880. Annually Elsevier publishes around 400,000 papers in around 2,500 journals. Achieve of the Elsevier contain 30,000 e-books and 13 million documents. Total yearly downloads of the Elsevier are around 900 million. (https://www.elsevier.com/books-and-journals)

❖ **EMBASE** (**ExcerptaMedica database**)

EMBASE is database of biomedical and pharmacological field. It is an Elsevier product which has more than 28 million records from 8,400 currently published journals since 1947 to present. EMBASE update their resources daily. EMTREE drug indexing helps in retrieval of drug information from the published literature. EMBASE coverages in biomedical journals is more than 90 countries and it is available through number of database vendors. (https://en.wikipedia.org/wiki/Embase)

❖ **INDEST-AICTE Consortium (Indian National Digital Library in Engineering Sciences and Technology)**

The **"**Indian National Digital Library in Engineering Sciences and Technology (INDEST) Consortium" was set up by the Ministry of Human Resource Development (MHRD) in 2003, on the recommendation of an Expert Group appointed by the Ministry. The headquarter of INDEST-AICTE Consortium is at IIT Delhi from where all the activities are coordinated. The members of the consortium are engineering and technological institutes and consortium subscribe e-resources for them on favourable terms and conditions and discounted rates of subscription. Funds for e-resources subscriptions for 62 journals centrally funded by institutes like IITs, NITs, IIMs, IISc Bangalore, ISM, IIITs NITTTR's and few other institutions are provided by the ministry. Consortium also provide access of selected electronic resources to 60 Govt./Govt.-aided engineering colleges with financial support from the AICTE and under its self-supported category 102 universities/institutions have joined the Consortium in 2012. Total members of the consortia are now reached to1235. (http://icolc.net/consortia/176)

❖ **INDEX MEDICUS**

Index Medicus is a bibliographical database in the field of biomedical sciences and life sciences which is produced by MEDLINE. MEDLARS, a bibliographic database is output of computerizing the indexing work of United States National Library of Medicine (NLM) which started 1960. Now MEDLARS became MEDLINE. Index Medicus and Abridged Index Medicus are content duration services that provide MEDLINE content into search subsets or database views. (https://en.wikipedia.org/wiki/Index_Medicus)

❖ **Institute of Electrical and Electronics Engineers (IEEE)**

IEEE is world's largest technical professional association which boost the development and application of electro technology and allied sciences for promoting innovation and technological excellence for the benefit of humanity. IEEE was established in 1884 as the AIEE, and AIEE merged with IRE it formed IEEE in 1963. IEEE have engineers, scientists, and allied professionals in their membership. By 2010, IEEE have more 3,95,000 members from 160 countries. IEEE served its members with 39 Societies; 130 journals and magazines; 900 active standards and more than 300 conferences annually. (http://www.ieee.org/about/index.html)

❖ **Institute of Physics (IOP)**

IOP is a charity institute which works to promote physics education, research and application. IOP is having over 50,000 members all over the world. IOP provides different services to its members like career advices, professional developments and grants the professional qualification of Chartered Physicist (CPhys), as well as Chartered Engineer (CEng) as a nominated body of the Engineering Council. IOP Publishing publishes more than 70 academic journals and magazines. IOP publishing spread research through journals, magazines, conference proceedings, community websites and books. IOP is the first publisher to publish journal on internet. (https://en.wikipedia.org/wiki/IOP_Publishing)

- ❖ **International Society for Phonics and Optics (SPIE)**

  SPIE is a non-profit international society for promoting an interdisciplinary approach to the science and application of light through interdisciplinary information exchange, publications, patent precedents, continuing education and career and professional growth. It provides its journals and proceedings at low or no cost in International Network for the Availability of Scientific Publications (INASP) partner and networked countries with low- and lower-middle-income economies as identified by the World Bank. It also provides similar services to the institutes which are members of INASP including universities, not-for-profit research institutes, libraries, teaching hospitals, and other similar institutions in other countries. SPIE also provide access with non-profit base to the health professionals, agricultural extension workers, and other professionals from the research institutes which are working in remote area and have no without formal collections. Through the eJDS program of the International Centre for Theoretical Physics SPIE provides free or low-cost distribution of articles published in in the SPIE Digital Library. (http://spie.org/about-spie/about-the-society/spie-fact-sheet?SSO=1)

- ❖ **J-Gate**

  J-Gate launched in February 2006, hosted by Informatics (India) Ltd Bangalore. It is a free database of open access journals. J-Gate is an electronic gateway to global e-journal literature which provides access to millions of journal articles from 13,117 Publishers available online. J-Gate indexed 49,667 journals and indexed 56,441,472 articles till date and more than 10,000 articles are added daily. Database serves multidisciplinary users including users from the science stream. (https://jgateplus.com/home/)

- ❖ **John Wiley and Sons Inc.**

  It is a global publishing company and also referred as Wiley, established in 1807. Wiley is academic publishing company which provide print as well e-resources for students and instructors in higher education, practitioners and researchers and in technical, scientific, medical, and scholarly fields. The publishing company produces books, encyclopaedias and journals. They also

produce online products and services, educational and training materials. (https://en.wikipedia.org/wiki/John_Wiley_%26_Sons)

❖ **JSTOR**

JSTOR means Journal Storage. It is a digital library initially containing digitized back issues of the academic journals. Now it holds current issues of journals, books and other primary sources. It also supplies full text search for almost 2000 journals. It provides access on subscription base but for some older public domain content accessible freely to anybody. As of 2013 over 8000 institutes from more than 160 countries had access to JSTOR. (https://en.wikipedia.org/wiki/JSTOR)

❖ **LANCET**

The Lancet is a weekly peer-reviewed journal in medical field. It was started from 1823 by Thomas Wakley, one of the oldest and well-known journals in medical sciences. Lancet publishes original research articles, editorials, review articles, correspondence, book reviewsas well as news features and case reports. Since 1991, The Lancet has been owned by Elsevier. (http://www.thelancet.com/)

❖ **McGraw Hill Education**

McGraw-Hill Education (MHE) is a leading science company and educational publishers provides customized educational content, services and software from school education to postgraduate education. MHE also supply references and trade publications for the medical, engineering and business profession. McGraw-Hill Education is a global company, currently works in 28 countries, has more than 4,800 employees and offers services and products to over 135 countries in 60different languages. Currently MHE offers more than 1,500 adaptive products in higher education and digital formats for its major K-12 programs. **(**https://en.wikipedia.org/wiki/McGraw-Hill_Education)

❖ **MEDLINE (Medical Literature Analysis and Retrieval System Online, or MEDLARS Online)**

MEDLINE is a bibliographic database of biomedical information and life sciences. It provides bibliographic information for articles from academic journals covering medicine, nursing, pharmacy, veterinary medicine, dentistry, and health care. National Library of Medicine launched MEDLARS (Medical Literature Analysis and Retrieval System) which is computerized biomedical bibliographic retrieval system. It contains more than 26 million records from 5,639 selected publications covering health and biomedicine from 1950 to the present. (https://en.wikipedia.org/wiki/MEDLINE)

❖ **Nature Publishing Group (NPG)**

NPG is division of Springer Nature which is scientific publishing company that publishes online databases, academic journals, magazines and services in science and medicine. It is a publisher of a well-known journal like Nature and Scientific American. It also publishes Nature research journals, Nature Reviews journals society-owned academic journals. Nature publishing was part of Macmillan Science and Education before Springer nature was formed in 2015. (https://en.wikipedia.org/wiki/Nature_Publishing_Group)

❖ **ProQuest**

ProQuest was started as microfilm publisher in 1938 and from 1939 is stared publishing doctoral dissertations. Now ProQuest provides product, services and application for the libraries. It supports research by providing information resources and tools and also by help libraries in acquisition, management and discovery of library collections. ProQuest also provide tools for discovery and citation management and platforms that allow library users to use, manage, discover and share research.

ProQuest have Total over 125 billion digital pages, which include dissertations and theses, eBooks, periodicals, newspapers, governmental and cultural archives historical collections and other aggregated databases. Mostly users get access this content through library Internet gateways. (https://en.wikipedia.org/wiki/ProQuest)

❖ **PubMed**

PubMed is a free search engine accessing primarily the MEDLINE database of references and abstracts on life sciences and biomedical sciences. MEDLINE is NLM database which covers indexed citations and abstracts on medical, dental, nursing, veterinary, preclinical sciences and health care journal articles. The PubMed was developed at the National Library of Medicine by the National Centre for Biotechnology Information (NCBI) and maintained by United States National Library of Medicine (NLM).

(https://en.wikipedia.org/wiki/PubMed)

❖ **SAE International**

SAE international is globally recognised and effective standard developing organisation for engineering professionals. Their main focus is on transport industry like commercial vehicles, automotive, and aerospace. SAE international offers memberships to individuals rather than companies. It has 138,000 members from different part of the world. SAE international also allot resources to programs and projects in STEM education, collegiate design competitions and professional certification.Since 1906, SAE international is publishing technical information for their members. It publishes monthly magazines like Aerospace Engineering and Manufacturing, Automotive Engineering International, Off Highway Engineering, SAE Vehicle Engineering, Truck and Bus Engineering, e-newsletters, etc. SAE also produce print and online books, around 100 books per year on various technical subjects, textbooks, historical and enthusiast-oriented books.

(https://en.wikipedia.org/wiki/SAE_International)

❖ **ScienceDirect**

ScienceDirect is world's leading source for medical, scientific, technical research. Science Direct is Elsevier's product, established in 1997. ScienceDirect covers index, abstract and full-text articles from science disciplines.ScienceDirect offers subscription-based access to a large database of scientific and medical research. It hosts over 12 million pieces of content from 3,500 academic journals and 34,000 e-books.

(http://www.sciencedirectcom/)

❖ **SciFinder**

SciFinder is the most complete database for indexing journals, chemical literature, articles and patents. It is a core research tool for chemistry, biochemistry, chemical engineering, nanotechnology, physics, environmental science, materials science and other science and engineering disciplines. From SciFinder, information can be searched by various access points like topics, substances, author, chemical by name, CAS Registry Number, use the editor to draw chemical structures, reactions etc. SciFinder's is complementary to other databases like Web of Science, PubMed, Reaxys, Compendex and INSPEC. (http://www.cas.org/products/scifinder)

❖ **Springer Link**

Springer was established in 1842 by Julius Springer in Berlin. Springer link is the world's most comprehensive online collection of scientific, medical and technological journals, reference works and books. They offer variety of products like eBooks, myCopy, Chapter, Springer Topic Collections, Rentals, Protocols, Journal articles, Journals, Electronic media. Springer Link offers electronic and printed literature from Springer-Verlag and also from Urban and Vogel, Steinkopff, and Birkhäuser. Springer Science plus Business Media (Springer) is a global publishing company that publishes books, e-books and peer-reviewed journals in science, technical and medical (STM) publishing. Springer books include textbooks, monographs, major reference works and book series; more than 168,000 titles are available as e-books from 24 different subject areas. (http://www.springer.com)

❖ **Taylor & Francis Group (T&F)**

Taylor and Francis founded in 1852, is an international publishing company which publish books and academic journals. T&F publishes more than 2700 journals and around 7000 new books every year. Over 140,000 titles are available in print and digital formats with T&F. It publishes in humanities, behavioural sciences, law education and social sciences from Routledge imprint and science, technology, mathematics and engineering from

CRC Press. T&F generally considered the smallest of the 'Big Four' - Reed-Elsevier, Wiley-Blackwell, Springer, and Taylor & Francis. (https://en.wikipedia.org/wiki/Taylor_%26_Francis)

❖ **UGC-INFONET**

The UGC-Infonet Digital Library Consortium was formally launched in December, 2003, shortly after providing the internet connectivity to the universities under the UGC- Infonet programmein the year 2003. The UGC-INFONET Digital Library Consortium is now no more operational. It has been merged into "e-Shodh Sindhu Consortium". e-Shodh Sindhu Consortium offers current as well as archival access to more 7500 core and peer-reviewed journals and 10 bibliographic databases from 26 publishers and aggregators in different disciplines to their members, institutions including centrally-funded technical institutions, universities and colleges that are covered under 12(B) and 2(f) Sections of the UGC Act. The main objective of e-Shodh Sindhu is to provide access to qualitative electronic resources including full-text, factual and bibliographic databases to academic institutions at a lower subscription rate. (http://www.inflibnet.ac.in/ess/about.php)

❖ **United States Patent and Trademark Office (USPTO)**

USPTO, established in 1975 at Washington DC, USA. USPTO is federal agency for granting U.S. patents and registering trademarks. It issues patents to inventors and businesses for their inventions, and trademark registration for product and intellectual property identification.

(https://en.wikipedia.org/wiki/United_States_Patent_and_Trademark_Office)

❖ **Web of Science:**

Web of Science was previously published by ISI, USA. It is an online payment based scientific citation indexing service maintained by Clarivate Analytics. Web of Science provides a complete citation search. It provides access to multiple databases which provide reference for cross-disciplinary research and allows for in-depth exploration of specialized sub-fields. (http://thomsonreuters.com/en/products-services/scholarly-scientific-research/)

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Chapter 5 – e-Resources Management and Its impact

5.1 Introduction

Libraries are playing pivotal role in scientific and industrial research by supporting timely information and provide accurate access to information to the researchers. Researcher's need information mostly very specific, pinpointed and urgent. Now a days only print resources are not sufficient to fulfill researcher's information need, but huge information is available in electronic form like websites, e-journals, e-books, internet resources, databases either online or offline. Some of the publishers publish documents only in electronic form. e-Resources have many advantages especially 24*7 availability, anywhere and quick access, multiple accesses, quick information retrieval by using search techniques, up-to-date information, multimedia format, interactive information etc. Hence users are also demanding more for e-resources in S&T areas. e-Resources are rapidly replacing the print resources in research libraries. Research libraries are spending major portion of their budget on subscribing to e-resources.

Developments in ICT has accelerated the publications and use of e-resources everywhere. Libraries are connected to each other by developing library network which helps in achieving resource sharing. Libraries prefer procurement of IP based resources with the help of LAN connectivity or wi-fi, multiple user facilities can access the resources at same time by many. Similarly, libraries are also digitizing their old valuable collection for preservation and to provide instant access to it. Web 2.0 technologies and availability of open source software packages helped libraries to organize, advertise and provide access to the digital resources effectively to users for conducting R&D activities.

5.2 What are e-resources?

Electronic resources are information resources in electronic form which need computer or another electronic device to access it. E-books, E-journals, databases, websites, library OPACs are few examples of e-resources.

According to IFLA (2012) "Electronic resources" refer to those materials that require computer access, whether through a personal computer, mainframe, or handheld mobile device. They may either be accessed remotely via the Internet or locally. Some of the most frequently encountered types are:

E-journals

E-books

Full-text (aggregated) databases

Indexing and abstracting databases

Reference databases (biographies, dictionaries, directories, encyclopaedias, etc.)

Numeric and statistical databases

E-images

E-audio/visual resources

According to Wiktionary (2002) Electronic resources are defined "Any source of information available through electronic means, now usually via the Internet."

5.3 Need of e-Resources

e-Resources are empowering the libraries to provide better services to the users. The few significant points are mentioned below.

- To get access to the information sources by many users at the same time. (Multiple user access).

- To provide quick access to the information.

- To provide better search ability by using various search techniques.

- To satisfy current information need of the researcher as well as retrospective information of any topic.

- To provide access to thousands of e-documents which is difficult for any library to subscribe in print format.

- To get access to the resources available in electronic form since many publishers are publishing their publications in electronic form only.

- To get access to the old issues of the journals which are available through perpetual access.

- To provide effective access to information economically.

- To encourage cooperative efforts for resources sharing with the help of information networks among the libraries.

- To get access to related information with the help of hyperlinking in the e-resources.

- To Save users time by providing information from anywhere in the globe.

5.4 Characteristics of e-Resources:

➢ e-Resources provide anytime, anywhere access to information.

➢ e-Resources provide quick and accurate retrieval of information.

➢ Hyperlink and hypertext facilities guide users to related information.

➢ Various search techniques can be used for easy and quick retrieval of the information.

➢ Most of the e-resources ownership is available at publisher'send and not with the libraries.

➢ e-Resources are well interactive.

➢ Provides quick access to the information, compared to print information.

➢ e-Resources provides alert services, for new addition of the information.

➢ Archival facilities ensure long term access to the information.

Due to various advantages of e-resources the collection of e-resources is available in S&T area as well as libraries are also acquiring to e-resources more. Hence management and organization of e-resources is essential in area.

5.5 Managing e-Resources in Research Libraries:

Electronic publications have made significant impact on the library collection and the library services. Science research libraries are now acquiring more e-resources. Managing print resources is easy task but managing both print and e-resources becomes difficult. Nature of both resources is different, and requires different skills and expertise for its effective management. For using print resources, users have to visit to libraries physically and consult the literature. But e-resources are accessible from publisher's website or offline resources and can be accessed through CD/DVD or hard disk using a computer at desk top also. Hence, for managing and using e-resources, library staff and users need some basic knowledge of computer and communication technology.

Libraries are now not storehouses of the resources but accessibility is more. Use of ICT makes the library activities automated which resulted in saving time and providing various services for the users. For managing library resources libraries are using automated systems. Many commercial software, as well as open source software are available for managing housekeeping activities of the libraries. Libraries using content management software to preserve, organize and provide access to the e-resources. Advancements in the ICT and availability of electronic resources helped the libraries to offer innovative products and services for users. New ways are being used to collect, process and disseminate the knowledge to the potential users. Library personnel are acquiring new ICT skill and using them in library resource management and providing innovative services. Libraries are also providing training to users for developing awareness about e-resources to users.

Libraries are procuring print as well as e-resources, collection development and collection management became more complex. Various factors affecting to collection development in library due to e-publications, users demand for e-publications, price negotiation, varying prices of e-resources, limited budget, more use of e-resources, etc. Hence libraries need proper written collection development policy for e-resources. As libraries' e-resources are increasing day by day, the collection development policy for digital collection is needed or there is need to amend the existing collection development policy which can accommodate e-resources.

Collection development policies (CDP) provide guidelines for development and management of library collection and all the activities involved in it like budgeting, selection, deselecting, preservation, weeding out etc. CDP is a formal document that describes issues like scope of the collection, budget, selecting responsibilities and weeding Mangrum & Pozzebon (2012). According to Davis (2013) "The CDP should include: General statement, Scope of the policy, ER to be collected, Selection criteria for fee-based ER, Selection responsibilities, Acquisition process, Procedure for evaluation and Licensing".

Though collection development policy is basic need for collection development, most of the libraries in India do not have written collection development policies for libraries. Procurement of e-resources made situation more critical. Libraries are following certain rules/convention for developing their collection but most of them don't have written policy for developing collection.

5.6 Users of e-Resources

In research or special subject libraries, most of the users are researchers, conducting research in various disciplines of science. They are special users, working on micro areas of a specific subject so their information need is also very specific and pinpointed. Users of the science libraries need information for their research and information need is specific and current as well as retrospective. As e-resources are providing current information efficiently, users prefer to use e-resources. Most of the researchers like to access e-resources through their desktop very frequently. They use library websites or library portals as an access point for e-resources. Users of e-resources, uses e-resources for keeping them updated in their subject field as well as for teaching etc. Most of the libraries provide e-resources through Document Delivery Service (EDDS) if not accessible from the particular library.

e-Resources used by users are familiar with use and access to e-resources, and they are using various searching techniques and features of e-resources for getting required information. e-Resources also helps them to find out similar research team through e-publication which helps to develop research collaborations.

5.7 e-Resources Management: Workflow

e-Resource management covers different factors, which are elaborated in following paragraphs. The diagrammatic approach is illustrated below. The e-resources management covers different element like selection, license agreement, method of acquisition, access related norms, renewal etc.
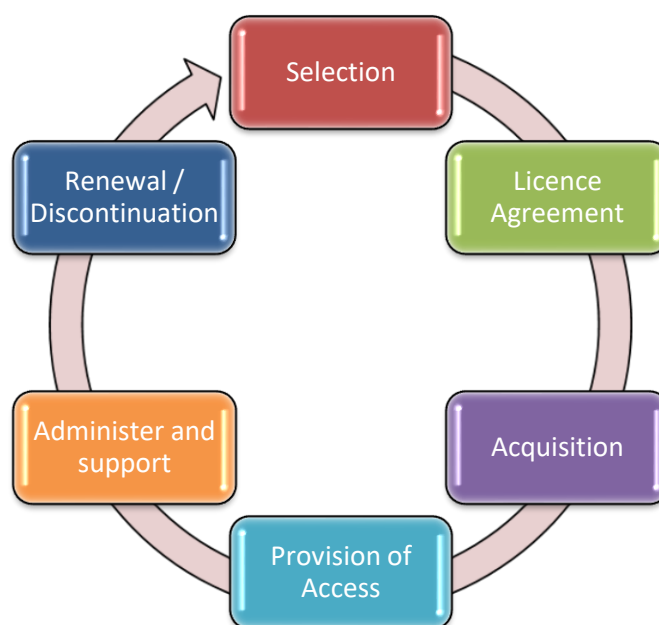
Fig 5.1 e-Resources Management: Workflow

5.7.1 Selection

Selection of the e-resources is generally managed by the experts in respective subject areas and members of library committee. Selection of the resources are not only based on the core and allied subjects but also on projects carried out in the institutes. The requirements of the users are considered while selecting e-resources. The need of e-resources is assessed after proper evaluation. While selecting e-resources budget is considered by the libraries. As per user's need as well as availability budget, e-resources based on subject areas are selected for the acquisition. There are different purchase models available for procurement of the e-resources like:

    i.   Annual subscription with access mode only.

    ii.   Annual subscription with perpetual access.

    iii.   Pay per view model.

iv.   Subscription with one-time payment, etc.

v.   Based on consortium facilities

5.7.2 License Agreement:

As per the users need and availability of budget, libraries select best purchase model for e-resources for their library. Librarians have to check license terms before procurement of e-resources. License agreement is a legal agreement between the library and publisher. It concerns rights and responsibilities by library and publishers. It is a legal contract which state terms and conditions for use of resources. It includes subscription tenure of the resources, perpetual access dates, clearly defined access rights, authorized users and authorized sites, methods of access, archiving policy, fair use, inter library clauses and restrictions, and individual registration requirements etc. It also states the terms and conditions of termination, renewal and financial obligation of both the parties at termination or renewals. Most of the science research libraries select IP-based access for e-resources over ID and password. In the IP-based access of e-resources, number of users can access the e-resources simultaneously from their desktop without remembering user id and password.

Libraries set trial access for the e-resources before subscribing it, so that the user can access it and find whether it is really useful and required for their research.

Suitable ICT infrastructure is required for access to e-resources and if not available in library can arrange the necessary infrastructure which is very essential for getting access to e-resources. The brief process of e-resource acquisition is discussed below-

5.7.3. Acquisition

After fixing terms and conditions and license agreement with publishers, e-resources are initiated and libraries place order and arrange to pay subscription amount to the publisher. Most of the science research libraries are part of various consortia. Hence, they subscribe e-resources through consortia and get the benefit of negotiated pricing. Libraries can also subscribe e-resources through the vendor or directly from the publishers.

5.7.4 Provision of Access

The library, shares IP addresses of the institute with the service provider to set access for the e-resources. After providing access, publisher's server identifies users by their IP address and it allows users to access the content. Sometimes proxy settings are required and managed with the help of IT personnel of the Institute. Most of the libraries are doing cataloguing of e- Resources with the help of MARC records provided along with the subscription of e-resources. Sometimes they have to do it manually. Library updates the Alphabetical lists of journals and databases available on the library websites and portal. They also update holding list of journals.

The library has to check access of e-resources frequently. If some problem is noticed in uninterrupted access, then contact the service provider and get it resolved. The libraries have to organize training programmes, orientation for the library staff and library users to use the e-resources more efficiently and effectively. Promotion of e-resources to the users is very important. Library spends lot of money on the procurement of e-resources, to justify the expenditure, library has to monitor the usage of the e-resource at their institute for identifying usage of e-resources.

5.7.5 Administering and support:

Library preserves all the data pertaining to e-resources like subscription related information, contact details, email ID, phone number, IDs and password of the e-resources in their knowledge base for recovery purpose, periodically. If library is providing restricted access to the user, the library has to check IP setting for the same. If any problem occurs then the library has to contact service provider or IT personnel to solve the problem. If users are facing any hardware or software related issues while accessing to e-resources, the library has to provide support to resolve the problems.

5.7.6 Renewal/Discontinuation

The library has to track user's feedback and usage report of e-resources before its renewal. If feedback and usage is satisfactory about e-resources then the library can renew the e-resources as per the decision.

The librarian and the/library have to keep in mind following points for successful collection management of e-resources:

- Library staff and users training.

- Promotion of e-resources.

- Develop awareness of e-resources among users.

- Copyright awareness about e-resources.

- Preservation and management of e-resources.

- Providing access to open access resources.

5.8   Impact of e-Resources

It was a time when libraries use to have an only printed collection. Advances in ICT have brought tremendous changes in information sources, information services and users information seeking behavior. Now all the science research libraries spend significant portion of their budget on e-resources. But libraries have not stopped procurement of print resources. Today science libraries are having a hybrid collection, (print resources as well as e-resources). Nature and characteristics of both the resources are very different from each other.

5.8.1   Impact of e-Resources on Researcher

In today's information age, tremendous information is available in electronic form. Scientific community is using e-publication heavily. Huge information gets published in electronic form e.g. e-journals, e-books, databases, various websites, blogs, etc. Voluminous information is available over the web easily and freely. Many publishers are keeping some e-resources for open access. Due to advancement of ICT, it is very easy to access, use, share e-resources. All these factors have highly influenced the researchers and tempt for using e-resources for research because of its merits over print.

In research libraries, the potential users are researchers who need information for their research work. Researchers are aware of technological advancement and use e-resources for their research, but some of them still prefer to use print resources. Students initially need some orientation but as they are referring many online resources, they soon adapt to use e-resources for study and research. Researchers

mostly learns searching strategies from their experience or from their friends and colleagues.

Since researchers are always busy in their research work, they get very less time to visit library for accessing required information. Hence researchers prefer to access the e-resources from their desktops. Libraries are subscribing to e-resources and provide IP based access, so users can access e-resources over LAN anywhere from the campus. Few scientists also benefited due to remote access for e-resources and use them over on vacations or traveling for seminar or conference etc.

Most of researchers uses e-resources daily to monitor research activity in the field, hence they know how to use the e-resources effectively. Initially researchers consult their colleagues, friends or library for getting required information through e-resources. Researchers also prefers to publish their research findings over the net or open source online journals. Use of databases helps researcher to find out number of citations received for the particular paper, also databases cover high impact factor journals published in scientific community. Researcher prefer to publish in high impact factor journals to get more citation and research views.

Using citation analysis researcher knows information about other researchers group working in similar areas which may lead to collaboration in research. e-Resources also helps to grab funding for the research work, since e-resources provide access to all disciplines of science. They also support inter disciplinary research. e-Resources support to quick sharing of the information and researchers get information on time. It helps in accelerating the research process, and also helps to avoid duplication in research.

5.8.2 Impact of e-Resources on Collection Development

When libraries procure only print resources, it is easy to select books by reading book reviews and other references. But the selection of e-resources is not that easy. The excellent content of e-resources are not only the criteria for its selection, but they have to consider other points like availability of infrastructure, license terms, etc. Procurement of e-resources bulk purchase - number of journals from the same publishers is procured in one time or database including thousands of journals are accessed.

Since libraries have started procuring e-resources, libraries are slowly moving from individual selection to cooperative selection through consortia. Consortia helps libraries to acquire e-resources at better prices and gives opportunity to libraries for joint bargaining with publishers for better products and services at economical ways. Print collection is in physical form, easy to arrange the collection as per user's usefulness, but the arrangement of e-resources is complex since most of the e-resources are accessible online from publisher's websites and having no physical format. For providing access to such online resources, libraries have to provide the list of e-resources along with hyperlinks on the library website, library blog or other such platforms, so that users can easily notice and access them. They also integrate e-resources in the library catalog. These works need some computer technology knowledge and expertise. Librarians gain the necessary skills and knowledge for creating library website, blog, and databases, etc. For organizing CD/DVD libraries are using Disk Stakka or CD mirror servers. To ensure the access to old and valuable print resources libraries have to initiated digitizing resources by making it available through the digital library, share drive, CD/DVD or institutes intranet.

5.8.3 Impact on Library Infrastructure

For using print resources necessary infrastructure is required which related to good lighting arrangement and comfortable library furniture etc. Infrastructure requirement of libraries for managing e-resources is different than print resources. As most of the e-resources users are accessing from the publisher's site essential requirements for e-resources like proper hardware and software, good internet connection, printer, scanner, etc. are essential. The modern science libraries are well equipped with enough computer terminals along with good processor speed, enough RAM, latest operating system, internet connectivity through Wi-fi or LAN. Library also provides a printer, scanner, photocopy machine, etc. Along with it, libraries also have a proper light arrangement and comfortable furniture.

All computers in library and other ICT devices always be in working conditions for users access e-resources smoothly. Library staff check ICT devices regularly to ensure its proper functionality. Few libraries have developed helpline systems through which users interact with libraries competent staff and get solved issues while accessing e-resources.

Most of the e-resources are procured through IP based access. Most of the scientific research institutes have LAN in their institute's campus area, covering computers from library, offices, hostel and campus residence. LAN facility permits users to access e-resources 24*7 over the campus. To enable users to access all types of files like text, audio and video bandwidth of internet connection need be good connectivity with high bandwidth speed.

Institutes provide Wi-Fi facility over the campus including the library. Wi-Fi uses radio waves to provide high-speed internet and network connection. Wi-fi helps to create LAN without wires and enable number of users to access the e-resources from their laptops and computer terminal within the campus. Wi-Fi reduces the cost of wiring involved in development campus LAN. Some of the libraries have Virtual Private Network (VPN) facility which permits users to access the e-resources when they are not physically present in the Campus; when they are traveling or at home during the vacation period. It increases the usage of the e-resources.

5.8.4 Impact on Library Services

Science research libraries are providing variety of services and facilities based on user's demands. These services and facilities help scientists in their research work.

- **Scientific data management**

Due to increase in scientific research huge data gets generated from research activities. It is challenging for the researcher to manage published data. Libraries are now getting involved in the management of scientific data. Librarians are taking part in the research projects from the initial stages and they are well aware of the information required for the research projects. It is necessary to understand researchers' requirement, problems and help them out to get required information. Stages of Scientific data management are planning, data collection or acquisition, data analysis or interpretation, data preservation, circulation, and data sharing. Now libraries are using cloud storage solutions or Institutional Repositories for to saving and providing access to the research data.

- **Document Delivery Services**

Document Delivery Services is one of the most important services of any science research library. It involves supply of the documents on users demand irrespective of location and form of the document. Sometimes users need and demand article or documents which are not procured or subscribed by the library. Library manages to get the requested paper/document from other libraries through resource sharing under Document Deliver Services for users. Due to increase in e-resources the speed of sending and receiving document through Document Delivery Services which have been accelerated. Due to advancement of ICT, users send the request and receive the documents through email which save users time and new instant DDS is called as EDDS (Electronic Document Delivery Service).

- **Resource Guides**

Most of research libraries prepare resource guides for user's for ready reference. Resource guides are systematic list of all the resources available in the library and freely available over the web on a particular subject. It contains printed books, e-books, e-journals, databases and print journal procured by the library. Other resources like the blog, websites, open accessed books, journals, search engines, subject gateways, databases, videos, scholarship, and fellowship available on particular subject are also highlighted. Resource guides gives a comprehensive view of the resources in the specific subject. It also provides one-click access the resources available for the specific subject. For researchers and students, subject guides are handy to get awareness and selection of source information for their research activity.

Libraries provides links to the subject guides through their website and users can easily access the same.

- **Online Public Access Catalogue (OPAC)**

Card Catalogue system is now replaced by Online Public Access Catalogue. It is the computerized version of the library catalogue. Users can access the library catalogue through library web or library intranet page. OPAC helps users to search particular document available in the library by using many access points

like keywords, author, title, ISBN, etc. Users can also view the documents issued by them and its status. OPAC allows users to reserve issued documents. OPAC also helps to obtain bibliographic details of available documents, number of copies, status of books, checked out to whom, the due date of checked out books etc. Libraries are integrating their e-resources with the OPAC which help to search and access resources using OPAC.

- **User Training/Orientation for e-Resources**

  Publishers of the e-resources are providing various features and facilities. Users can use multiple search strategies while searching specific resources. Users also interested in availability of citation for selected articles, its impact factors, total publications of institutes covered by the particular database, etc. If users are aware of these facilities, they can use the e-resources more efficiently. Therefore, libraries are arranging training programmes inhouse as well as through vendor/ publishers for their users, which explain details of all the features of e-resources. Libraries are also conducting library orientation, vendor talk, hands on expertise, email announcements, user guides on the website, etc.

- **Institutional Repository (IR):**

  Science research libraries are uploading institutional publications, research publications of their institute's members, these and many other resources in the institutional repository which enable to organize, preserve and provide access to it. Most of these documents are available in electronic format, to upload these in IR. Some of the libraries are digitizing old and valuable print resources for preserving and for securing its access for future use. Libraries are providing access to the digitized content through IR. Users can access IR from institutes LAN or through the web. The library can put embargo period for some of the resources in the IR and block its access temporally as per the author's request.

- **Access to Open Access Publications:**

  The resources which are available freely for access and use are called as open access resources. In science stream many resources are available in open access. The scientific community has also realized the importance of open access publications as it increases the usage and impact of the publications. Many peer

reviewed journals have provided access to their back issues as open access. Some of the publishers have partially converted all their issues as open access use. Even some open-access peer-reviewed journals have started appearing since early 21st century. These journals satisfy all the features/quality control mechanism of peer-reviewed journals published by commercial publishers. These journals are really boon to the researchers working in under-developed or developing countries where access to high quality journals is prohibited because of the cost factor. Science research libraries are developing awareness and preparing list of open access resources related to their field and provide access to them through the library website.

- **Library website**

Library website acts as an access point for all library services and the library resources. It keeps users updated about latest library development. Library website also serves as the access point for various library services and library resources

- **Similarity Checking Facility**

Voluminous information is available over the web, which anyone can easily access and use in their publications. It becomes essential for the users to check the originality of their documents before submitting it for the publication. Research libraries are procuring originality checking by web-based tools like Turnitin, iThenticate, Urkund etc., which helps users to compare their document's contents with vast databases to ensure its originality.

5.8.5 Impact on Library Professionals:

Role of the library professionals has undoubtedly changed in IT environment. They are become the digital librarians, cybrarians, and information brokers. Since libraries are procuring digital collections, it is now the warehouse of digital knowledge and librarians acts as a mediator between e-resources and the users by disseminating the precise information to its potential users effectively and efficiently. They also act as the consultants to information by providing digital reference service, electronic information service, browsing information for the users using e-resources. They analyze, repackage and provide information as per

the users need and also create online platforms like digital library, develop databases to showcase the resources and provide access to it. The digital librarians are taking an effort to educate their users on retrieving the specific information from the information sea.

Library professionals plays an important role in scientific research by providing access to the required scientific information and services which support the scientific research. Librarians are not only custodians of the resources but in ICT environment their role has changed, and they have to perform various duties at the same time.

- **Librarian:**

The primary role of the librarian is collection development, technical processing, managing the library activities. Many changes are taking place in the library collection and services due to technological advancement. Library professionals have accepted transformation and molded themselves to face the new environment by acquiring necessary skills, are regularly update themselves by keeping in touch with the latest developments.

- **Information Manager:**

To fulfil user's information need, librarians are managing information resources and providing appropriate information services. For providing information to the user library professional needs to have full knowledge of library resources and clear understanding of users' information needs. Librarians have to be creative, analytical, able to deal with the range of users and their requirements, enthusiastic and self-motivated. The Library professionals also tries to provide requested information from the other libraries or information centers if it is not available to them. Librarians developing strong library network related to their subject.

- **Information Adviser:**

Satisfying users need and advising them for consulting literature using library collection, library professionals need to have an ability to evaluate the resources and understand the content critically. Voluminous information is available in e-resources, and to retrieve specific information, library personnel have acquired

knowledge of searching skills to guide users to search information across multiple applications, databases networks, platforms etc. The libraries take assistance from subject experts for analyzing, organizing and repackaging information as per user needs. Subject experts also help in collection development of e-resources.

The increasing demand for efficient library and information services also gives rise to embedded librarianship, which presupposes that the librarians have to work along with other subject experts/ researchers in different projects and contribute his/ her role as content manager/ information manager/ or information adviser depending upon the requirements.

5.8.6 Impact of e-Resources on Publishers:

Advancement in ICT and in e-resources, brought tremendous changes in publication industry. Publication industry is shifting from print publications to e-publications. In e-publications all the task right from submission of manuscript to peer reviewing and distributing to users is carried out in digital media, which is very fast and economical. Hence publishers are preferring more to publish resources in electronic form. Digital content is more popular as it is relatively easy to publish and disseminate to the users and inexpensive than print resources. Hence some publishers stop print edition of their publication and publishing only electronic edition. Social and digital media allows to all individuals to act as publisher. Many individuals publish their information on blog, twitter, facebook, website etc.

Summary:

e-Resources are playing major role in the scientific research by providing current information required by the researcher. Though management of e-resources is complex process, but it helps libraries to fulfill the information requirements of the users. e-Resources act as a catalyst in the scientific research. Researcher also prefers to use e-resources for getting access to the required information. e-Resources not only helps in getting information but also in disseminating their findings of research.

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Chapter 6: Profile of Science Research Libraries

6.1   Introduction:

Pune is called as 'Oxford of the East' as it has many prominent educational and research institutes in the city. There are many research institutes working in various disciplines. The researcher tried to prepare a brief account of these institutes to understand in brief the association of these institutes in information society. This chapter provide brief information of selected research institutes in Pune. The information presented is collected from annual reports, institute's websites or from the institute's library. The researcher tried to presents the institute's research activities and information precisely in the following paragraphs.

6.2   Status of Selected Science Research Institutes in Pune

About 18 science research institutes are established in Pune under different departments of central government which are selected for the present research study. All the selected science research institutesare funded by different departments of government of India, except two i.e. Central Institute of Road Transport (CIRT) and Automotive Research Association of India (ARAI).

Armament Research and Development Establishment, High Energy Material Research Laboratory and Research and Development Establishment these research institutes are doing research work in various areas of defense which strengthens national security. All the research institutes have good campus facilities, laboratories and other infrastructure. These are leading institutes in their respective fields. The science research institutes hired well-qualified scientists, researchers, faculties and technical staff which are performing quality research. These institutes are also assisting in conducting post graduation and doctoral courses to create skilled professionals for conducting research. Table 6.1 detailed the activities performed in these 18 institutes in Pune.

Table 6.1 Science Research Institute Profile

Sr. No.	Name of the Institute	Core Research Area	Courses Conducted	Year of Establishment
1	Agharkar Research Institutes (ARI) (Formerly MACS - Maharashtra Association for the Cultivation of Science	Life Science	M.Sc., Ph. D Affiliated to Savitribai Phule Pune University	1946 1992 renamed as ARI
2	Armament Research and Development Establishment (ARDE)	Weapons Technology	Continuing Education Programmes	1958
3	Automotive Research Association of India (ARAI)	Automotive	B. Tech, M. Tech and Ph. D	1966
4	Central Institute of Road Transport.(CIRT)	Training, Testing and Consultancy	Short Course Transport Management	1967
5	Central Water Power Research Station (CWPRS)	Hydraulics, Costal Engineering, Mathematical Model and Civil Engineering	Training Programmes and Workshop	1916
6	Centre for Development of Advanced Computing (C-DAC)	High-Performance Computing, Super Computing and	PG Diploma	1988

		Linguistic Computing		
7	Defence Institute of Advance Technology (DIAT) (Formerly- Institute of Armament Studies (IAS),Institute of Armament Technology (IAT)	Defense Related Techniques in navigation systems, wireless sensors, Efficient Propulsion System, Weapons systems	M. Tech, Ph.D.	IAS -1952 IAT-1967 DIAT- 2006
8	High Energy Material Research Laboratory (HEMRL) (Formerly- Explosives Research & Development Laboratory (ERDL)1960	Defense Research and Development	-	1908 ERDL – 1960 HEMRL - 1995
9	Indian Institute of Science Education and Research, Pune (IISER Pune)	Basic sciences	BS-MS, Ph.D.	2006
10	Indian Institute of Tropical Metrology (IITM)	Tropical Metrology	M. Tech, M. Sc., Ph.D.	1962
11	Inter-University Centre for Astronomy and Astrophysics (IUCAA)	Astronomy and Astrophysics	Ph.D.	1988
12	National AIDS Research Institute (NARI)	HIV	Ph.D.	1992

13	National Centre for Cell Science (NCCS)	Biotechnology	Ph.D., Cell Culture	1986
14	National Centre for Radio Astrophysics (NCRA)	Astronomy and Astrophysics	MSc, Integrated PhD, Ph.D., Post Doc, Visiting Research Programmes	1990
15	National Chemical Laboratory (NCL)	Chemical Sciences	Ph.D., M. Tech	1950
16	National Institute of Virology (NIV) (Formerly - Virus Research Centre (VRC).	Virology	Ph.D., M.Sc.	1952 VRC – 1967 NIV- 1978
17	National Research Centre for Grapes (NRCG)	Grapes	Ph.D.	1997
18	Research and Development Establishment(R&DE)	Military Engineering	-	1962

6.3 Profile of Science Research Institute

Brief profile of the science research institute, selected for the study is given below-

6.3.1 Agharkar Research Institute (ARI)

Agharkar Research Institute, Gopal Ganesh Agarkar Road, Pune 411004, is an autonomous, state of the art research institute for life sciences under Department of Science and Technology, Government of India. ARI was established in 1946 as Maharashtra Association for the Cultivation of Science

(MACS) and was registered under Societies Registration Act. Institute established in honor of late Professor S. P. Agharkar, the institute's founder Director, the institute was renamed as Agharkar Research Institute in 1992. Life science research is conducted in the ARI under 6 different themes namely Biodiversity and Developmental Biology, Genetics & Plant Breeding, and Nanobioscience Paleobiology, Bioenergy, Bioprospecting.

ARI is affiliated to Savitribai Phule Pune University for M.Sc. and Ph.D. programme. ARI offers summer training and project supervision from students from all over the country. ARI operates number of research schemes funded by DST, ICAR, ICMR, CSIR, MoE, DBT, and MNES. ARI accept consultancy, technology transfer programmes from public and private undertakings from India and outside world and sponsored research projects.

ARI Library (Library and Information Centre)

ARI Library Information Centre has very good collection in Life Sciences and allied areas. The library was started by the donation of the entire collection of books, rare back volumes, periodicals and reference work especially in German by Prof. S.P.Agharkar. Since then books, journals and other reading martial have been continually added.

Library and Information Centre's special feature is the availability of the complete set of "Biological Abstracts" since its inception (first issue till the year 2000). Ekaswa-A' and 'Ekaswa-B' in CD-ROM available, which gives information on Indian patent. It holds unique collection of geological maps, atlases, microfilms/ microfiches. The library is participating member in the National Knowledge Resource Consortium which provides access to thousands of e-Resources from well-known publishers. (http://aripune.org/)

6.3.2 Armament Research and Development Establishment (ARDE)

Established in 1958, Armament Research & Development Establishment, Armament PO, Pashan, Pune, is an important research institute under DRDO, working towards self-sufficiency and self-reliance in the armament field. The main function of ARDE is to conduct research and development of technology and various defense products in the area of high energy material and explosive material. The activities of ARDE are related to conventional armament technology, comprising basic and applied R&D,

test, modeling and evaluation, prototyping, simulation and software development, limited scale pilot-plant production of crucial items and transfer of technology. ARDE has built up a sound knowledge-base and technologies to develop the conventional weapons and munitions required by the three Services and Para-military forces. ARDE conducts continuing education programme in solid modeling for system and engineering, warhead technology, and purchase management.

ARDE Library:

ARDE library is very spacious and designed in such way that natural sunlight is available in the library. ARDE library has good collection of books and non-book material. The library is one of its own kinds as it having collection especially on armament technology. The Library is a member of DRDO libraries e-Journal consortia which helps them. It has more than forty thousand books, 161 print journals, 200 online journals. The library has special collection of specification, standards and reports which are arranged in the separate section. Library has digitized all the specifications and standards and provided access to them through institutional repository over the campus-wide network.

(https://www.drdo.gov.in/drdo/labs1/ARDE/English/indexnew.jsp?pg=about-lab.jsp)

6.3.3 Automotive Research Association of India (ARAI)

Automotive Research Association of India, Survey No.102, Vetal Hill Off Paud Road, Rambaug Colony, Kothrud, Pune, is a research institute in the field of automotive Industry, working under ministry of Heavy Industries and Public Enterprises, Government of India. Since ARAI has received recognition and accreditation of OHSAS 18001, ISO 9001, ISO 14001 and NABL. ARAI is playing vital role in assuring safe, less polluting and more efficient vehicles. ARAI provides technical expertise in research and development, testing, certification, a framing of vehicle regulations and homologation. ARAI has developed state of art environment with highly qualified manpower. The Indian Automotive Industry, ARAI has been providing various services in the field of design & development. The association also helps automobile industries to manufacture and testing of components, along with the valuable guidance and support. ARAI extends its scope to meet the requirement of the automotive industries anywhere in the world.

ARAI is conducting B.Tech., M. Tech and Doctoral program in Automotive Engineering, I. C. Engines, Power train Electronics and Manufacturing & Industrial Engineering. ARAI has tied up with recognized national and international educational institutes like College of Engineering (Pune), VIT University (Vellore), VEL TECH University (Chennai), Christ University (Bengaluru), University of Alabama at Birgimham (USA), Tennesse Technological University (USA), Loughborough University (UK) and Technical University Braunschweig (Germany). For taking admission students have to clear different entrance exams at respective collaborative universities and the counseling/interviews conducted jointly by ARAI Academy and the partner university.

In ARAI students and the faculty has been carrying out research on the important area of automobile industry like alternate fuels, engine combustion, vehicle dynamics and vehicle safety, hybrid vehicles, active suspension systems and active noise cancellation technologies, Connected Vehicles and IoT etc. ARAI faculties have patents on their name due to good research carried out in automotive area.

ARAI Library (ARAI Knowledge Centre)

ARAI knowledge Centre is one of the finest special libraries in India. Knowledge Centre has developed due to special collection of automotive and related subjects. The primary objective of the knowledge centre is to satisfy all type of information need of in-house researchers. ARAI knowledge centre has a good collection of books, National and International standards, seminar/conference proceedings, technical reports, Journals etc. The Institute's Institutional Repository provide on campus access to Conference Proceedings, SIAT Keynote & Technical Papers, SIAT Announcements, Seminar Papers, Staff Publications, Automotive Abstracts, ARAI Updates, News Clippings, and Open Access Electronic books etc. (https://www.araiindia.com/).

6.3.4 Central Institute of Road Transport (CIRT)

The Ministry of Shipping & Transport & the Association of State Road Transport Undertakings have jointly initiated the establishment of 'Central Institute of Road Transport, Post Box No. 1897, Pune- Nasik Road, Pune." CIRT take efforts for improving the efficiency & productivity of the transport

sector. CIRT has been conducting technical training, automobile component testing services and consultancy. They also offer management development programmes for maintenance, engineering, general management, and transport operations. CIRT takes consultancy and research assignments on transportation planning, traffic management, transport policy, materials management, maintenance management, human resource management and management information systems. CIRT is recognized as automobile component testing laboratory by Bureau of Indian Standards.

CIRT Library:

CIRT library has good collection of books and journals on transport, automobile engineering, management, fuel science, computer science, general reading, auto engineering standards, and quality management. All the CIRT staff, students and CIRT participants is default member of the library. CIRT library offers outside membership to the users. CIRT library offers services like reference service, indexing and abstracting service, photocopying service and institutional membership. They have indexed all the transport and management related articles since 2001. These articles are searchable by author, keyword, subject and KWIC. CIRT library also has collection of abstracts of the books and articles undertaken since 2001. (http://www.cirtindia.com/)

6.3.5 Central Water Power Research Station (CWPRS)

Central Water Power Research Station, Sinhagad Road, Khadakwasla, Pune, was established in 1916 as a "Special Irrigation Cell" by the Bombay Presidency to modify irrigation practice to meet agricultural requirements. It is taken over by Govt of India in 1936.

CWPRS works under the Ministry of Water Resources, River Development and Ganga Rejuvenation. CWPRS is the main central agency which handles R&D needs of the projects related to water and energy resources development and water-borne transport. CWPRS is one of the foremost institutes in the field of hydraulics and allied research. Through physical and mathematical model, they provide specialized services in river training and flood control, coastal protection, hydraulic design of bridges, foundation engineering, harbors, hydraulic structures, pumps and turbines, construction materials, ship hydrodynamics, earth sciences, and cooling environmental studies, water intakes. For different projects, related to water resources, energy and water-borne transport CWPRS provides hydraulically sound and

economically viable solutions. CWPRS has collaboration with WAPCOS and educational and research institutions for to enhance its activities. CWPRS continuously updating its facilities and expertise to themselves, updated with the rapid advancements in hydraulic research. Since 1971 CWPRS is Regional Laboratory of ESCAP. CWPRS also provide services for the projects in the neighborhood countries and countries in the Middle East and Africa

CWPRS Library [Library and Information System]

Library and Information System of CWPRS was established in 1988. It was initially known as Water and Power Information System. It provides various information services to the engineers and scientists working in the field of hydraulic engineering and allied subjects. The library has a good collection of the books and journals related to hydraulic engineering and allied subjects. (http://cwprs.gov.in/)

6.3.6. Centre for Development of Advanced Computing (C-DAC)

Centre for Development of Advanced Computing (C-DAC) Pune University Campus, Ganesh Khind Pune, was established in 1988 by Scientific Society under the Ministry of Communications and Information Technology, Government of India. C-DAC, Pune is the first C-DAC centre in the country. C-DAC, Pune is one of the leading institutes in the research and development in IT, Electronics and associated areas. C-DAC, Pune is also conducting several national strategic importance programmes. C-DAC, Pune has developed first indigenous super computer "Parama" and provided an open frame architecture to deliver "PRAM Yuva", the fastest supercomputer of India. Yuva is rated 64 among world's top supercomputers.

C-DAC, Pune supports the concepts of multilingual computing in the country. They are defining the standards for the adoption of Indian languages on computers. Centre has worked on the technology and product for multilingual computing. This helped to spread use of a computer to common people by providing them opportunity to use computer in their own languages. C-DAC, Pune conducts research in geometrics, health informatics, human-centered design & computing, and education & training. C-DAC, Pune works as the mentor in the various innovations, in the greater national interest. C-DAC, Pune has established, its Advanced Computing Training School (ACTS) to fulfill the need of training people in the Information Technology. They offer various courses and some courses with the international collaborations.

C-DAC Library:

C-DAC library has good collection of print and non-print documents related to the information technology and allied areas. The users of the C-DAC library are students, faculty and researcher of the C-DAC. Institute is in transit phase of shifting from one campus to other. The library is managed from two different locations to serve their users. (https://cdac.in/index.aspx?id=pune)

6.3.7 Defence Institute of Advance Technology (DIAT)

Defence Institute of Advance Technology, Girinagar, near to Khadakwasla Dam, Pune is placed in 'A' category Deemed university by MHRD, Government of India. The institute is accredited by 'NAAC' and NBA. DIAT is Autonomous Organization working under Department of Defence Research & Development, Ministry of Defence, Government of India.

Defence Institute of Advance Technology was started long back in 1952 as Institute of Armament Studies. It was renamed as 'Institute of Armament Technology' in 1967. Institute of Armament Technology had received recognition from All India Council of Technical Education (AICTE) under Pune University, they are conducting 8 courses for M.E. in 1981. In 2000 Institute received status of Deemed University. The institute has been renamed as Defence Institute of Advance Technology from 2006. DIAT is conducting M. Tech and Ph. D programmes for providing skill manpower.

DIAT is the unique university which doing research in indigenous contemporary Defence related technologies in Navigation Systems, Efficient Propulsion Systems, Wireless Sensors, Weapon Systems for DRDO and Defence Services. DIAT also provide technological solutions for battle field effectiveness and produce qualified quality manpower.

DIAT Library

DIAT Library and information centre is very spacious and well equipped with infrastructure. DIAT library and information centre has developed good collection to fulfill institutes goals by providing information services to the scientist, students and staff members. The library resources focused on Defence, Science and Technology and allied subjects. Library is having good collection of printed as well as e-

Resources. Library offers various services like reference membership, circulation, information alert, resource sharing, bibliographic, document delivery and digital library services to the library members. (https://www.diat.ac.in)

4.3.8 **High Energy Material Research Laboratory (HEMRL)**

High Energy Material Research Laboratory, Sutarwadi, Pune is leading lab of the Defence Research and Development Organization under the Armament cluster. HEMRL was started in 1908 as Chemical Examiner's Office at Nainital. The institutes went through various changes with respect to name and places and in 1960, finally, it started as Explosives Research & Development Laboratory (ERDL), in Pune. On 1st March 1995, the institute was named as High Energy Material Research Laboratory (HEMRL). HEMRL is an ISO 9001-2008 certified Lab.

HEMRL is defense research laboratory working for development & evaluation of various weapons like Solid Propellants for Rockets & Missiles, Solid Propellants & Cartridge Case Technology for Gun Ammunition, High Explosive Compositions, advanced generation of Fuel Air Explosives and Thermobaric Explosives, Pyrotechnics. The lab also works on the development of Explosive Reactive Armor. HEMRL conduct research in - basic and applied on all aspects of High Energy Materials including the Synthesis, characterization & evaluation of advanced High Energy Materials. The lab provides Pilot Plant Facilities for High Energy Materials, testing and evolution of high energy materials. HEMRL also work in the areas of the development wide range of instrumentation/electronic equipment for study and evaluation of High energy materials. HEMRL provide technical assistance, guidance and consultancy about high energy materials, their applications and production. The Lab has excellent research and production facilities for the study of explosive, pyrotechnic phenomena and propellant.

HEMRL Library:

HEMRL have big and spacious library well maintained by professional library staff. HEMRL Library has a good collection of technical books, printed scientific journals and electronic resources. As per users demand and need HEMRL library have developed good collection of patent and specifications. The Library is a member of DRDO consortia through which they get access to many electronic resources. (https://www.drdo.gov.in/drdo/labs1/HEMRL/English/indexnew.jsp?pg=homepage.jsp.)

5.3.9 Indian Institute of Science Education and Research Pune (IISER Pune)

Indian Institute of Science Education and Research, Pune was established in 2006 by the Ministry of Human Resource Development. IISER Pune was declared as an Institute of National Importance by an Act of Parliament in 2012. IISER, Pune is one of the leading institutes devoted to basic science research and teaching. The main aim of IISER is to develop Science University with the highest caliber committed for teaching and research for providing modern research and high-quality education which support curiosity and creativity of the researcher. IISER Pune has developed world class laboratories, which provide opportunity for students to conduct experiments as well as advanced research under the guidance of world-class faculties. Along with classroom teaching IISER Pune builds various skills in students like scientific inquiry, communication skills, problem-solving, electronics and instrumentation, computational sciences and workshop practices. IISER Pune focused their research in the Biology, Chemistry, Earth and Climate Science, Mathematics and Physics allied areas related to these subjects. Now IISER Pune also introduced Humanities and Social Sciences programme. IISER Pune conducting 5 years Integrated Masters programme i.e. BSMS Programme, Integrated Ph.D. after science graduation and provides Ph.D. programme after M.Sc.

IISER Pune Library (Srinivasa Ramanujan Library)

The mission of Srinivasa Ramanujan Library is to support institutes teaching, learning activities by providing access to the information required by its users. Library housekeeping operations are fully automated with the help of LibSys – library management software. Library having good collection of printed books, full text and bibliographic database. The library has adopted modern ICT techniques and tools for providing best services to the users.(www.iiserpune.ac.in)

6.3.10 Indian Institute of Tropical Metrology (IITM)

IITM is a recognized research centre approved by Savitribai Phule Pune University for Ph.D. in Atmospheric and Space Sciences. IITM runs M. Tech. programmes in collaboration with Savitribai Phule Pune University. The scientist of IITM also takes part in teaching for M. Tech. M.Tech. Teaching programme in Pune University also.

Indian Meteorological Department was transformed into an autonomous organization as Indian Institute of Tropical Metrology (IITM) on 1st April 1971. Since July 2006 IITM is working under Ministry of Earth Sciences (MoES). IITM was working under the Ministry of Tourism and Civil Aviation but from 1985 it was brought under the Department of Science and Technology (DST) of the Ministry of Science &Technology.

IITM Library

IITM library has very good collectionin print as well as in electronic resources in the area of Ocean-Atmosphere Climate System. They are subscribing to Scopus and Web of Science databases. Library has access to e-books from Springer and Cambridge publishers. IITM library is a member of MoES Consortium which provides access to around 130 online journals. IITM library provides QR code facility for utilization of IITM Library Services from user's smart phones. (http://www.tropmet.res.in/).

6.3.11 Inter-University Centre for Astronomy and Astrophysics (IUCAA)

Inter-University Centre for Astronomy and Astrophysics (IUCAA) established in Savitribai Phule Pune University Campus, Meghnad Saha Road, Ganesh khind, Pune, is an autonomous institute established in 1988 by the University Grants Commission (UGC) of India for promoting set up and development inactive groups in astronomy and astrophysics at Indian universities. The main aim of the IUCAA is to act as a center of excellence for teaching, research and development in astronomy and astrophysics within the university sector.

IUCAA conducts two type of activities – i. Core academic programmes ii. Visitor academic programmes. Basic research, advanced research, workshops, giant metre-wave radio telescope and guest observer programmes and the Ph.D. programme, etc. come under core academic programme and refresher courses for teachers, visitor and associates programme, and helping the nucleation and growth of astronomy and astrophysics at Indian universities come under visitor academic programme. IUCAA select Ph.D. students through Joint Entrance Screening Test (JEST) and IUCAA-NCRA Admission Test. IUCAA doesn't offer M.Sc. or B.Sc. course but the Savitribai Phule Pune University offers optional courses in astronomy and astrophysics in its M.Sc. programme in physics which many times taught by IUCAA faculty.

IUCAA conducts research on various fields of astronomy, astrophysics and allied areas. The current areas of research include classical and quantum gravity, Cosmic magnetic fields, Cosmology and large-scale structure, Cosmic Microwave Background studies, Galactic and extragalactic astronomy, Gravitational waves, Instrumentation for astronomy, High energy astrophysics, Solar Physics, Interstellar medium, Solar system and stellar physics, Observational Astronomy and Virtual observatory. IUCAA is also part of Virtual Observatory. India is doing project along with Persistent Systems Ltd., Pune. NASA Astrophysical Data System mirror is hosted by IUCAA.

IUCAA Library:

ICUAA library which has a rich collection of print and not print materialsin the area of astronomy and astrophysics. The library is having more than 14 thousand books, 126 subscribed journals, around 473 e-books, 11000 bound volume of the journals. This Library is a member of Forum for Resource Sharing in Astronomy and Astrophysics (FORSA) which facilitate to share resources of the participant libraries. IUCAA library is a member of UGC INFONET Digital Library Consortium.

The Library uses SLIM 21 library management software for library activities and also use various open source and free software for providing library services e.g. Blogger for News Paper service, for the Institutional Repository. IUCAA library have YouTube channel for providing access to the recorded videos of the various lectures etc.(https://www.iucaa.in/)

6.3.12 National AIDS Research Institute (NARI)

National AIDs Research Institute, 73-G, MIDC, Bhosari, Pune was established in October 1992 under Indian Council Of Medical Research (ICMR) for conducting devoted research on HIV infection and AIDS. The institute played the vital role in fighting against HIV and AIDS by conducting clinical research for optimizing the treatment and care, techniques for prevention of AIDS and by providing new information on HIV biology. NARI efficiently supports National AIDS Control Programme in its activities, especially surveillance, laboratory services, capacity building and drug resistance.

Scientific Advisory Committee guide the research activities conducted in the NARI. Ethics committee review and approve the project to ensure the maintenance of high

ethical standards in the research. The strength of the NARI is active involvement of the community at all the stages of new studies.

Since May 2010, NARI provides antiretro viral drugs under Full NACO ART roll out programme for HIV infected patients in Pune Corporation area. NARI has radiological investigative facilities and service laboratory for testing and clinical pathology testing services of HIV and CD4 and freezing facility for the samples. The institute also established a clinic at National Institute of Virology for clinical trials studies and Gadikhana Dispensary for catering medical services to the high-risk patient such as female sex workers and STD patients.

NARI Library:

The NARI Library is well placed and contains enough print and e-resources to manage support the research work of NARI. NARI library provides access to various resources through JCCC@ICMR Consortia, NML-ERMED e-journal consortium, J-Gate@ICMR and Cochrane databases. (http://www.nari-icmr.res.in/).

6.3.13 National Centre for Cell Science (NCCS)

National Centre for Cell Science (NCCS), is established in the premises of Savitribai Phule Pune University Campus Ganesh Khind Pune, is an autonomous institute under the Department of Biotechnology, Government of India. NCCS has been carrying out important research in area of cell biology, since its establishment. NCCS work as the national repository of animal cell cultures. NCCS conducts teaching and training programme supporting human resource development. NCCS playsthe vital role in basic research of cell biology especially which are dealing with important health issues like cancer,metabolic and infectious diseases and regenerative medicine. NCCS has integrated modern and conventional disciplines like computational and structural biology, stem cell biology, immunology and microbiology and genomics and proteomics, to handle challenges in the research. NCCS scientist has made impact on the research world by publishing various scientific paper in renowned scientific journals.

National Centre for Cell Science is recognized Ph.D. Center by Savitribai Phule Pune University, Punjab University, Devi Ahilya Vishwa Vidyalaya Chandigarh and Manipal Academy of Higher Education, Manipal. NCCS select Ph.D. students from ICMR, CSIR and UGC Junior Research Fellowships. Including Ph.D. programmes,

NCCS also conduct summer training and M.Sc. project training for the students from all over India.

NCCS Library:

NCCS Library has developed good collection in the area of biotechnology to support institute goals. Library is having more than twelve thousand bound volume journals, more than 2000 books, 200 NCCS Ph.D. theses etc. Scientist's requirement is focused in NCCS library collection development. The library has access to more than 700 online journals through "DeLCON" DBT Online journal consortia. The library subscribing to 6 more online journals related to the institute research.

NCCS library uses SLIM 21 with RFID Interfaced library software for library housekeeping activities. Library uses barcode technology for circulation of the documents. NCCS library is listed in the Union Catalogue of Biomedical Serials in India and member of the Medical Library Association of India. (http://www.nccs.res.in/)

6.3.14 National Centre for Radio Astrophysics (NCRA)

National Centre of Radio Astrophysics (NCRA), Savitribai Phule Pune University Campus, Pune 411 007, is an autonomous Centre of Tata Institute of Fundamental Research (TIFR). NCRA-TIFR is the well-known research institute in the field of radio astronomy in India. NCRA has focused the research on low frequency radio astronomy. NCRA faculty members are doing research in various fields like solar physics, pulsars the interstellar medium, active galactic nuclei, supernova remnants, the Galactic Centre, nearby galaxies, high-red shift galaxies, fundamental constant evolution and the epoch of reionization. TIFR-NCRA has built and operates the largest steerable radio telescope in the world, the Giant Metrewave Radio Telescope, as well as the Ooty Radio Telescope. The institute also offers challenging opportunities to work the astronomy, astrophysics, and in instrumentation development. The major research areas of TIFR-NCRA are The Sun and the Heliosphere, The Milky Way, Pulsars and Transients, Pulsar Surveys, The Interstellar Medium, Nearby Galaxies, Active Galaxies and Clusters, High Redshift Galaxies, Cosmology and the Epoch of Reionization, Fundamental Constant Evolution, Extragalactic Deep Fields, Radio Continuum Surveys, The Intergalactic Medium, The

Giant Metrewave Radio Telescope, The Ooty Radio Telescope, The Square Kilometer Array and Astronomical instrumentation.

NCRA-TIFR conducts a regular doctoral research programmein astronomy or radio instrumentation. The degree is awarded by TIFR Deemed University. Students are selected for Ph.D. through three channels- Joint Entrance Screening Test (JEST), the IUCAA-NCRA Admission Test (INAT), and the TIFR entrance test (conducted by TIFR-Mumbai).

TIFR-NCRA Library:

The institute has its library having good collection of resources on Radio Astrophysics and allied areas. TIFR-NCRA Library gets access to many e-Resources through TIFR consortia. Library providing various value-added services to serve their users. (http://www.ncra.tifr.res.in/ncra/main)

6.3.15 CSIR-National Chemical Laboratory Laboratory (NCL)

National Chemical Laboratory, Dr. Homi Bhabha Road, Pune- 411 008 is one of the important laboratories of Council of Scientific and Industrial Research (CSIR) which is established in 1950. CSIR-NCL is famous for its excellent scientific research in chemistry and chemical engineering. CSIR-NCL also actively involved in industrial research with partnership with industry. CSIR-NCL is well known-research and development organization engaged in research in chemical sciences.

NCL Mission:

1. To carry out research and development in chemistry and allied science to eventually gives product, intellectual property, process, tacit knowledge or services, which bring wealth and other benefits to the NCL's stakeholders.
2. To carry out research and development which can fulfill present and future demands of the its stakeholders
3. To create and sustain specialized knowledge competencies and Resource Centers within NCL to provide support to its stakeholders.
4. To help in creation of highly qualifies Ph.D. students in the field of chemical, material, engineering biological sciences.

CSIR NCL conducting is Ph. D programme in Science and Integrated Ph. D programmes in chemical engineering stream.

CSIR- NCL KRC (Knowledge Resource Centre)

CSIR NCL KRC provides information service to the scientific and technical staff of the laboratory through their print and digital resources collection.

CSIR- NCL KRC is using KOHA software for library automation. The library has self-circulation, document security with the help of RFID technology. KRC is part of KNOWGATE project initiated by CSIR where library moved its data from proprietary software to open source software Koha. The KRC provides online access to subscribed journals and CSIR consortium, electronic access to many reference books, Ph.D. theses submitted by NCL research students. Library also provides access to the various reports like BIOS, FIAT, CIOS, SRI. KRC using Drupal, a open source content management software to provides services to their users.

KRC in its collection has 1,43,150 printed books, subscription to 250 print and online journals. It holds chemical abstract since beginning (1907 to till date). Digitized documents Annalen der Chemie (1832-1918), Chemische Berichte (1868-1916) etc. are also available. (http://www.ncl.india.org/)

6.3.16 National Institute of Virology (NIV)

National Institute of Virology, 20/ A, Dr. Ambedkar Road, Post Box No. 11, India Pune, was established by Indian Council of Medical Research (ICMR) and Rockefeller Foundation as Virus Research Centre (VRC). VRC was designated as National Institute of Virology (NIV) in 1978. It is an outcome of global programme of investigations on the arthropod-borne group of viruses. Since 1967 the NIV is entirely funded by ICMR. NIV conducting research in Cell repository, Influenza, Rickettsioses, Hepatitis, Electron microscopy, and related viruses, Virus registry, Clinical Virology, Biochemistry, and Biostatistics. Scientific Advisory Committee (SAC) coordinate all the research activates of the NIV.

Due to expertise in virological training and research, emphasis is on self-reliance. VRC acquired its status of national importance and was renamed as National Institute

of Virology (NIV) in 1978. Research areas of NIV are Influenza, Avian Influenza, Hepatitis, Encephalitis, Dengue, Chikungunya, Enteric Viruses, HIV-AID etc.

NIV has established Microbial Containment Complex (MCC) which having P-3 biosafety levels for handling highly infectious microorganisms at Pashan. MCC provides National Containment facility for safe handling of highly hazardous pathogens.

Since 1969, NIV has started functioning as the regional center of the WHO for South-East Asia for arbovirus studies and NIV has been functioning as a WHO collaborating center for arbovirus reference and research from 1974. It has recognized as the WHO Collaborating Centre for Arbovirus and Haemorrhagic Fever Reference and Research and Rapid Diagnosis of Viral Diseases. NIV also acts as National Centre for Hepatitis and Influenza. NIV field unit at Bangalore acts as one of the centers under National Polio Surveillance Program conducting surveillance of acute flaccid paralysis cases from Karnataka as a part of Global Polio Eradication Programme of the WHO South-East Asia region since 1997.

NIV providing services like basic and applied research, supply of laboratory animals, Outbreak Response, Surveillance-Human Mosquito birds and poultry, Diagnostics and kit supply, etc.

NIV is recognized as Ph. D. center of Savitribai Phule Pune university. NIV also conducts M.Sc. Virology under the aegis of Institute of Bioinformatics and Biotechnology, University of Pune.

NIV Library (Information Centre and Library)

NIV Library has good collection of documents on virology and allied areas. Users of the NIV Information Centre and Library are the scientist, staff, students of the NIV and other institutions in the Pune. Information Centre and Library uses Libsys software for library housekeeping activities.

NIV library has online subscription for four journals Nature, Science, Lancet and NEJM. They get access to 243 online journals through National Medical Library, New Delhi. They also have access to JCCC and J-Gate through ICMR which provide access to 2717 online journals.

Information Centre and Library providing various services like reference service, citation analysis, document delivery service, reprints, literature search, similarity check through Turnitin software, Newspaper clipping, interlibrary loan from NCCS, BJ medical college, ARI etc. (http://www.niv.co.in/)

6.3.16 National Research Centre for Grapes

On 18th January 1997 ICAR-National Research Centre for Grapes, Manjiri Farm, P B No 3, P O Solapur Road, Pune, 412307, was established under the Indian Council of Agricultural Research. The main objectives of National Research Centre for Grapes is to conduct strategic and applied research on grapes for increasing its production, productivity, transfer of technology and capacity building of stakeholders for increased and sustained production of grapes. It also acts as National Referral Laboratory for food safety Pesticide residue in fruits.

The National Research Centre for Grapes has well-equipped library. Library having the collection of print as well electronic resources on agriculture and allied areas and library provides good services to the users. (http://nrcgrapes.nic.in/)

6.3.18 Research and Development Establishment (R&DE)

Research and Development Establishment (R&DE), 50, Alandi Road, Kalas, Pune is a laboratory of the Defence Research & Development Organization (DRDO) established on 9th Feb 1962. The main function of R&DE is the development of mobility equipment for Indian Army Corps of Engineers. The lab has developed many indigenous Combat Engineering Equipment. The lab has acquired expertise in ground system engineering for all the major weapon programmes.

The lab conducts research and development in many areas of mobility equipment. The main areas of work of the lab are Design & Development various systems like Combat Engineering Systems such as Military Bridging and Mine Warfare Systems, Weapon launch System such as Prithvi, Agni, Brahmos, AD, MR SAM, Nirbhay, etc. large structures using FRP composite material Robotics systems, MEMS. The lab also works in the development of Field Defence Systems and NBC Collective protection Shelters, hydraulic and pneumatic actuators, circuits etc and electro-mechanical based systems, power sources etc. R&DE is fully equipped with technology and infrastructure required for the research.

R&DE Library:

R&DE has a well-developed library system supporting the vision and mission of the organization. The library has a good collection of print as well as electronic resources to serve users of the library. The library is a member of DRDO consortia which facilitate the access of many online journals and e-books.

(https://www.drdo.gov.in/drdo/labs1/RDE(E)/English/indexnew.jsp?pg=homepage.jsp)

Chapter Summary:

This chapter presents the highlighted information about scientific research institutes established under the umbrella of the government of India in the Pune city. All research institutes are conducting research work at national and international level which has an impact on the countrie's development and security. Some of the institutes along with research participate in are running educational courses post-graduation or doctoral programms are developing skilled and expertise manpower and scientist in the country for conducting advance level research.

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9. Indian Institute of Science Education and Research. (n.d.). Retrieved February 24, 2018, from http://www.iiserpune.ac.in

10. Indian Institute of Tropical Metrology. (n.d.). Retrieved February 16, 2018, from http://www.tropmet.res.in/

11. Inter-University Centre for Astronomy and Astrophysics. (n.d.). Retrieved February 24, 2018, from https://www.iucaa.in/

12. National AIDs Research Institute. (n.d.). Retrieved March 2, 2018, from http://www.nari-icmr.res.in/

13. National Centre for Cell Science. (n.d.). Retrieved from http://www.nccs.res.in/

14. National Centre for Radio Astrophysics. (n.d.). Retrieved fromhttp://www.ncra.tifr.res.in/ncra/mainRetrieved on4th March 2018

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16. National Institute of Virology. (n.d.). Retrieved fromhttp://www.niv.co.in/

17. National Research Centre for Grapes. (n.d.) Retrieved March 2, 2018, from http://nrcgrapes.nic.in/

18. Research and Development Establishment.(n.d.). Retrieved March 4, 2018, from https://www.drdo.gov.in/drdo/labs1/RDE(E)/English/indexnew.jsp?pg=homepage.jsp

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Chapter 7A: Data Analysis: Librarians

7.1 Introduction

Researcher has made efforts to collect data using survey and questionnaire as data collection tool to assess the status of e-resources in science research libraries as well as which steps have been taken by librarians to manage and preserve e-resources, which is challenge for digital age librarians.

The present chapter analyses the data collected systematically using tables and charts and observations are recorded systematically.

7.2 Response to Librarians' Questionnaires:

The purpose of librarians' survey is to assess the status of e-resources collection and its management in science research libraries. There are about 25 Research Institutes for science research, whose objective is to conduct research in various disciplines of science under the umbrella of Government of India. Out of 25 research institutes, six institute libraries have only traditional print collection and they do not have initiated acquisition of e-resources yet and one institute library do not have proper library and other facilities. Hence, these seven libraries are excluded from this study. Remaining 18 libraries are considered for the study. All these libraries are special libraries and focused on science disciplines. Out of 18 libraries, all the librarians have responded to survey and response is 100%.

Part A: Institute Profile:

In this part, the researcher tried to obtain information about the institutes. Researcher has asked some questions like the postal address, website, year of establishment, status of institute, funding agency, core research areas, courses conducted, etc. The data analysis is presented in Table 7.1 and 7.2.

Q. A1-A5

Table 7.1 Institute Profile

Sr. No	Name and Address of the Institute	Website	Year of Establishment	Status of the Institute
1	Agharkar Research Institute Gopal Ganesh Agarkar Road, Pune – 411004	http://aripune.org/	1946	Autonomous
2	Armament Research and Development Establishment Armament PO, Pashan, Pune, Maharashtra 411021	https://www.drdo.gov.in	1958	Government
3	Automotive Research Association of India Survey No.102, Vetal Hill Off Paud Road, Rambaug Colony, Kothrud, Pune, Maharashtra 411038	https://araiindia.com	1966	Autonomous
4	Central Institute of Road Transport. Post Box No. 1897, Pune- Nasik Road, Pune – 411 026.	http://www.cirtindia.com	1967	Autonomous
5	Central Water Power Research Station (CWPRS), Khadakwasla, Pune-411024	http://www.cwprs.gov.in	1916	Government
6	Centre for Development of Advanced Computing Pune University Campus, Ganesh Khind, Pune - 411 007	https://cdac.in/	1988	Autonomous
7	Defence Institute of Advance Technology Girinagar, Pune 411025	http://www.diat.ac.in	1952	Autonomous
8	High Energy Material Research Laboratory	-	1908	Government

	Pashan, Pune - 411021			
9	Indian Institute of Science Education and Research Dr. Homi Bhabha Road, Pashan, Pune 411 008	http://www.iiserpune.ac.in/	2006	Autonomous
10	Indian Institute of Tropical Meteorology Dr. Homi Bhabha Road, Pashan, Pune 411 008	http://www.tropmet.res.in	1962	Autonomous
11	Inter-University Centre for Astronomy and Astrophysics P.B. No 4, Ganesh Khind, Pune - 411007	https://www.iucaa.in/	1988	Autonomous
12	National AIDs Research Institute73, 'G'-Block MIDC Bhosari, Pune - 411026, Maharashtra, India	http://www.nari-icmr.res.in/	1992	Autonomous
13	National Centre for Cell Science NCCS Complex, University of Pune Campus, University Road, Ganesh Khind, Pune	http://www.nccs.res.in/	1986	Autonomous
14	National Centre for Radio Astrophysics Pune University Campus, Post Bag 3,GaneshKhind P.O., Pune 411 007	http://www.ncra.tifr.res.in/ncra	1990	Autonomous
15	National Chemical Laboratory CSIR-National Chemical Laboratory, Dr. Homi Bhabha Road, Pune- 411 008	http://www.ncl-india.org/	1950	Autonomous
16	National Institute of Virology	http://www.niv.co.in	1952	Autonomous

	MCC 130/1, Sus Road, Pashan, Pune, Maharashtra 411021			
17	National Research Centre for Grapes ICAR-National Research Centre for Grapes, P.B. No. No. 3, P.O. Manjri Farm, Solapur Road Pune – 412307	http://www.nrcgrapes. nic.in/	1997	Autonomous
18	Research and Development Establishment Kalas, Dighi, Pune – 411015	https://www.drdo.gov.i n	1962	Government
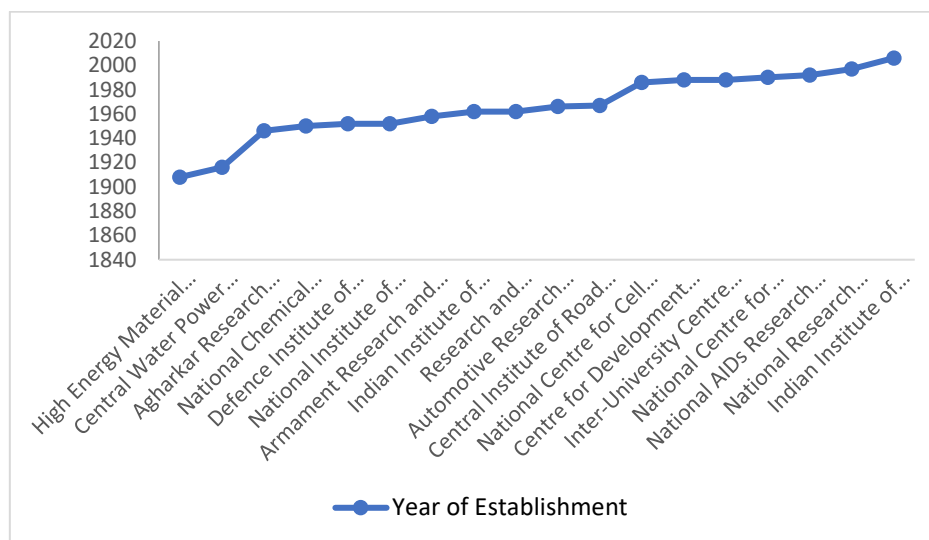
Fig 7.1 Chronological development of science institutes in Pune

Observation:

Among the 18 institutes, the oldest institution is High Energy Material Research Laboratory established in 1908 and the youngest institution is Indian Institute of Science Education and Research established in 2006. Among the 18 institutes 14 institutes are autonomous institutes under different department/ministry of the Government of India and 4 institutes are purely central government institutes.

A. Q. A6-A8

Table 7.2 Funding Agency, Core Research Area and Courses Conducted

Sr. No	Name of the Institute	Funding Agency	Core Research Area	Courses Conducted
1	Agharkar Research Institutes	DST, Government of India	Life Science	M.Sc., Ph. D
2	Armament Research and Development Establishment	Ministry of Defence, Government of India	Weapons Technology and Defence	Continuing Education Programmes
3	Automotive Research Association of India	Self	Automotive Research	B. Tech., M. Tech and Ph. D
4	Central Institute of Road Transport.	Self	Training, Testing and Consultancy in Road Transport	Short Course Transport Management
5	Central Water Power Research Station	Government of India	Hydraulics, Costal Engineering, Mathematical Model and Civil Engineering	Training Programmesand Workshop
6	Centre for Development of Advanced Computing	Department of Information Technology, Government of India	High Performance Computing, Super Computing and Linguistic Computing	PG Diploma
7	Defence Institute of Advance Technology	Defence Research and Development Organisation	Defense Related Techniques in navigation systems, wireless sensors, Efficient	M. Tech, Ph. D

			Propulsion System, Weapons systems	
8	High Energy Material Research Laboratory	Government of India	Defense Research and Development	-
9	Indian Institute of Science Education and Research	Ministry of Human Resource Development, Government of India	Basic sciences	BS-MS, Ph. D
10	Indian Institute of Tropical Metrology	Ministry of Earth Sciences	Tropical Metrology	M. Tech, M. Sc., Ph. D
11	Inter-University Centre for Astronomy and Astrophysics	University Grants Commission	Astronomy and Astrophysics	-
12	National AIDs Research Institute	Indian Council of Medical Research	HIV	Ph. D
13	National Centre for Cell Science	Department of Biotechnology	Biotechnology	Ph. D, Cell Culture
14	National Centre for Radio Astrophysics	Government of India	Astronomy and Astrophysics	MSc, Integrated Ph. D, Ph. D, Post Doc, Visiting Research Programmes
15	National Chemical Laboratory	Council of Scientific and Industrial Research	Chemical Sciences	Ph. D, M. Tech
16	National Institute of Virology	Indian Council of Medical Research	Virology	Ph. D, M.Sc.
17	National Research Centre for Grapes	Indian Council of Agriculture Research	Grapes	Ph. D
18	Research and Development Establishment	Ministry of Defence, Government of India	Military Engineering	-

Observation:

All the organisations are receiving funds from Government of India except Central Institute of Road Transport and Automotive Research Association of India. The institutes which are conducting Ph. D Programmes are recognised as the Ph.D Centres under various universities except DIAT, IISER and NCL. DIAT is Deemed University having accreditation from NAAC and NBA. IISER is an autonomous institute awarding its own master and doctoral degree and NCL students gets Ph.D. degree from AcSIR.

B. Library Profile

Q. B1-B2

To analyze the status of the libraries, some questions were asked to the librarians like library contact number, email ID, library working hours, Library Manager/Head and his/her designation and qualifications, number of library staff, status of library automation, library management software used by the library, availability of separate internet library for the users, availability of library OPAC on the web, etc. The data is analysed in following tables.

B.1 Status of Libraries – Communication Facilities

Table 7.3 Library Communication Facilities

Sr. No	Name of the Institute	Phone No.	E- mail ID
1	Agharkar Research Institutes	020-25325023	snkulkarni@aripune.ac.in
2	Armament Research and Development Establishment	020-25932740	ardetire@gmail.com
3	Automotive Research Association of India	020-30231192/93	knowledgecentre@araiindia.com
4	Central Institute of Road Transport.	020-67345300	library@cirtindia.com
5	Central Water Power Research Station	020-24103488	wapis@cwprs.gov.in
6	Centre for Development of Advanced Computing	020-25704237	techlib@cdac.in

7	Defence Institute of Advance Technology	020-24304231	library@diat.ac.in
8	High Energy Material Research Laboratory	020-25869393	ejournal@hemrl.drdo.in
9	Indian Institute of Science Education and Research	020-25908234	library@iiserpune.ac.in
10	Indian Institute of Tropical Metrology	020-25904314	lip@tropmet.res.in
11	Inter-University Centre for Astronomy and Astrophysics	020-25604308	library@iucaa.in
12	National AIDs Research Institute	020-27331200	Library.nari@nariindia.org
13	National Centre for Cell Science	020-25708230	infonccs@nccs.res.in
14	National Centre for Radio Astrophysics	020-25719211	library@ncra.tifr.res.in
15	National Chemical Laboratory	020-25902032	library@ncl.ac.in
16	National Institute of Virology	020-26006350	nivlibrary2014@gmail.com
17	National Research Centre for Grapes	020-26956026	nrcglibrary@gmail.com
18	Research and Development Establishment	020-27044230	

This data might be useful for ILL, EDDS as well as local resource sharing network of special libraries.

Q. B. 2 Library Working Hours

Table 7.4 Library Working Hours

Sr. No.	Name of the Institute	Working Hours	
		Monday to Friday/Saturday	On Holidays
1	Agharkar Research Institutes	9.00 AM to 5.30 PM	Closed
2	Armament Research and Development Establishment	9.00 AM to 5.00 PM	Closed

3	Automotive Research Association of India	8.30 AM to 5.00 PM	Closed
4	Central Institute of Road Transport.	9.00 AM to 6.30 PM	Closed
5	Central Water Power Research Station	9.00 AM to 5.30 PM	Closed
6	Centre for Development of Advanced Computing	9.00 AM to 6.00 PM	Closed
7	Defence Institute of Advance Technology	9.00 AM to 7.30 PM	Closed
8	High Energy Material Research Laboratory	8.30 AM to 5.00 PM	Closed
9	Indian Institute of Science Education and Research	8.00 AM to 11.00 PM	8.00 AM to 11.00 PM
10	Indian Institute of Tropical Metrology	9.00 AM to 6.00 PM	Closed
11	Inter-University Centre for Astronomy and Astrophysics	9.00 AM to 9.00 PM	10.30 AM to 7.00 PM
12	National AIDs Research Institute	9.00 AM to 5.30 PM	Closed
13	National Centre for Cell Science		Closed
14	National Centre for Radio Astrophysics	9.30 AM to 6.00 PM	Closed
15	National Chemical Laboratory	9.00 AM to 5.30 PM	Closed
16	National Institute of Virology	9.00 AM to 5.30 PM	Closed
17	National Research Centre for Grapes	10.00 AM to 5.00 PM	Closed
18	Research and Development Establishment	8.30 AM to 5.00 PM	Closed

Observation:

This data is useful for visiting scientist to research libraries in Pune city physically for referring old and classic documents.

Most of the libraries are kept open for 8 to 9 hours except IISER Pune and IUCAA library. IISER Pune and IUCAA libraries are kept open for nearly 12 and 15 hours (per day) respectively. Only IISER Pune and IUCAA libraries are open during the holidays.

B. Q.3 Information about Library Managers -

Table 7.5 Library/Information Managers

Sr. No	Name of the Institute	Name of Head of Library	Designation	Qualifications
1	Agharkar Research Institutes	Dr. S.N. Kulkarni	PLIO	Ph. D
2	Armament Research and Development Establishment	Mrs. Avachat	Scientist 'G'	MSc. B. Lib I Sc.
3	Automotive Research Association of India	Mrs. S. S. Das	Manager	M. Lib
4	Central Institute of Road Transport.	Mr. Rajkumar Malajure	Business Development Manager and Editor Officer	M. Tech, MBA
5	Central Water Power Research Station	Dr. M. M. Rao/ Dr. D.T. Gaikwad	Library and Information Officer	M. Lib, Ph. D
6	Centre for Development of Advanced Computing	Dr. Nagnath R. Ramdasi	Chief Librarian	M. Lib, Ph. D
7	Defence Institute of Advance Technology	Dr. S. S. Sirurmath	University Librarian	M. Lib., M. A., M.Com., PGDLAN, Ph. D
8	High Energy Material Research Laboratory	Mr. A. B .Rahalkar	Technical Officer	M.Sc., B. Lib.

9	Indian Institute of Science Education and Research	Dr. Umeshareddy Kacherki	Deputy Librarian	MLIS, Ph. D
10	Indian Institute of Tropical Metrology	Mrs. Shompa Das	Scientist 'D' and Library and Publication Division	MSc, MLIS
11	Inter-University Centre for Astronomy and Astrophysics	Mrs. N.U. Bawdekar	Scientific Officer-E	MLIS
12	National AIDs Research Institute	Dr. S.M.Shahabuddin	ALIO	PGD, Ph. D
13	National Centre for Cell Science	Dr. K. S. Behera	Technical Officer 'B'	MLIS, Ph. D
14	National Centre for Radio Astrophysics	Mr. G. Balakrishna	In charge	MLIS, SET
15	National Chemical Laboratory	Dr. Sunita Barve	Senior Technical Officer	MLIS, Ph. D
16	National Institute of Virology	Mrs. Vandna Chandere	Assistant Library and Information Officer	M.A., MLIS ADCSSAA
17	National Research Centre for Grapes	Ms. Varsha Salunke	Library In charge	B. Lib
18	Research and Development Establishment	Mr. S.S. Arole	Scientist 'D'	MSc., MLIS

Observations:

It is observed that library managers/heads have the different designations as per their parent institute's structure and policies. All the library heads are well-qualified librarians and are capable of managing their library very well. Out of 18 library heads,

8 are Ph. D, 6 having Master degree in Library and Information Science. Remaining 4 are either graduate in LIS or different qualifications other than library science.

Q. B.4- Library Staff

Table 7.6 Library Staff

Sr. No	Name of the Institute	Professional	Technical	Administrative	Support
1	Agharkar Research Institutes	2	1	2	
2	Armament Research and Development Establishment	7	3	1	4
3	Automotive Research Association of India	4	4		1
4	Central Institute of Road Transport.	1		1	
5	Central Water Power Research Station	15			5
6	Centre for Development of Advanced Computing	2		2	2
7	Defence Institute of Advance Technology	7			
8	High Energy Material Research Laboratory	4	3		1
9	Indian Institute of Science Education and Research	4			1
10	Indian Institute of Tropical Metrology	4	1		2
11	Inter-University Centre for Astronomy and Astrophysics	5			
12	National AIDs Research Institute	1			1
13	National Centre for Cell Science	2			

14	National Centre for Radio Astrophysics	1			1
15	National Chemical Laboratory	3			4
16	National Institute of Virology	3			1
17	National Research Centre for Grapes	1			
18	Research and Development Establishment	3	2	1	1

Observation:

In all the science research libraries in Pune, around 114 total library staffis working out of which 69 are professional staff, 14 technical staff, 7 administrative staff and 24 support staff. It is observed that special research libraries have professional staff ranging from 1-5 (15 Libraries) and 3 libraries have staff between 7-15. Minimum professional staff availability in maximum research libraries compare to other libraries may be marching towards procurement of e-resources in these libraries.

Q. B.5 Number of Users

Table 7.7 Number of Users

Sr. No.	Institute Name	Post Graduate Students	Researchers and Scholar	Faculty
1	Agharkar Research Institutes	50	50	40
2	Armament Research and Development Establishment	100	500	
3	Automotive Research Association of India	262	461	9
4	Central Institute of Road Transport.		85	9
5	Central Water Power Research Station (CWPRS)		256	
6	Centre for Development of Advanced Computing (C-DAC)	700	600	

7	Defence Institute of Advance Technology	495	116	80
8	High Energy Material Research Laboratory		300	
9	Indian Institute of Science Education and Research	353	80	140
10	Indian Institute of Tropical Metrology	9	243	
11	Inter-University Centre for Astronomy and Astrophysics (IUCAA)	10	36	23
12	National AIDs Research Institute	15		20
13	National Centre for Cell Science		125	32
14	National Centre for Radio Astrophysics (NCRA)	6	20	20
15	National Chemical Laboratory	33	194	63
16	National Institute of Virology	43	17	38
17	National Research Centre for Grapes		45	17
18	Research and Development Establishment		580	

Observation:

It is observed from the data that research institutes provide services to research students, PG students, faculties, scientists, scientific staff, outside visitors etc. The users need current information more along with retrospective information.

Q. B.6 Library Collection – Print Collection

Table 7.8 Library Collections - Print Collection

Sr. No.	Name of the Institute	Print Books	Print Journal	Ph. D Theses Print	Bound Volumes	Any Other
1	Agharkar Research Institutes	27000	50	260	12800	-

2	Armament Research and Development Establishment	40079	161	-	10032
3	Automotive Research Association of India	8000+	35			1500 Standards and 900+ project reports
4	Central Institute of Road Transport.	11357	43			Specifications- 4036
5	Central Water Power Research Station	45887	157		21940	Reports - 8208
6	Centre for Development of Advanced Computing	8300	57		5000	
7	Defence Institute of Advance Technology	57242	50	11	21875	Reports - 2000
8	High Energy Material Research Laboratory	11500	57	100		Patents /Specifications - 5000
9	Indian Institute of Science Education and Research	25000	50	90	500	-
10	Indian Institute of Tropical Metrology	8375	20	203	6484	
11	Inter-University Centre for Astronomy and Astrophysics	14743	126	80	11000	
12	National AIDs Research Institute	2370	20	8	1100	

13	National Centre for Cell Science	3100	50	250	14000	
14	National Centre for Radio Astrophysics	6000	20	65	5000	
15	National Chemical Laboratory	150000	30	-	50000	
16	National Institute of Virology	18500	14	08	115	
17	National Research Centre for Grapes	807	04	02	-	
18	Research and Development Establishment	23000	100	10	100	

All science research libraries in Pune are having a fairly good collection of print and e-resources. In print collection, they have printed books, print journals, Ph. D theses and bound volumes of journals etc. are available. Some libraries as per their requirements have special collections like standards, specifications, reports, patents, etc.

Table 7.9 Library e-Resources Collection

Sr. No.	Name of the Institute	E – Journals	E-Books	Databases	Ph. D Theses	Digitized Documents	CDs/DVDs
1	Agharkar Research Institutes	60	-	3	-	2700	-
2	Armament Research and Development Establishment	200	7294	2	-	100	1696
3	Automotive Research Association of India	5	203	6			
4	Central Institute of Road Transport.	10	3				812

5	Central Water Power Research Station	56					341
6	Centre for Development of Advanced Computing	05		2			700
7	Defence Institute of Advance Technology	1822	190	10	11		80
8	High Energy Material Research Laboratory	08	-	-	-	-	-
9	Indian Institute of Science Education and Research	3000	5000	15	90		1000
10	Indian Institute of Tropical Metrology	83	213	4	48	24	465
11	Inter-University Centre for Astronomy and Astrophysics	178	3508	10	-	-	154
12	National AIDs Research Institute	18	8	2		-	300
13	National Centre for Cell Science	940	1	-	250	300	375
14	National Centre for Radio Astrophysics	15			50		1000
15	National Chemical Laboratory	210	1000	5		1500	2000
16	National Institute of Virology	247	-	2	8	17	28
17	National Research Centre for Grapes	04	-	1	-	-	-
18	Research and Development Establishment	-	600	3	-	-	15

Observation:

In all science libraries in Pune print collections are very sound in holding in which journal are more. But now it is noticed that 18 libraries in Pune city have initiated e-resources collection along with print. In electronic collection libraries are having e-journals, e-books, databases, Ph. D theses. National Chemical Library is having a unique collection of microfilm and microfiche in their collection. Subscribed e-resources are used by users but they also use free internet resources for getting open sources article available over net.

Q. B.7 -8 Databases, e-Books Publishers

Table 7.10 Databases and e-books publishers

Sr. No.	Name of the Institute	Full Text Databases	Bibliographic Databases	Publishers of E-Books Procured by Library
1	Agharkar Research Institutes	Science Direct	Web of Science, SCOPUS	-
2	Armament Research and Development Establishment	National Technical Reports Library, National Programmes on Technology Enhanced, Indian Standards	-	AIAA, ASM, McGraw Hill, Bureau of Indian Standards, ASTM, NTIS, IIT Madras, IIT Bangalore
3	Automotive Research Association of India	SAE International, Bureau of Indian Standards,South African Bureau of Standards, ADR, EEC, ECE		Elsevier, Woodhead Publication
4	Central Institute of Road Transport.	-	-	-
5	Central Water Power Research Station	-	-	-

6	Centre for Development of Advanced Computing	ACM Digital Library, IEEE	-	-
7	Defence Institute of Advance Technology	IEL Online, ACM Digital Library, ASME Journals, ProQuest Technology Collection, ProQuest ABI Inform, ProQuest D &T, Springerlink online, Nature Archive	SCOPUS, J-Gate Plus	American Institute of Aeronautics and Astronautics, Wiley
8	High Energy Material Research Laboratory	-	-	-
9	Indian Institute of Science Education and Research	International Press JSTOR Nature Publishing Group (NPG) OSA's Optics InfoBase Project Euclid's Prime Collection Royal Society of Chemistry (RSC) Package A Science Direct Science Online SPIE: Int. society for optics and photonics Wiley Interscience	Faculty of 1000: MathSciNet SciFinder Scholar Synfacts Web of Science	Springer – Verlag, Cambridge
10	Indian Institute of Tropical Metrology	MoES Consortia, IITM Theses Database, IITM Publications	Web of Science, SCOPUS,	Springer, Cambridge
11	Inter-University Centre for Astronomy and Astrophysics	American Institute of Physics, American Physical Society,	Web of Science, ISID	Cambridge, Oxford

		Emerald Collection, Institute of Physics, Springer Collection,T& F Journal Collection, Astrophysics Data System (Free)		
12	National AIDs Research Institute	Cochrane	J-Gate+	-
13	National Centre for Cell Science	-	-	Elsevier
14	National Centre for Radio Astrophysics	Not Subscribing but getting access through their head office library (TIFR Consortia)		
15	National Chemical Laboratory	Thomson Innovation, Questel	Web of Science, SciFinder	Bentham Science, RSC, Springer,Wiley, World E-book, AAAS
16	National Institute of Virology	ERMED, ICMIR Consortia	J-Gate Plus	-
17	National Research Centre for Grapes		J-Gate	
18	Research and Development Establishment	Indian Standards, ASME, ASTM		

Observation:

All the libraries have acquired databases in their respective subjects either in full text or bibliographical as per their user's needs. In full-text databases, Science Direct, Indian Standards, ACM Digital Library are very common. In bibliographic databases Web of Science, Scopus, J-Gate and SciFinder are common. National Centre for Radio

Astrophysics library has not subscribed to databases, but they are getting access to database from TIFR library.

Q. B.9 Sufficient library staff for managing e-resources

This question was asked to librarians for understanding their opinion about the adequacy of library staff to manage e-resources in their library.

Table 7.11 Sufficient library staff for managing e-resources

Response	Adequacy of library staff to manage e-resources	Percentage
Yes	10	55.56
No	5	27.78
Can't Say	3	16.66
Total	18	100.00
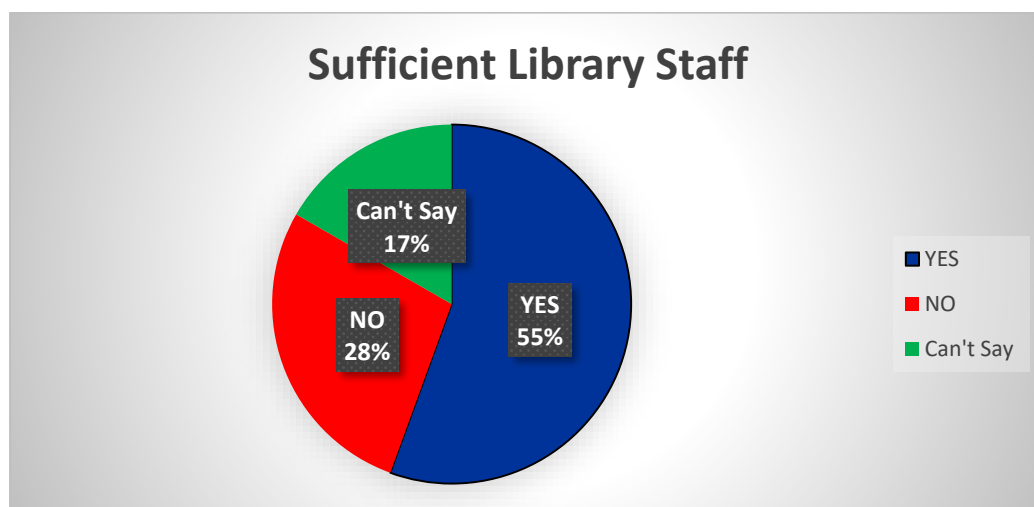
Fig 7.2 Sufficient of library staff for managing e-resources

Observation:

It is observed that around 55% libraries indicated that they have sufficient library staff for managing e-resources. 28% libraries do not have sufficient library staff to maintain e-resources and 17% libraries have not opinioned on this issue.

Q. B.10 Status of Library Automation:

Automation is essential for best utilization of e-resources in any advanced libraries. The researcher has tried to understand the status of library automation.

Table 7.12 Status of Library Automation

Response	Status of Library Automation	Percentage
Full	12	66.67
Partial	5	27.78
Initiated	1	5.56
Total	18	100
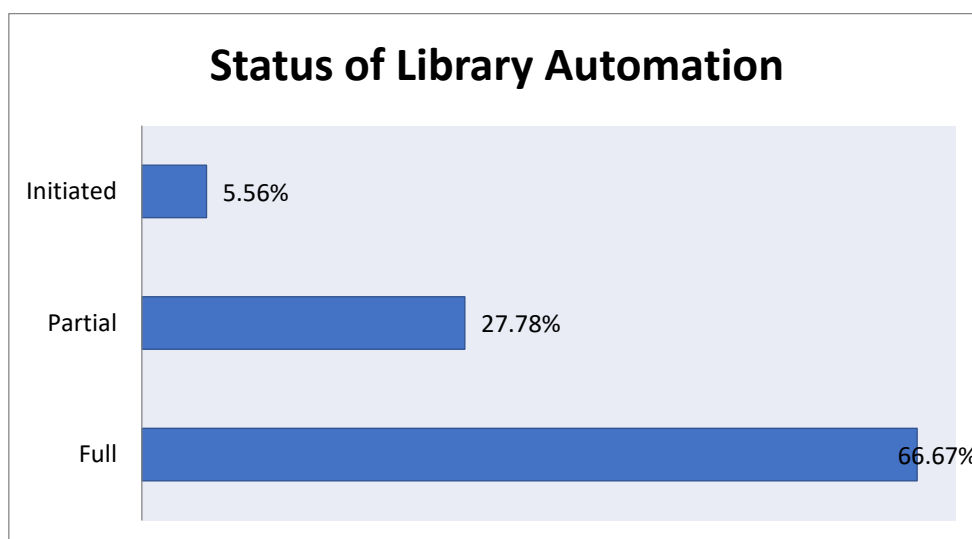
Fig 7.3 Status of Library Automation

Observation:

66.67% libraries are fully automated, 27.78% libraries automation is still in process and only in 1 library automation process has just initiated. It is observed that all most all libraries are automated in S&T area.

Q. B.11 Library Management Software

Question was asked to know the use of software for automation of libraries.

Table 7.13- Use of library management software

Library Software	Response	Percentage
LIBSYS	9	50.00
SLIM	4	22.22
LIBSUITE	2	11.1
LIBRARIAN	1	5.56
KOHA	1	5.56
In Process of Automation	1	5.56
Total	18	100

Observation:

It is observed that most of S&T and research libraries in Pune are using commercial software. Different software packages are used in libraries for library management. 50% libraries are using LIBSYS software, 22.22% libraries are using SLIM, whereas 11% libraries are using LIBSUITE and 5.88% Libraries are using LIBRARIAN and KOHA.

Q.B.12 Availability of LAN.

Table 7.14 – Availability of LAN

Response	Library –Part of institute LAN	Percentage
Yes	16	88.89
No	2	11.11
Total	18	100.00
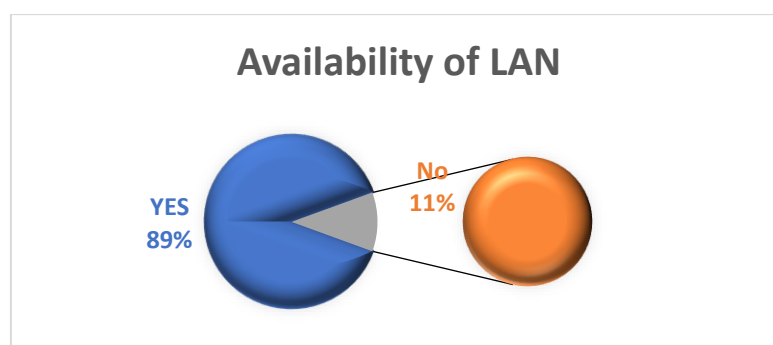
Fig 7.4 Availability of LAN

Observation:

It is observed that 89 % libraries are part of their institutes LAN and only 11% are not yet part of the institute's LAN.

Q. B.13 Availability of internet Lab for users

This question was asked to ascertain whether institute has provided separate internet lab for users where they can access to the e-resources.

Table 7.15 Availability of internet Lab for users

Response	Respondent	Percentage
Yes	11	61.11
No	7	38.89
Total	18	100.00
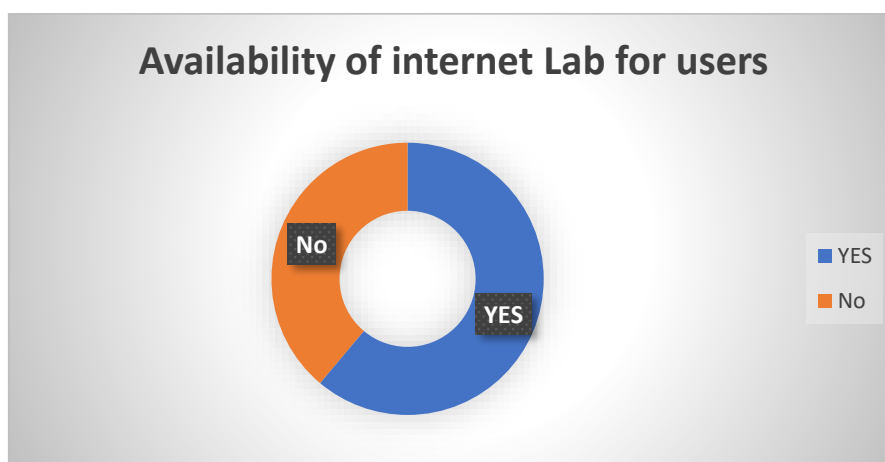
Fig 7.5 Availability of internet Lab for users

Observation:

61% libraries have established separate internet labs for searching internet, OPAC and using e-resources in libraries. But 39% libraries do not have separate internet labs yet.

B.14 Availability of OPAC on the web

Table 7.16- Availability of OPAC on the web

Response	Respondent	Percentage
Yes	11	61.11
No	7	38.89
Total	18	100.00
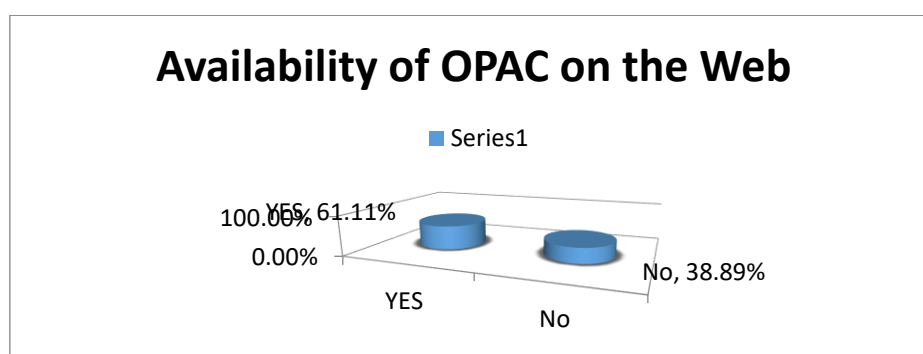
Fig 7.6 Availability of OPAC on the web

Observation:

Only 61% libraries made their OPAC available on the web for the use of users from other institutes.

Part C - e-Resources Collection Management

To identify the efforts made for collection management of e-resources some questions were asked to libraries like availability of written collection development policy, feedback on the budget, selection of e-resources, licensing agreements, acquisition, management, training, promotion of e-resources, renewal strategies, preservation, open access publications, technical issues, copyright of e-resources, challenges faced by librarians. The researcher also tried to find out various services offered by the libraries with the help of e-resources.

Written Collection Development Policy for library

The question was asked to know whether the science research libraries have developed collection development policy in written form especially for e-resources.

Table 7.17- Written library collection development policy for e-resources

Response	Respondent	Percentage
Yes	4	22.22
No	14	77.78
Total	18	100
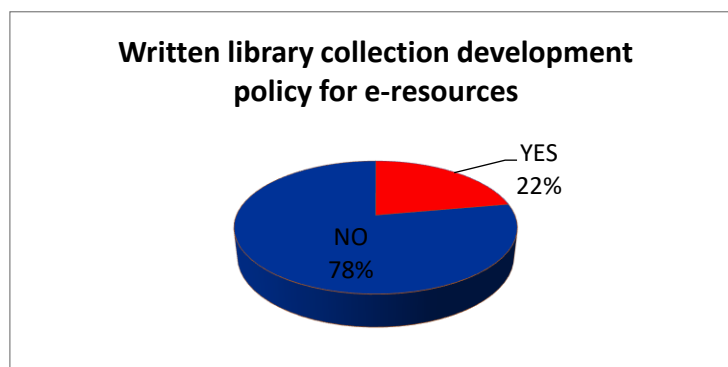
Fig 7.7 Written Library Collection Development Policy for e-resources

Observation:

Only 22 % libraries have written library collection development policy for acquisition and management of e-resources, but 78% libraries don't have written collection development policy.

C.I. Budget:

This question was asked to librarians to assess the annual budgetary provision of the library.

Q. C.I.1 Availability of separate budget for subscription toe-resources

Table 7.18- Availability of separate budget for subscription to e-resources

Response	Respondent	Percentage
Yes	5	27.78
No	13	72.22
Total	18	100
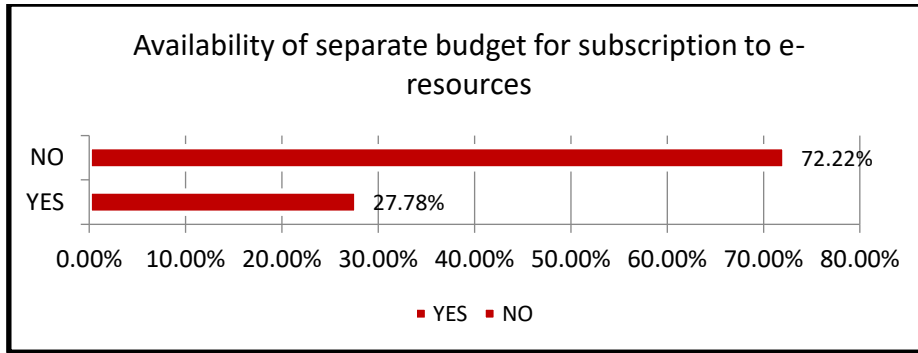
Fig 7.8 Availability of separate budget for subscription to e-resources

Observation:

It is observed that 72% libraries do not have separate budget for procurement to e-resources and only 27.78% libraries have separate budget for subscription to e-resources.

Q. C.I.2 Sufficient budget for subscription to e-resources

Table 7.19- Sufficient budget for subscription to e-resources

Response	Respondent	Percentage
Yes	14	77.78
No	4	22.22
Total	18	100
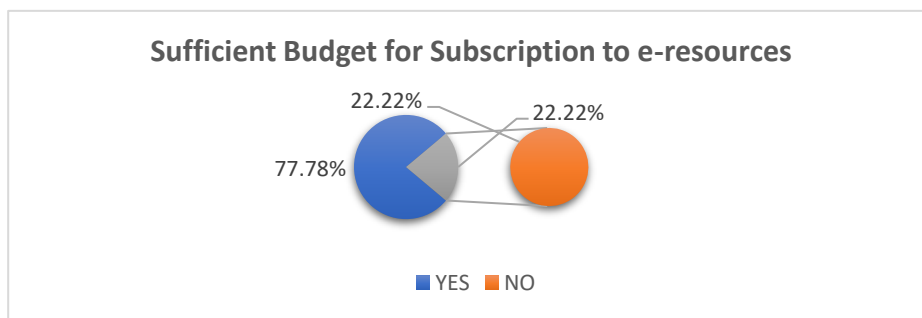
Fig 7.9 Sufficient budget for subscription to e-resources

Observation:

78% libraries pointed out that sufficient budget is made available for subscription to e-resources where as 22% libraries do not have sufficient budget.

Q. C.I.3 Is library budget is fixed to percentage of total institute's budget

Table 7.20- Library budget - fixed percentage of total institute's budget

Response	Respondent	Percentage
Yes	4	22
No	14	78
Total	18	100
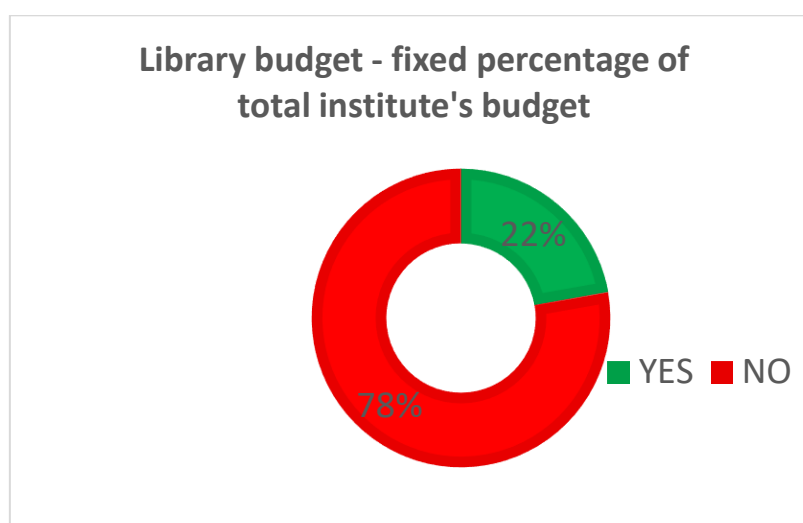
Fig 7.10 Library budget - fixed percentage of total institute's budget

Observation:

In the libraries, collection development of print or e-resources is most important part of any research institute and need huge budget to manage resources in research libraries. 78% libraries are not getting fixed percentage of institutes total budge but only 22 % libraries are getting fixed percentage form their institutes' total budget.

Q. C.I.4 Current year library budget

Libraries budget is not fixed as it is based on budget received from parent body. The few institutes have provided approximate amount of their current year's budget, but due to some reasons others have not mentioned and not responded to this question.

Table 7.21- Current year's library budget

Sr. No	Name of the Institute	Library Budget (Previous Year)	Percentage of allocation to e-resources out of the total library budget	Percentage of allocation to print resources out of the total library budget
1	Armament Research and Development Establishment	40 Lakhs	Not Specific	Not Specific
2	Central Institute of Road Transport.	03 Lakhs	Not Specific	Not Specific
3	Central Water Power Research Station	15 Lakhs	Not Specific	Not Specific
4	Centre for Development of Advanced Computing	10 Lakhs	Not Specific	Not Specific
5	Defence Institute of Advance Technology	2 Crores 27 Lakhs	Not Specific	Not Specific
6	High Energy Material Research Laboratory	30 Lakhs	Not Specific	Not Specific
7	Indian Institute of Science Education and Research	5 Crores	Not Specific	Not Specific
8	Indian Institute of Tropical Metrology	90 Lakhs	Not Specific	Not Specific
9	National AIDs Research Institute	15 Lakhs	Not Specific	Not Specific
10	National Centre for Radio Astrophysics	35 Lakhs	Not Specific	Not Specific
11	National Chemical Laboratory	4 Crores	Not Specific	Not Specific
12	Research and Development Establishment	40 Lakhs	Not Specific	Not Specific

Observation:

Many libraries have not provided their actual budget allocation due to administrative policies, hence analysis is not possible here. However, twelve libraries have provided the

data, which is analyzed in table no 7.21. The budget varies from institute to institute as per their requirements and policies. Indian Institute of Science Education and Research library receives 5 cores followed by National Chemical Laboratory (4 Crores) and DIAT library (2.27 Crores). Discussion with the librarians pointed out that libraries are spending significant portion of library budget on e-resources now.

B. II. Selection

Few questions were asked to assess the selection process of the e-resources in libraries.

Q. C.II.1. Intimation about new e-resources

The multiple-choice question was asked to understand how libraries get information about the new e-resources availability.

Table 7.22 - Intimation about new e-resources

Response	Respondent	Percentage
Faculty Member's request	12	66.67
Advertisement by publisher	14	77.77
Consortia meeting	7	38.88
Conferences	10	55.55
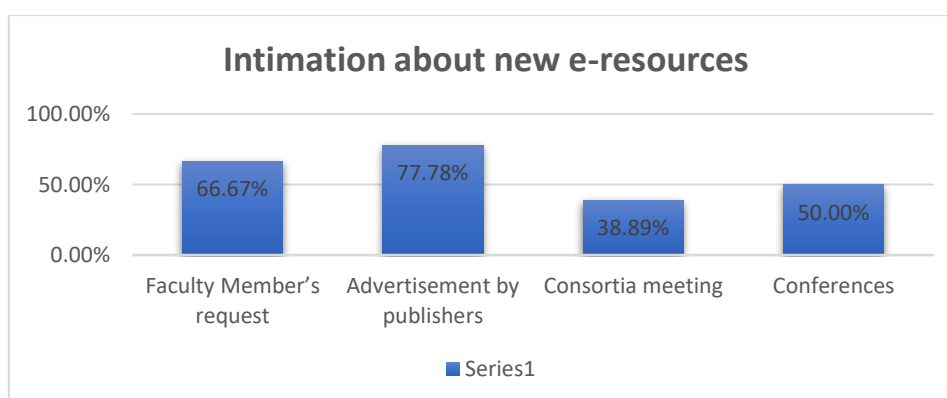
Fig 7.11 Intimation about new e-resources

Observation:

77.78% libraries receive information about new e-resources from the publisher's advertisements and 66.67% libraries get this information from the faculties. About 50%

librarians get information through conference on new e-resources whereas 38.89% librarians get this information through consortia meetings.

Q.C.II.2. Who plays an important role in developing e-resources collection for the library?

Multiple choice question was asked to understand who is responsible for developing e-resources in the libraries.

Table 7.23-Important role in developing e-resources collection

Response	Respondent	Percentage
Faculty	11	61.11
Library staff	14	77.77
Researchers/Students	6	33.33
Any other	0	0
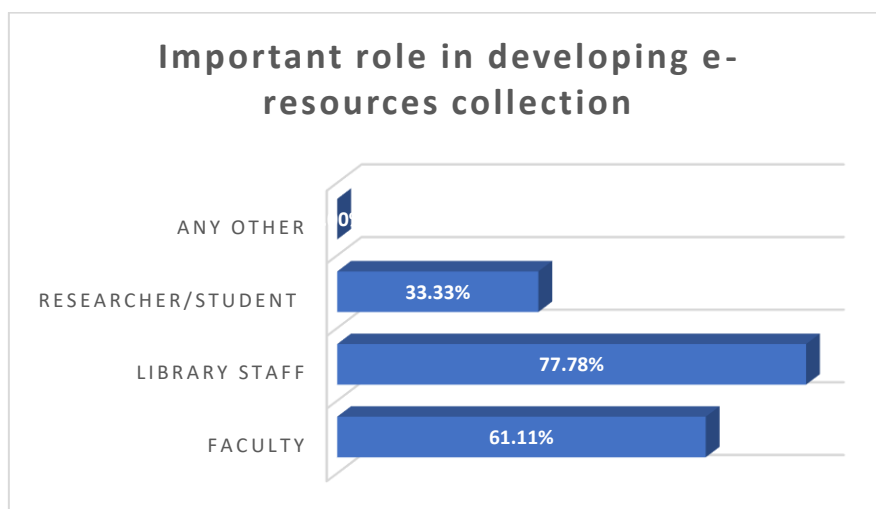
Fig 7.12 - Important role in developing e-resources collection

Observation:

It is observed that 78% library staff acquire e-resources by suggestions and evaluating resource and plays important role in the development of e-resources collection where as 61% faculties of institute playing the important role. 33 % librarians indicated that researchers/students play important role in the development of e-resources collection in the library by suggesting new e-resources.

Q. C. II.3. Do libraries take trial access before purchasing?

Table 7.24 -Trial access

Response	Respondent	Percentage
Yes	14	77.78
No	4	22.22
Total	18	100
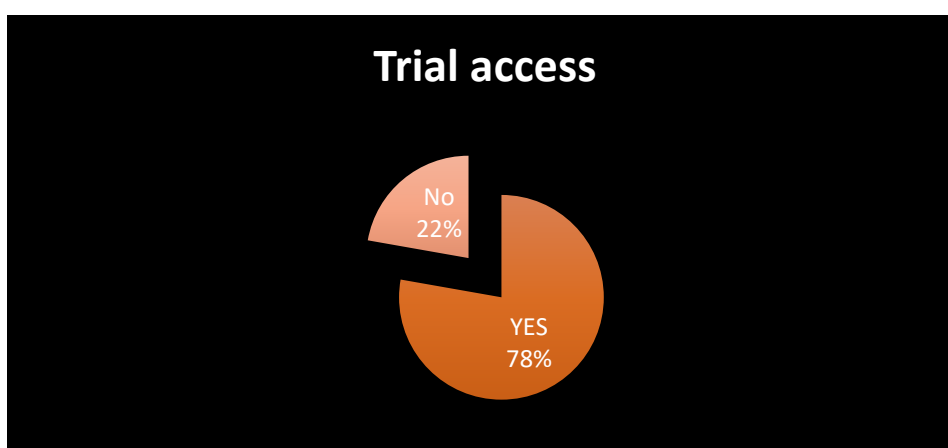
Fig 7.13 – Trial access

Observation:

To understand usefulness of the e-resources, library generally avail facility of trial access before procurement. It was observed that 78% libraries are taking trial access of the e-resources before procurement.

Q. C. II.4. Who evaluates e-resources?

Only 14 libraries have answered this question.

Table 7.25-Evaluation of e-resources

Response	Respondent	Percentage
Library users	4	28
library staff with the help of users	5	36
Library Committee	5	36
Total	14	100
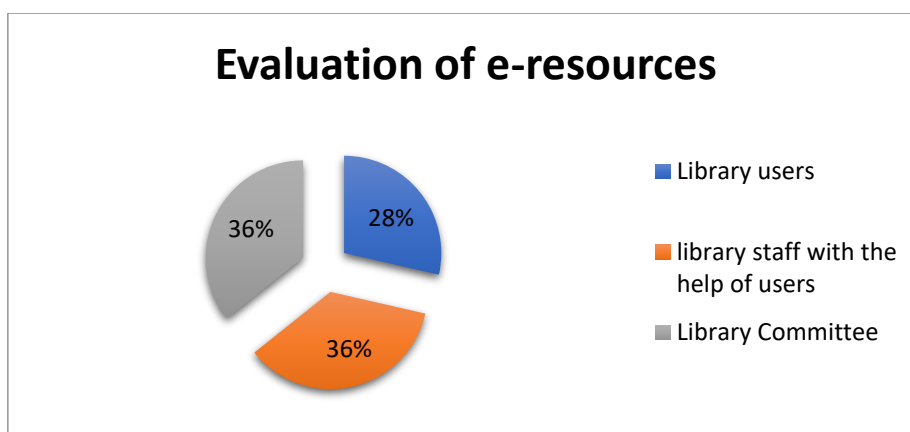
Fig 7.14 –Evaluation of e-resources

Observation:

It was observed that 36% libraries evaluate e-resources/information resources with the help of library staff and their users for procurement. 36 % libraries, indicated that library committee members are evaluating e-resources and 28 % libraries indicated that their users are evaluating e-resources for the procurement.

Q. C. II.5. Important criteria used while selection of e-resources.

This question was asked to find out the criteria used for selection of e-resources e.g. requirements, content, cost, technical feasibility, functionality and reliability, vendor support, supply, licensing terms, usage, evaluation, mode of access etc. while selecting e-resources for the library.

Table 7.26- Criteria used while selection of e-resources

Sr. No	Criteria for selection of e-resources	Very important	Important	Moderately Important	Slightly important	Not Important
1	Users Requirements/Needs	18				
2	Contents	15	3			
3	Cost	10	7	1		
4	Technical Feasibility	10	6	2		
5	Functionality and Reliability	09	7	1	1	
6	Vendor Support	10	6	1	1	

7	Supply	12	6			
8	Licensing Terms	11	6			
9	Usage	13	5			
10	Evaluation	18				
11	Mode of Access	18				

Observation:

The analysis indicated that criteria used while selecting e-resources that all the libraries (100% libraries) consider user requirements/needs, evaluation and mode of access as very important criteria on top level, followed by content (83.33%), usage (72.22%), supply (66.66%), licensing terms (61%), cost (55.55%), technical feasibility (55.55%), vendor support (55.55%), functionality and reliability (50%).The criteria selected for e-resources selection are identified individually in the following tables 7.27 to 7.35.

1. Users Requirements

Table 7.27 User requirements

Response	Respondent	Percentage
Very important	18	100
Important	0	0
Moderately Important	0	0
Slightly important	0	0
Not Important	0	0
Total	18	100

Observation:

100% libraries have considered user requirements/needs are very important criteria while selecting e-resources.

2. Contents of the e-resources

Table7.28 Contents of the e-resources

Response	Respondent	Percentage
Very important	15	83.33
Important	3	16.66
Moderately Important	0	00.00
Slightly important	0	00.00
Not Important	0	00.00
Total	18	100

Observation:

It is observed that 83.33% libraries have considered contents of the e-resources as very important criteria and 16.66% indicated it is important aspect.

3. Cost of the e-resources

Table 7.29 Cost of the e-resources

Response	Respondent	Percentage
Very important	10	55.55
Important	7	38.88
Moderately Important	1	5.55
Slightly important	0	0.00
Not Important	0	0.00
Total	18	100

Observation

The data shows that 55.55% libraries have considered cost of the e-resources is very important criteria while selecting the e-resources.

4. Technical Feasibility

Table 7.30 - Technical Feasibility

Response	Respondent	Percentage
Very important	10	55.56
Important	6	33.33
Moderately Important	2	11.11
Slightly important	0	00.00
Not Important	0	00.00
Total	18	100

Observation:

55.56% libraries have considered technical feasibility is very important criteria, whereas 33.33% considered it as an important criterion. 11.11% libraries have considered it as moderately important while selecting e-resources.

5. Functionality and Reliability

Table 7.31 - Functionality and Reliability

Response	Respondent	Percentage
Very important	9	50
Important	7	38.88
Moderately Important	1	5.56
Slightly important	1	5.56
Not Important	0	0.00
Total	19	100

Observation:

The data shows that 50% libraries have considered functionality and reliability as very important criteria while selecting the e-resources for libraries.

6. Vendor Support

Table 7.32 Vendor Support

Response	Respondent	Percentage
Very important	10	55.56
Important	6	33.33
Moderately Important	1	5.56
Slightly important	1	5.56
Not Important	0	0.00
Total	18	100

Observation

It is observed that 56% libraries have considered vendor support as an important criterion as well as other libraries have also given equal consideration for vendor selection.

7. Supply of e-Resources

Table**7.**33 – Supply of e-Resources

Response	Respondent	Percentage
Very important	12	66.67
Important	6	33.33
Moderately Important	0	0.00
Slightly important	0	0.00
Not Important	0	0.00
Total	18	100

Observation:

67% libraries have considered supply of e-resources and its connectivity as very important criteria, 33% consider as important criteria while selecting e-resources. Supply is most important factor.

8. Licensing Terms

Table 7.34 - Licensing Terms

Response	Respondent	Percentage
Very important	11	61.11
Important	6	33.33
Moderately Important	1	5.56
Slightly important	0	0.00
Not Important	0	0.00
Total	18	100

Observation:

License Terms (61%) are very important criteria while selecting the e-resources for its acquisition and the terms between vendor and libraries need be in written form.

9. Usage

Table 7.35 -Usage

Response	Respondent	Percentage
Very important	14	77.77
Important	4	22.23
Moderately Important	0	0.00
Slightly important	0	0.00
Not Important	0	0.00
Total	18	100

Observation:

78% libraries have considered usage of e-resource as an important criterion while selecting e-resources.

10. Evaluation

Table 7.36 - Evaluation

Response	Respondent	Percentage
Very important	18	100

Response	Respondent	Percentage
Important	0	00.00
Moderately Important	0	0.00
Slightly important	0	0.00
Not Important	0	0.00
Total	18	100

Observation:

100% libraries have considered evaluation of e-resources is very important criteria.

11.   Mode of Access

Table 7.37 - Mode of Access

Response	Respondent	Percentage
Very important	18	100
Important	0	00.00
Moderately Important	0	0.00
Slightly important	0	0.00
Not Important	0	0.00
Total	18	100

Observation:

All libraries have considered evaluation of e-resources is very important criteria.

III. Licensing Agreements

License agreement is very important part of e-resources subscriptions. License agreement defines rights and responsibilities between library and publisher or service provider. It is legal contract stating proper use of e-resources.

Researcher tried to analyses licensing agreements and few questions were asked in this issue.

Q.C.III.1 Licensing Agreements with service provider

Table 7.38 - Licensing Agreements with service provider

Response	Respondent	Percentage
Yes	16	88.89
No	2	11.11
Total	18	100
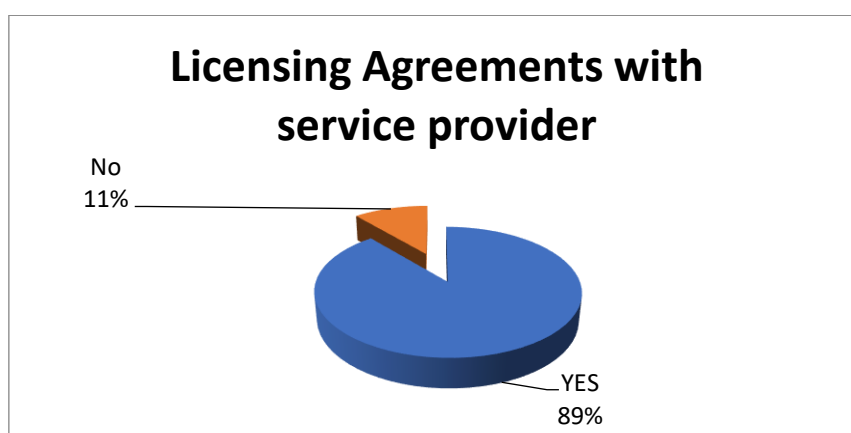
Fig 7.15 – Licensing Agreements with service provider

Observation:

It is found that 89% libraries have entered in the Licensing Agreements with the service provider of e-resources and fixed the terms for the use of e-resources.

Q. C.III.2. Nature of renewal of licensing agreement

Table 7.39 - Nature of renewal of licensing agreement

Response	Respondent	Percentage
Automatic Renewal	1	6.25
Notice issued for renewal	15	93.75
Early termination	0	0%
Total	16	100

Observation:

93.75% libraries renewed licensing agreements after receiving renewal notice issued from the licensor and 6.25% libraries automatically renew their licensing agreements.

Q. C.III.3. Features provided by licensor

Respondent are requested to select more than one option if requires while responding to question.

Table 7.40 - Features provided by licensor

Response	Respondent	Percentage
Scholarly Sharing	6	37.5
Providing Electronic Links	11	68.75
Archival/ Back up copy	8	50
Photocopying	10	62.5
Electronic Reserves	3	18.75
Access to Database	16	100
Any other	0	0
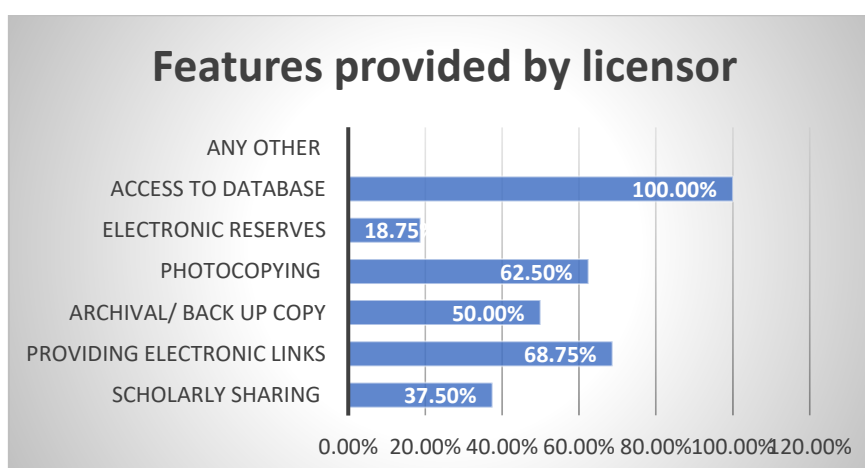
Fig 7.16 –Features provided by licensor

Observation:

It is observed that after subscribing to e-resources all the licensors are providing access to subscribed databases. 68.75% licensors are providing electronic links, 62.50% licensors allowing photocopying, 50% licensor are providing the archival and backup copy, 37% allowing scholarly sharing and 18.75% allowing electronic reserves.

C.III.4. Method of access

Multiple choice questionwas asked to understand the methodof access to e-resources.

Table 7.41 - Method of access

Response	Respondent	Percentage
Stand-alone	1	5.56
Remote access via web	7	38.89
Campus-wide	15	83.33
Any other	0	0.00
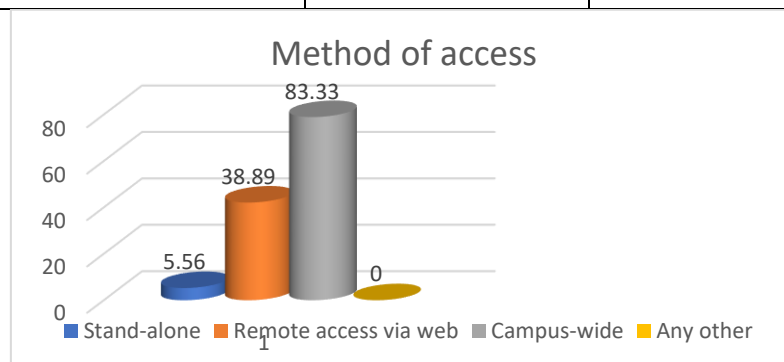
Fig 7.17 –Method of access

Observation:

The data indicates that 83% libraries provides campus-wide access to the e-resources and 38.89 % libraries providing remote access via web whereas 5.56% libraries have stand-alone access to the e-resources.

Q. C.III.5. Type of subscription:

To assess the types of subscriptions to e-resources, the multiple-choice question was asked.

Table 7.42 - Type of subscription

Response	Respondent	Percentage
Annual subscription with access only model	8	44.44
Annual subscriptions with perpetual access	15	83.33
Pay per view	1	5.56
Subscription with onetime payment	3	16.67
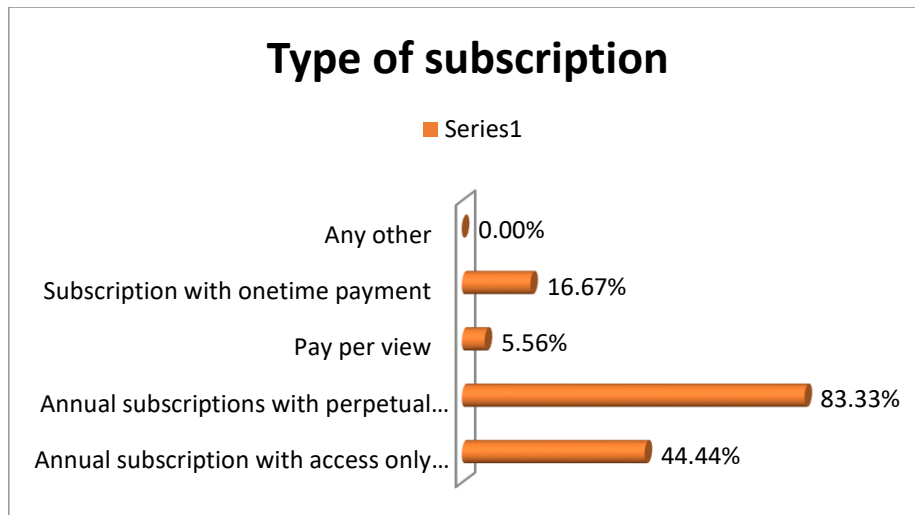
Fig 7.18–Type of subscription

Observation:

It is observed that 83.33% libraries are paying for the annual subscription with perpetual access, 44.44% libraries use the annual subscription with access only model whereas 16.67 % paying for subscription with onetime payment and only 5.56% libraries using pay per view model of subscription.

Q.C.III.6. Authentication of users while providing access to e-resources:

Table 7.43 -Authentication of users while providing access to e-resources

Response	Respondent	Percentage
IP Based	11	61.11
Login and Password	3	16.67
Both	4	22.22
Total	18	100
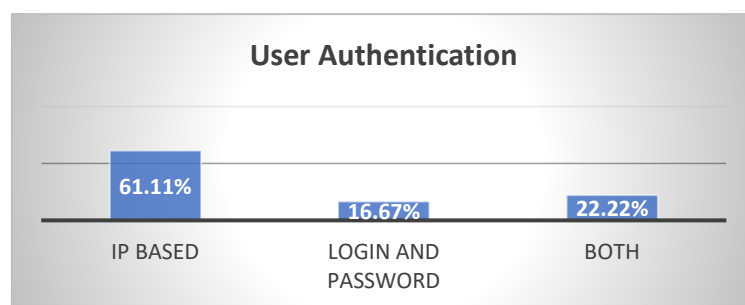
Fig 7.19 – User Authentication

Observation:

61.11% libraries provide range of IP addresses to the service provider, and their server authenticates library users by their IP address. IP address enables the number of users to use the resources simultaneously within the institute. 16.67% providing login ID and password to their users which provides limited access to the users. 22.22% libraries use both IP address and login ID and password for user's authentication.

Q. C.III.7. Method of paying subscription amount for e-resources

Table 7.44 - Method of paying subscription amount for e-resources

Response	Respondent	Percentage
By Cheque	0	00.00
Direct transfer through bank (Online transfer)	14	77.78
Both	4	22.22
Total	18	100
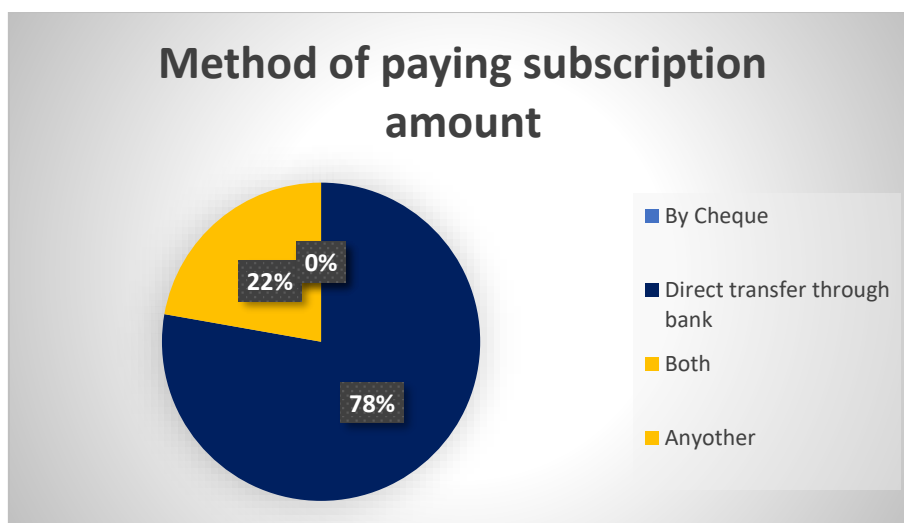
Fig 7.20 –Method of paying subscription amount

Observation:

It is noticed that 78% libraries are paying subscription directly through bank transfer, whereas 22% libraries using both bank transfer and cheque payment for subscription amount of e-resources.

Q. C.III.8 Difficulties faced while dealing with the licensor

To understand the difficulties libraries are facing while dealing with licensor, multiple choice question was asked. 16 Libraries have licensing agreement with the service provider.

Table 7.45- Difficulties faced while dealing with the licensor

Response	Respondent	Percentage
Inequality in the bargaining power	10	62.50
Inflexibility on the part of vendor	10	62.50
Fitting license agreement to the need of the library	8	50
Jurisdiction	2	12.50
Lack of legal advice	7	43.75
Any other	0	0
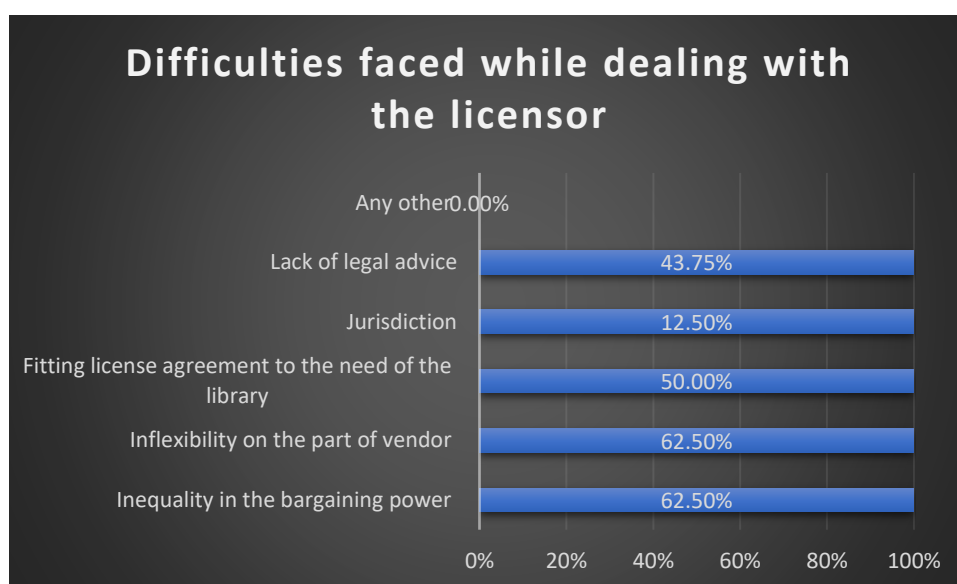
Fig 7.21 –Difficulties faced while dealing with the licensor

Observation:

62.50% librarians noticed inequality in the bargaining power and inflexibility on the part of the vendor are difficulties faced by librarians. 50% librarians observed difficulties in fitting license agreement to the needs of library. 44% librarians said that

lack of legal advice is main difficulty while dealing with the licensor. 12% librarians are afraid of jurisdiction while dealing with the licensor.

Q. C.III.9. Type of access:

Table 7.46 - Type of access

Response	Respondent	Percentage
Multiuser with IP based	11	61.11
Single users with ID and Password	3	16.67
Both	4	22.22
Total	18	100
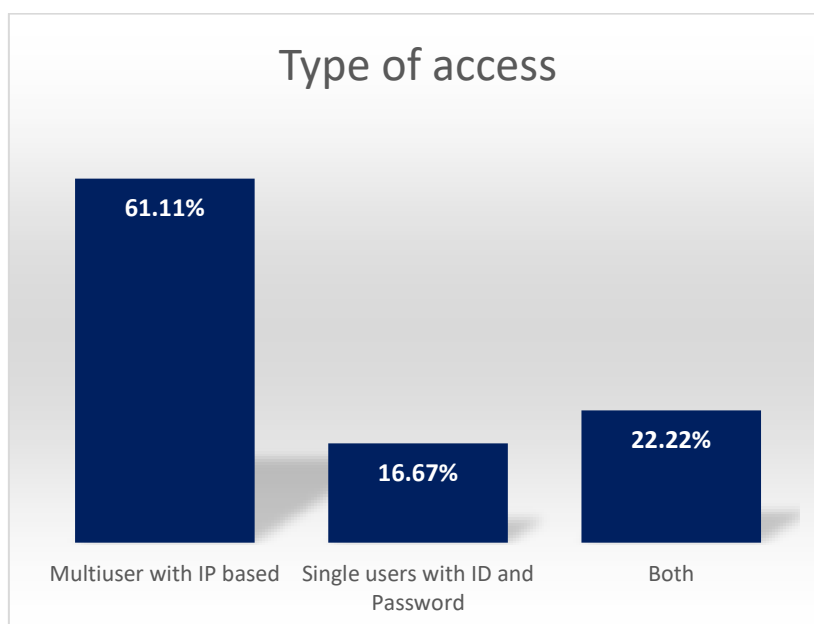
Fig 7.22 – Type of Access

Observation:

It is observed that 61.11% libraries are using IP based access. So many users can access the resources simultaneously, 16.67% libraries use ID and password so one user can access the resource at a time, whereas 22.22 libraries are using both types of access as per requirement of users.

Q. C.III. 10 Checking the terms and conditions mentioned in the License Agreements

Table 7.47 - Checking the terms and conditions mentioned in the License Agreements

Response	Respondent	Percentage
Librarian	18	100
Other	00	00.00
Total	18	100
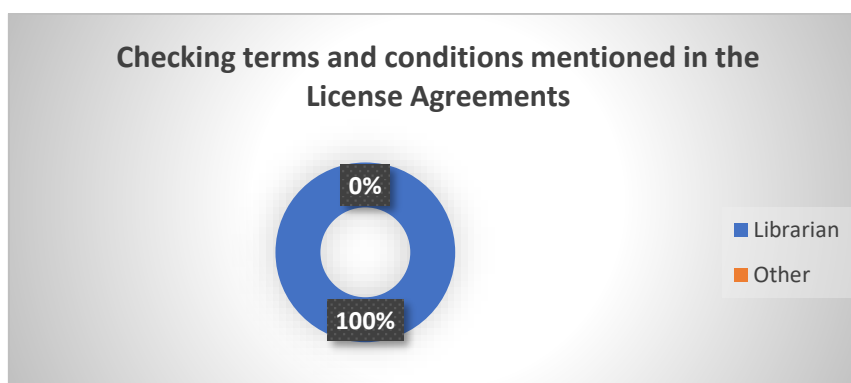
Fig 7.23 – Checking terms and conditions mentioned in the License Agreements

Observation:

In all the libraries, librarians check the terms and condition mentioned in the license agreements. Some librarians take help of the library committee, administrative officer for fixing the terms and conditions mentioned in the License Agreement.

Q. C. IV. 1. Approval for subscription to electronic resources

Table 7.48 - Approval for subscription to electronic resources

Response	Respondent	Percentage
Director of Institute	6	33.33
Library Committee	6	33.33
Director of institute with recommendation from library Committee	6	33.33
Any other	0	0
Total	18	100
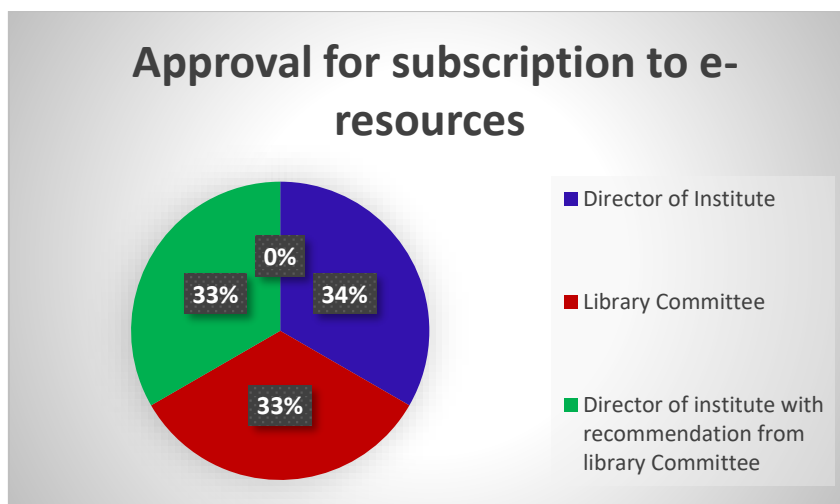
Fig 7.24 – Approval for subscription to electronic resources

Observation:

Not in a single library's librarian have full authority to approve the titles for the subscriptions to e-resources. In 33.33% libraries, director of the institute approves the subscription of e-resources. In 33.33% libraries, library committee approves the titles. In 33.33% libraries, Director of Institute with the recommendation from Library Committee approves the e-resources subscription.

Q. C. IV. 2. Separate committee to take decisions for e-resources subscription

Nature of e-resources is different than print resources, so it is always better to have separate committee to decide for e-resources subscription.

Table 7.49 - Separate committee to take decisions for e-resources subscription

Response	Respondent	Percentage
Yes	0	0
No	18	100
Total	18	100
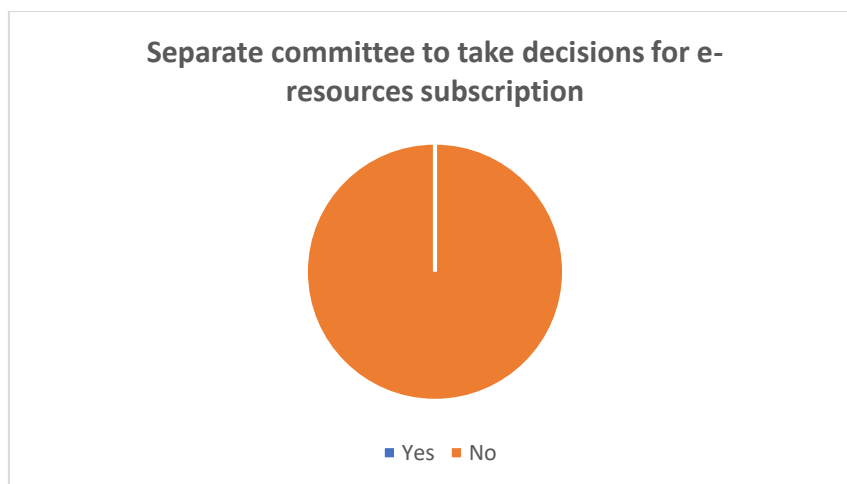
Fig 7.25 – Separate committee to take decisions for e-resources subscription

Observation:

It is observed that none of the libraries are having a separate committee to take the decision on the e-resources subscription.

Q. C. IV. 3. Mode of subscription to e-books

Table 7.50 - Mode of subscription to e-books

Response	Respondent	Percentage
Directly from Publishers	8	88.89
Through Consortia	1	11.11
Through Subscription Agency	2	22.22
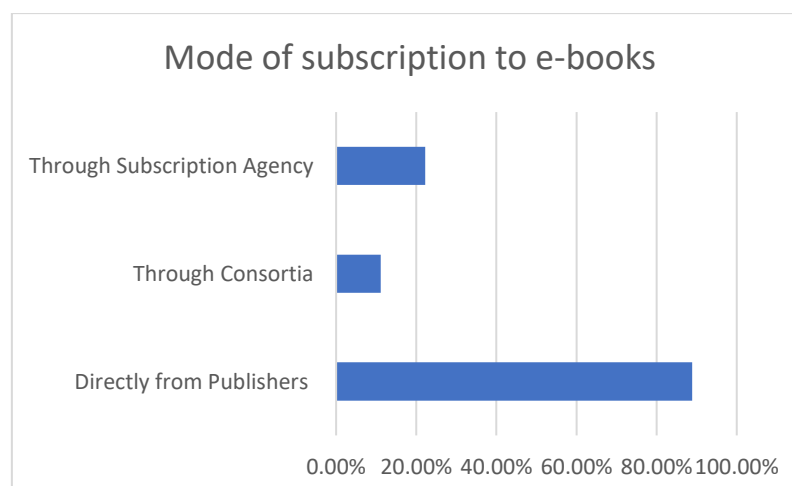
Fig 7.26 – Mode of subscription to e-books

Observation:

89% libraries subscribe to e-books directly through publishers. 22% libraries procure e-books through subscription agency and only 11% libraries take help of consortia for the procurement of e-books.

Q. C. IV. 4. Member of Consortia

Table 7.51 - Member of consortia

Response	Respondent	Percentage
Yes	14	77.78
No	4	22.22
Total	18	100
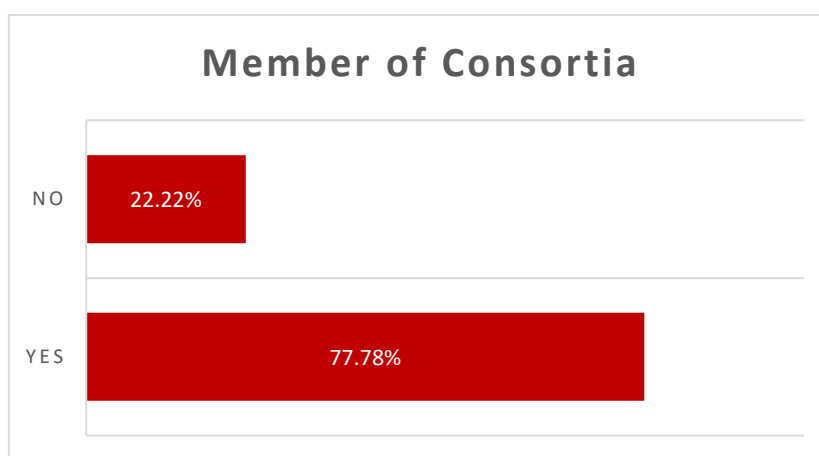
Fig 7.27 – Member of consortia

Observation:

This data analysis indicates that 78% libraries are the member of library consortia.

Q. C. IV. 5. If Yes -Name of the consortia:

Table 7.52 - Name of the consortia

Sr. No.	Institute Name	Name of the Consortia
1	Agharkar Research Institutes	CSIR-DST
2	Armament Research and Development Establishment	DRDO Libraries and E-Journal Consortia

3	Centre for Development of Advanced Computing (C-DAC)	MCIT Consortium and MCIT Consortium
4	Defence Institute of Advance Technology	JCCC Consortia
5	High Energy Material Research Laboratory	DRDO Libraries and E-Journal Consortia
6	Indian Institute of Science Education and Research	e-ShodhSindhu and IISER Library Consortia
7	Indian Institute of Tropical Metrology	MoES Consortia
8	Inter-University Centre for Astronomy and Astrophysics (IUCAA)	FORSA Consortia
9	National AIDs Research Institute	ERMED Consortia by National Medical Library and ICMR Consortia
10	National Centre for Cell Science	"DeLCON' DBT E-Journal consortia
11	National Centre for Radio Astrophysics	TIFR Consortia and FORSA Consortia
12	National Chemical Laboratory	CSIR-DST
13	National Institute of Virology	ICMR Consortia J-Gate Plus
14	Research and Development Establishment	DRDO Consortia E-Journal and E-Books

Observation:

Armament Research and Development Establishment, High Energy Material Research Laboratory and Research and Development Establishment these institutes are part of DRDO labs have DRDO Consortia for e-Journal and e-Books. Inter-University Centre for Astronomy and Astrophysics and National Centre for Radio Astrophysics are part of FORSA consortia. Other libraries are the members of consortia as per their requirement e.g. CSIR NCL is part of CSIR consortia, NIV is part of ICMR consortia. Similarly, most of institutes are covered under consortia agreements.

Q. C. IV. 6.Does libraries feel that Consortia plays major role in subscribing to e-resources

Table 7.53 - Consortia plays major role in subscriptions of e-resources

Response	Respondent	Percentage
Yes	17	94.44
No	1	5.56
Total	18	100
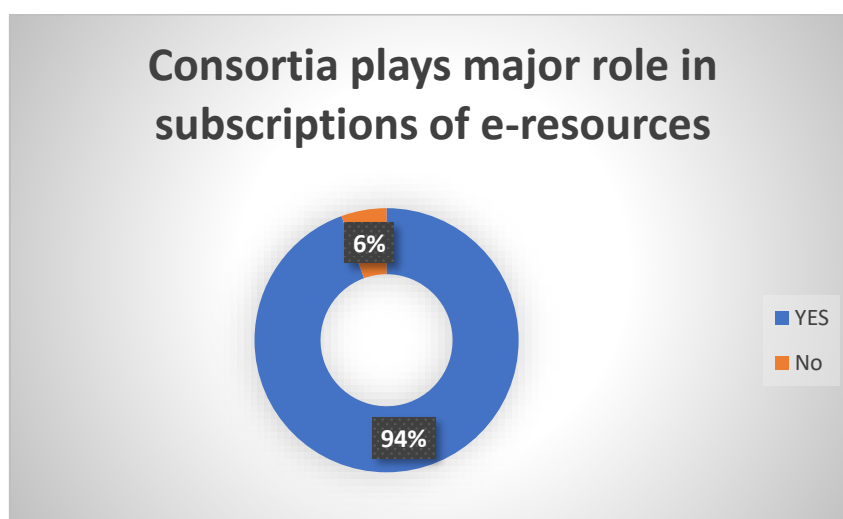
Fig 7.28 – Consortia plays major role in subscription e-resources

Observation:

According to 94% libraries, consortia plays an important role in the subscribing to e-resources.

C. IV. 7. Advantages of consortia purchase

This multiple-choice question was responded by the 16 librarians who are feeling that consortia plays an important role in subscription of e-resources.

Table 7.54 -Advantages of consortia

Response	Respondent	Percentage
Favourable pricing	15	93.75
Bargaining of number of titles provided by publisher	11	68.75

Negotiation on terms and condition	12	75
Any other	0	0
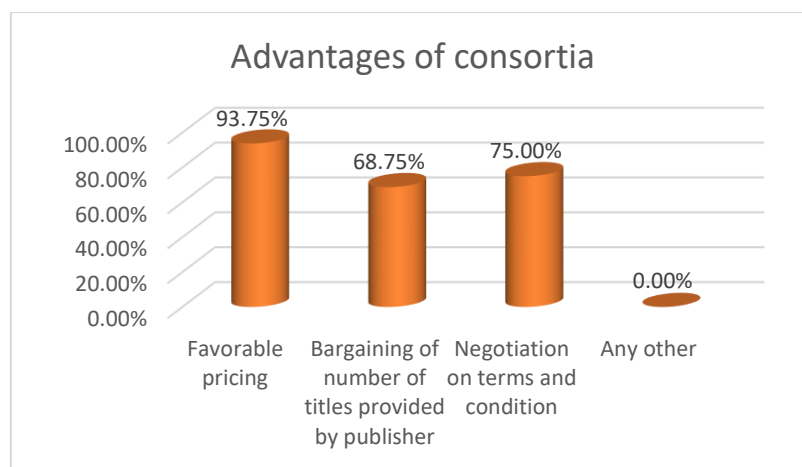
Fig 7.29 –Advantages of consortia

Observation:

94% librarians feel that favourable pricing is one of the advantages of the consortia, 75% librarians mentioned that consortia helps in negotiation of terms and conditions. 68% said that consortia help in bargaining number of titles provided by the publisher. Consortia is overall beneficial as it provides maximum access to information in average cost of products.

Q. C. IV. 8. Disadvantages of consortia:

Table 7.55 - Disadvantages of consortia

Response	Respondent	Percentage
Yes	13	72.22
No	5	27.78
Total	18	100
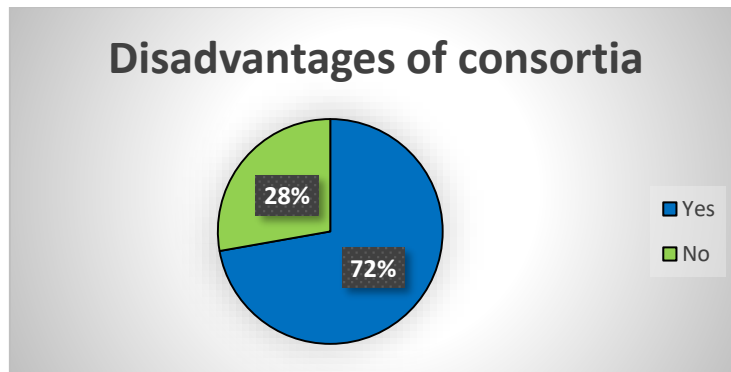
Fig 7.30 – Disadvantages of consortia

Observation:

72% librarians stated that consortia purchase has some disadvantages too. Whereas 28% librarians felt that consortia purchase do not have any disadvantages.

Q. C. IV.9. Disadvantages of consortia?

Respondent librarians stated following disadvantages of the consortia purchase: -

i. Unwanted resources are also included in the package.
ii. Single or limited number of titles required by individual library cannot be covered.
iii. If the membership is stopped in-between due to some reasons, then back issue availability is missing.
iv. Independence of each library member for access to titles, period of supply, ordering action, etc. is lost.
v. Sometime pricing proves to be expensive if subscribed resources are under-utilized.
vi. Duplicate subscription.

Observation:

It observed that irrespective of many advantages of consortia purchase, libraries may face some difficulties at the individual level. As the small libraries don't have big voice in consortia, they have to suffer more.

C. V Management of e-resources:

To assess the efforts made by libraries towards management of e-resources few questions were asked regarding methods of providing access to e-resources, access

point for e-resources, availability of federated search facility, updating e-resources information, cataloguing of e-resources, availability of Electronic Resource Management System and digital/institutional repository, access point for digital/institutional repository, services provided by vendor, organization of CD/DVD, etc.

Q. C.V.1. How libraries provide access to e-resources?

Multiple choice question was asked to understand how libraries provide access to e-resources.

Table 7.56 - How libraries provide access to e-resources

Response	Respondent	Percentage
Access in the library	11	61.11
Remote access through campus network	16	88.88
Internet	7	38.88
Wi-Fi enabled access in the campus	6	31.58
Any other	0	00.00
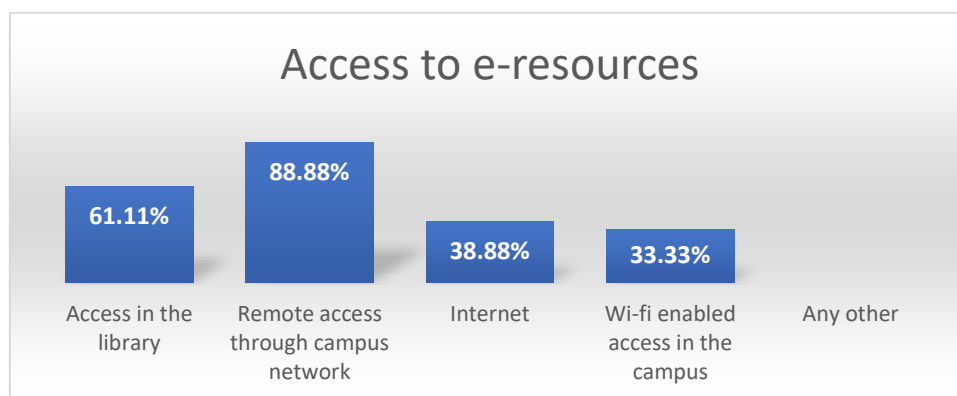
Fig 7.31 – Access to e-resources

Observation:

It is noticed that about 89% libraries provide campus-wide access to e-resources, 61% libraries provide access to e-resources only in library premises, 39% libraries provide access through the internet using ID and password and 33% libraries provide Wi-Fi enabled access over the campus.

Q. C.V.2. Access point for e-resources

Table 7.57 - Access point for e-resources

Response	Respondent	Percentage
Library Website	7	38.89
Library Catalogue	5	27.78
Both	6	33.33
Total	18	100
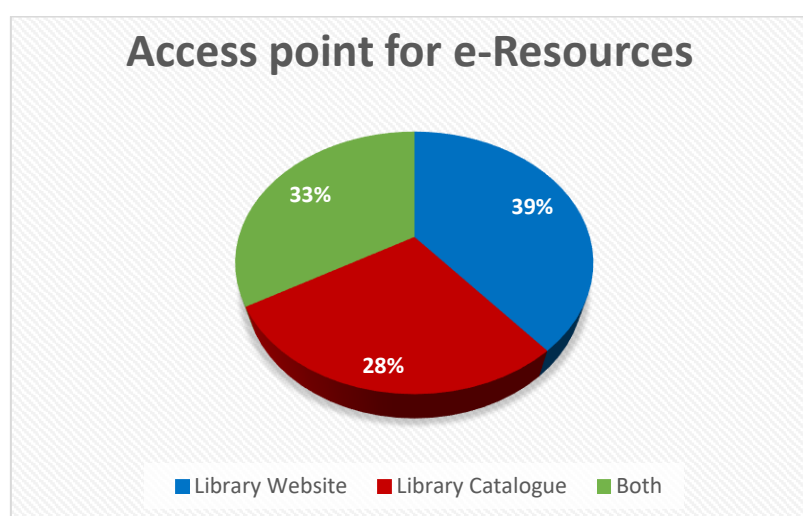
Fig 7.32 –Access point for e-resources

Observation:

39% libraries use library website to link the resources and provide access to it, 28% libraries use library catalogue as access point for e-resources and 33% libraries use both library website as well as library catalogue as access point of e-resource.

C.V.3. Availability of federated search facility

Table 7.58 - Availability of federated search facility

Response	Respondent	Percentage
Yes	5	27.78
No	13	77.22
Total	18	100
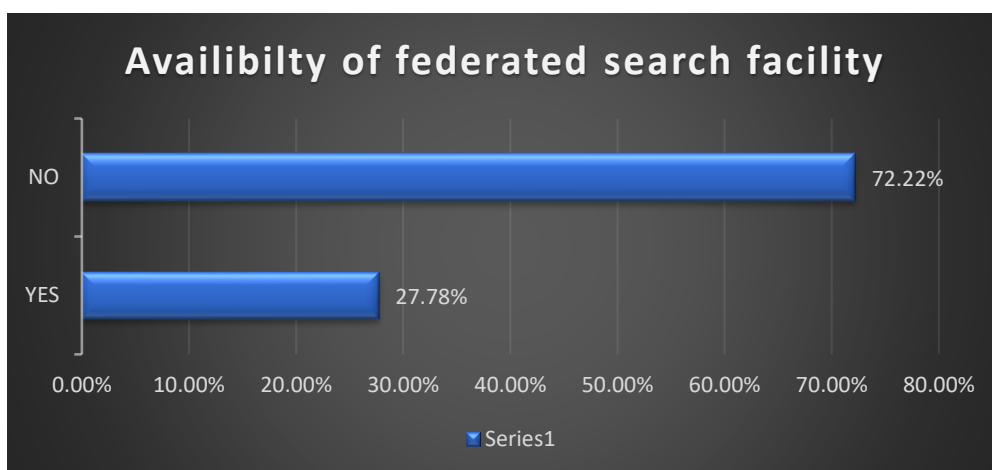
Fig 7.33 –Availability of federated search facility

Observation:

Only 28% libraries are providing federated search facility to users.

Q. C.V.4. Tools and techniques for finding out the availability of e-resources in the library.

A multiple-choice question was asked.

Table 7.59 - Tools and techniques for finding out the availability of e-resources in the library

Response	Respondent	Percentage
List Displayed on Website	13	72.22
Electronic Resources Management System (ERMS)	0	0.00
List Display on Intranet	6	33.33
OPAC	6	33.33
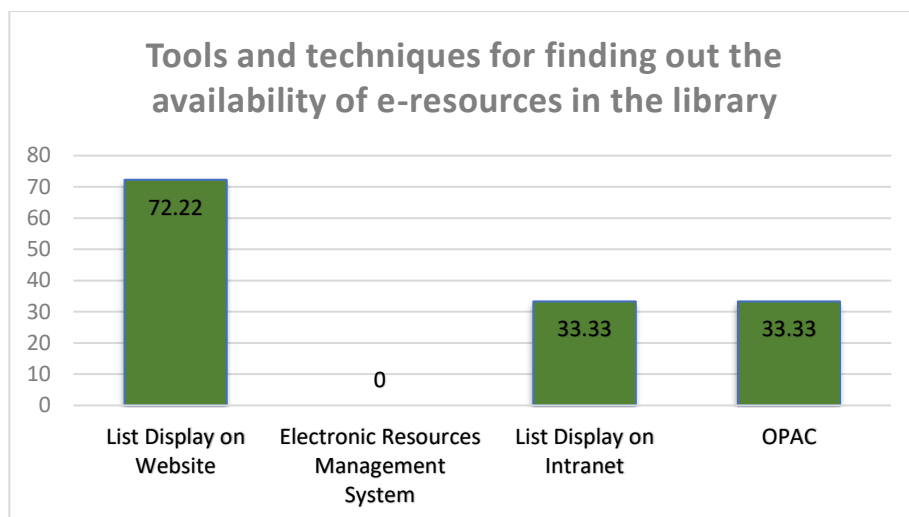
Fig 7.34 – Tools and techniques for finding out the availability of e-resources in the library

Observation:

It is observed that 72.22% libraries display compiled list of e-resources on their library website so that the user can find its availability. In 33.33% libraries display list on their intranet (LAN) and 33.33% libraries include in OPAC which helps users in finding the availability of e-resources.

Q. C.V.5. Availability of integrated OPAC for print and e-resources

Table 7.60- Availability of integrated OPAC for print and e-resources

Response	Respondent	Percentage
Yes	9	50
No	9	50
Total	18	100
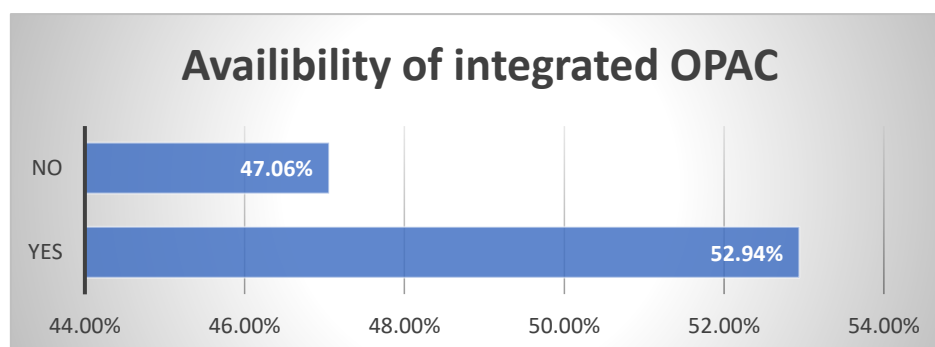
Fig 7.35 –Availability of integrated OPAC

Observation:

Only 50% libraries are providing integrated OPAC for print and e-resources.

Q. C.V.6. Frequency of updating e-resources information on library website.

Only 13 libraries are putting their list of e-resources on website, hence only these libraries responded to this question.

Table 7.61 - Frequency of updating e-resourcesinformation on library website

Response	Respondent	Percentage
Monthly	4	30.77
Biannually	2	15.38
Annually	6	46.15
Once in while	1	7.70
Total	13	100
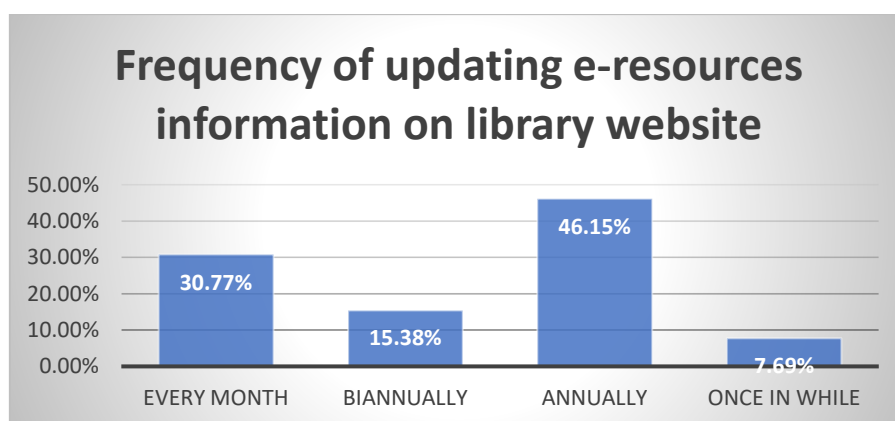
Fig 7.36 –Frequency of updating e-resources information on library website

Observation:

It is observed that most of the libraries are regularly updating e-resources information on their library website. 30.77% libraries update information monthly, and 15.38% update it biannually, whereas 46.15% libraries update annually and 7.69% libraries updating website once in a while.

Q. C.V.7. Measures taken to ensure smooth access to e-resources

Table 7.62 - Measures taken to ensure smooth access to e-resources

Response	Respondent	Percentage
Random check for access of e-resources	5	27.78
Taking Users Feedback	1	5.56
Both	12	66.66
Total	18	100

Observation:

67% libraries use random check for access to e-resources and take user's feedback to ensure smooth access of e-resources. 28% libraries use only random check for access of e-resources. 5% libraries take only user's feedback.

Q. C.V.8. Cataloguing of e-resources:

Table 7.63 - Cataloguing of e-resources

Response	Respondent	Percentage
Yes	7	38.89
No	11	61.11
Total	18	100
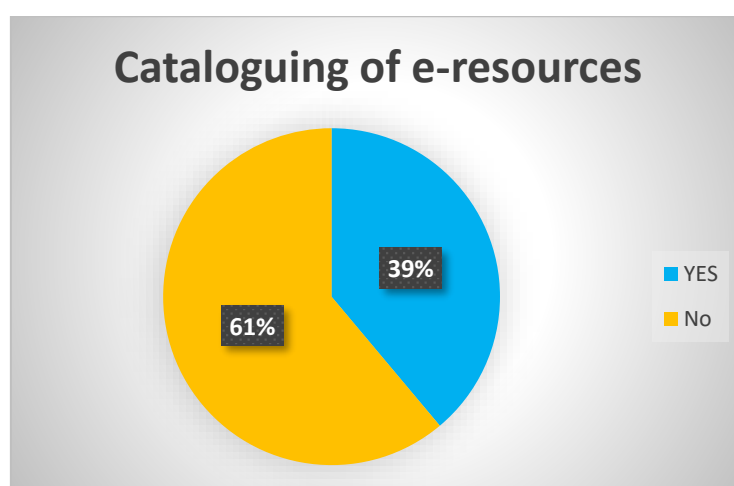
Fig 7.37 – Cataloguing of e-resources

Observation:

Although cataloguing is an important part to manage of e-resources, but it was observed that 61% libraries are not cataloguing e-resources.

Q. C.V.9. Methods used for cataloguing of e-resources:

Table 7.64 - Methods used for cataloguing of e-resources

Response	Respondent	Percentage
AACR	3	42.86
MARC	3	42.86
Dublin Code	1	14.29
Total	7	100

Observation:

The data shows among the respondent libraries, 43% libraries are using AACR cataloguing rules, 43% libraries using MARC records for cataloguing of e-resources. Only 14% libraries using Dublin code standards.

Q. C.V.10. Library staff helps the users for using e-resources.

Table 7.65 - Library staff helps the users for using e-resources

Response	Respondent	Percentage
Yes	18	100
No	0	00.00
Total	18	100

Observation

All the libraries under survey helps users for finding and use e-resources and even library staff is cooperative in helping them for effective access.

Q. C.V.11. Management of e-resources information like ID password, subscription period, publisher.

Table 7.66 - Management of e-resources information

Response	Respondent	Percentage
In Library Management Software	7	38.88

Excel	10	55.56
Other	1	5.56
Total	18	100

Observation:

55.56% libraries are still using excel software for managing e-resources information whereas 38.88% libraries using library management software and 5.56% libraries using other methods like printed register and email for managing e-resources information.

Q. C.V.12. Use Electronic Resource Management System

Libraries are spending more budget one-resources but they are not ready to spend some amount of budget to get Electronic Resources Management System to manage e-resources effectively.

Table 7.67 - Use Electronic Resource Management System

Response	Respondent	Percentage
Yes	1	5.56
No	17	94.44
Total	18	100
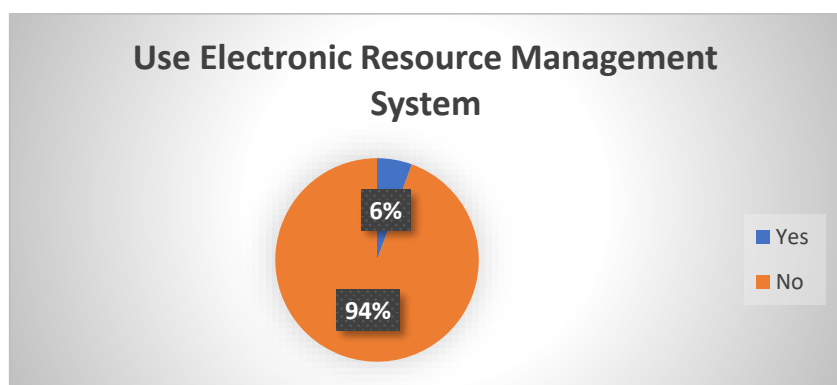
Fig 7.38 – Use Electronic Resource Management System

Observation:

The data shows that 94% libraries are not using Electronic Resource Management System.

Q. C.V.13. Availability of digital/institutional repository

Table 7.68 - Availability of digital/institutional repository

Response	Respondent	Percentage
Yes	13	72.22
No	05	27.78
Total	18	100
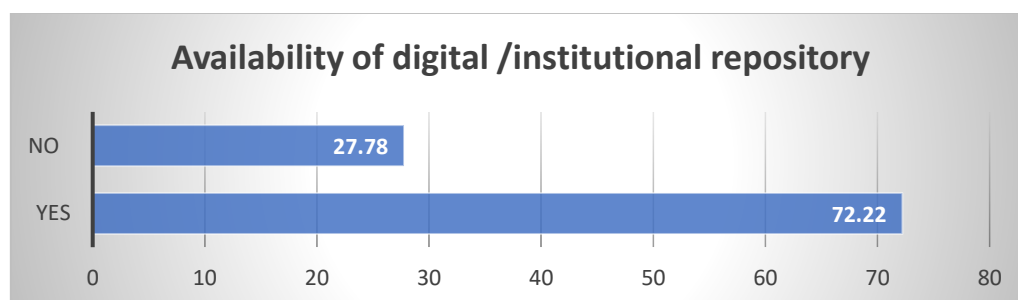
Fig 7.39 – Availability of digital repository/institutional repository

Observation:

It is very positive sign that in most of the research libraries (72%) are managing and developing digital/institutional repository.

Q. C.V.14.Software used for digital/institutional repository

Libraries are using different software for creating digital/institutional repository in their institute.

Table 7.69 - Software used for digital/institutional repository

Response	Respondent	Percentage
DSPACE	8	61.54
Green Stone	2	15.39
LS Digital	0	0.00
E-Print	1	7.69
Other	2	15.38
Total	13	100
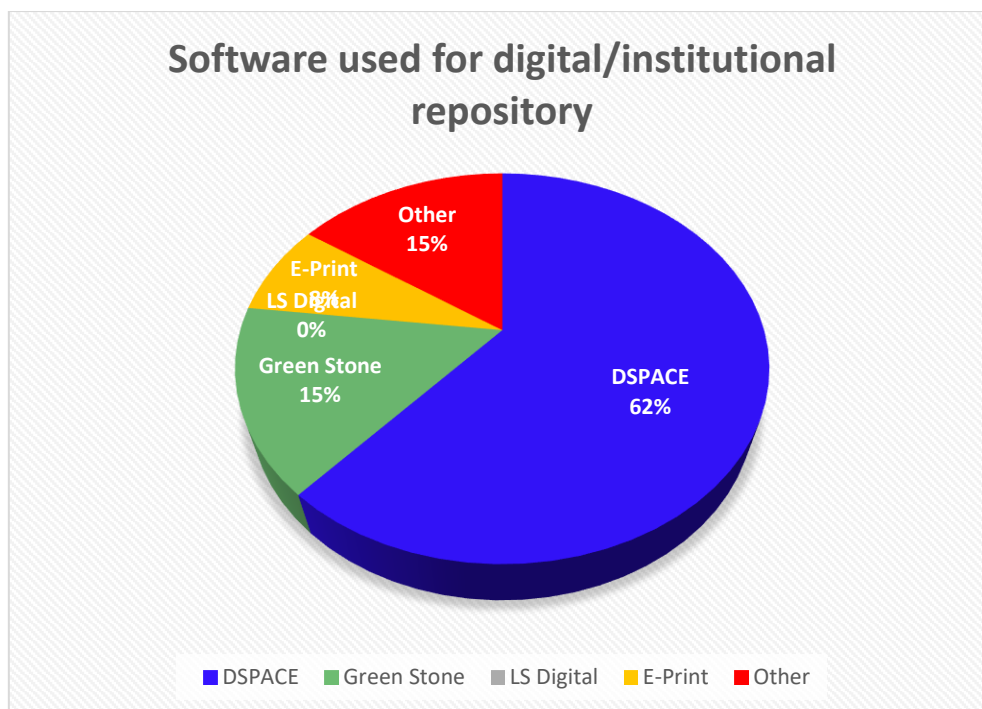
Fig 7.40 – Software used for digital/institutional repository

Observation:

61.54% libraries are using DSPACE for developing the digital/institutional repository, 15.39% libraries use Green Stone, 7.69% libraries are using E-Prints and 15.38% libraries use in-house developed software for developing digital/institutional repository.

Q. C.V.15.Which e-resources are available in digital/institutional repository?

Multiple choice question was asked to understand the e-resources available by the libraries in digital/institutional repository.

Table 7.70 e-Resources available in digital/institutional repository

Response	Respondent	Percentage
Theses	8	61.54
Dissertations	6	46.15
Institutional Publications	13	100
Seminars	2	15.38
Institutional News in Media	7	53.84
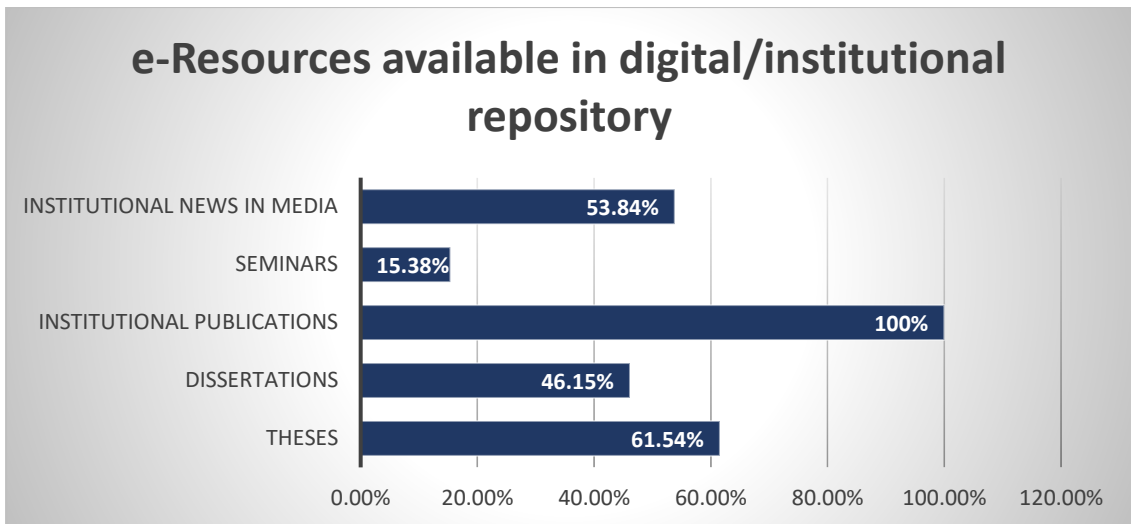
Fig 7.41 –e-Resources available in digital/institutional repository

Observation

All the libraries upload institutional publications in digital/institutional repository. 61.54% libraries upload their theses in IR. 53.84% libraries upload institutional news in media, 46.15% libraries upload dissertations and 15.38% libraries upload seminars in the digital/institutional repository.

Q. C.V.16. Access point to digital/institutional repository

Table 7.71 - Access point to digital/institutional repository

Response	Respondent	Percentage
Intranet	10	76.92
Website	4	38.46
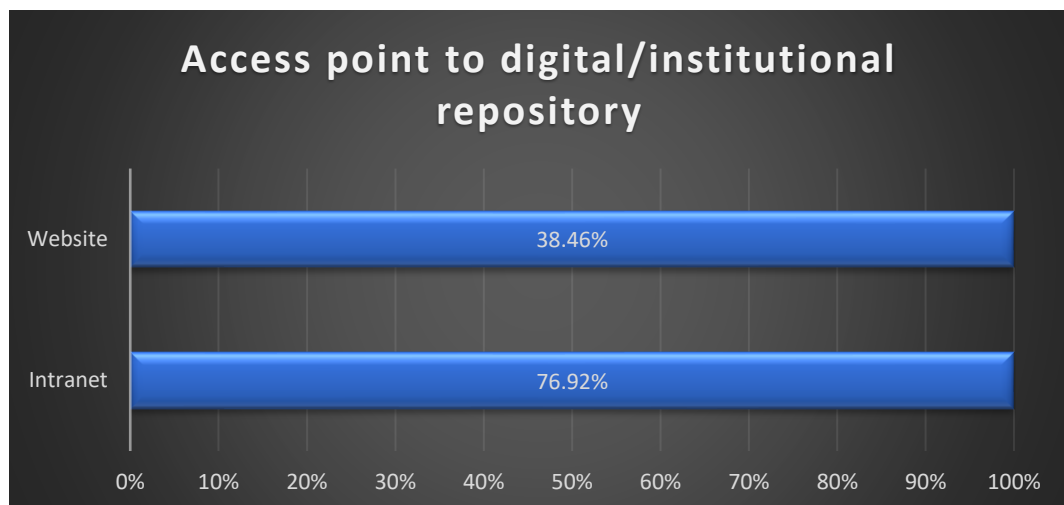
Fig 7.42 – Access point to digital/institutional repository

Observation:

76.92% libraries are providing access to digital/institutional repository through intranet for internal users in the campus, users can access the resources uploaded in IR. 38.46% libraries are providing access through web and all the users over the globe can access to the resources available in IR. Two libraries provide access through both intranet and web.

Q.C.V.17. Services provided by vendors

The multiple-choice question was asked to assess the services given by vendors and responded by 15 libraries.

<div align="center">Table 7.72 - Services provided by vendors</div>

Response	Respondent	Percentage
Trial evaluation and product demonstration	11	73.33
User training and support	9	60
Technical/customer support and system notification processes	7	46.67
Customization	5	33.33
Data security and archiving	1	6.67

Observation:

73.33% vendors provide trial and hands on demonstration for evaluation, 60% vendors provide users training and support**,** 46.67% vendors give technical/customer support and system notification processes, 33% vendors only customize and 7% vendors helps in data security and archiving.

Q.C.V.18. How many libraries insist publisher to customize e-resourcesas per their needs?

<div align="center">Table 7.73 – Customization of e-resources</div>

Response	Respondent	Percentage
Yes	09	50
No	09	50
Total	18	100

Observation:

Only 50% libraries insist publishers to customize e-resources as per the need of users.

Q. C.V.19. Organization of CD/DVD in the library.

14 libraries are having CD/DVD in their collections and only these libraries answered the following questions: -

Table 7.74 – Organization of CD/DVD in the library

Response	Respondent	Percentage
Disk Stakka	00	00.00
CD Server	01	7.14
In Rack	13	92.86
Any other	00	00.00
Total	14	100
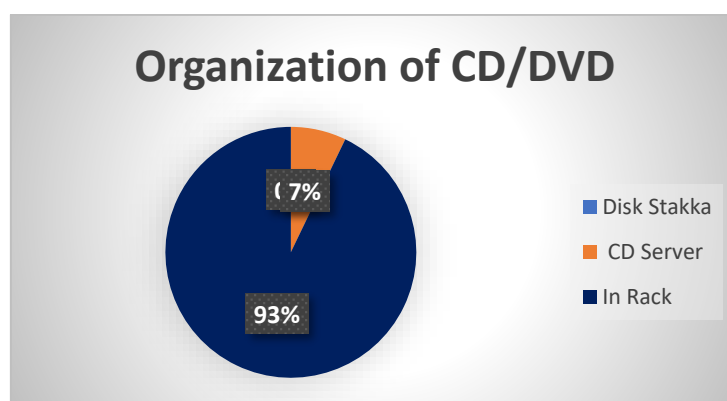
Fig 7.44 – Organization of CD/DVD in the library

Observation:

Out of 18 libraries only 14 libraries have CD/DVDs collection. From the 14 libraries, 13 libraries i.e. 93% arrange collection in racks and only 7% library having CD Server for preservation of CD/DVD.

Q. C.V.20 Availability of CD server

Table 7.75 – Availability of CD server

Response	Respondent	Percentage
Yes	1	5.56
No	17	94.44
Total	18	100

Observation:

94.44% libraries do not have CD servers for organizing CD/DVDs and only 5.56% libraries are having a server.

C.VI. Training Programmes for staff and users

To increase usage of e-resources, training programmes for the staff and users are essential. In this section, questions were asked to understand strategies of libraries and their efforts to train their staff and users for efficient use of e-resources.

Q. C.VI.1. How many libraries are arranging training programmes **for library staff?**

Table 7.76 – Arranging training programmes for library staff

Response	Respondent	Percentage
Yes	15	83.33
No	3	16.67
Total	18	100
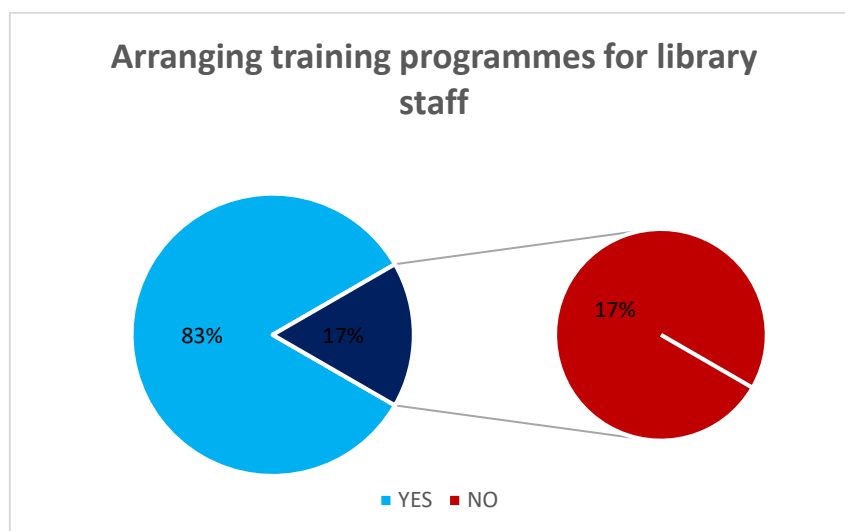
Fig 7.44 – Arranging training programmes for library staff

Observation:

83% libraries are arranging e-resources training programmes for library staff to enhance the use of library e-resources.

C.VI.2. Frequency of arranging training Programmes for library staff.

It is very essential for the library staff to understand all the features of the e-resources, searching skill, etc. to guide their users properly. Training is highly required to develop library staff expert in e-resources use and its management.

Table 7.77 – Frequency of arranging training Programmes for library staff

Response	Respondent	Percentage
Regularly	04	26.67
Sometimes	10	66.67
Rarely	1	6.67
Total	15	100
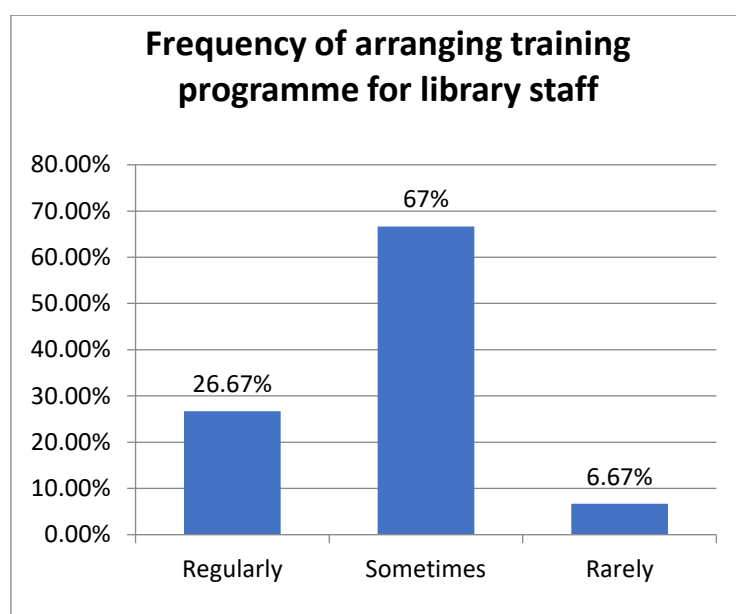
Fig 7.45 –Frequency of arranging training Programmes for library staff

Observation:

Though training is highly required for the library staff, it is found that only 27% libraries are arranging library staff training programmes regularly. 67% libraries arrange library staff training programmes sometimes, and 7% libraries arrange it rarely. Library staff is also deputed for workshop and training programmes.

Q. C.VI.3. Ways adopted by libraries for training library staff.

Multiple choice question was asked to understand the methods used by libraries to provide for training to its library staff.

Table 7.78 – Ways adopted by libraries for training library staff

Response	Respondent	Percentage
In House from other trained staff	7	46.67
Training from Vendor	7	46.67
Sending to different Institute	11	73.33
Any other	0	0.00
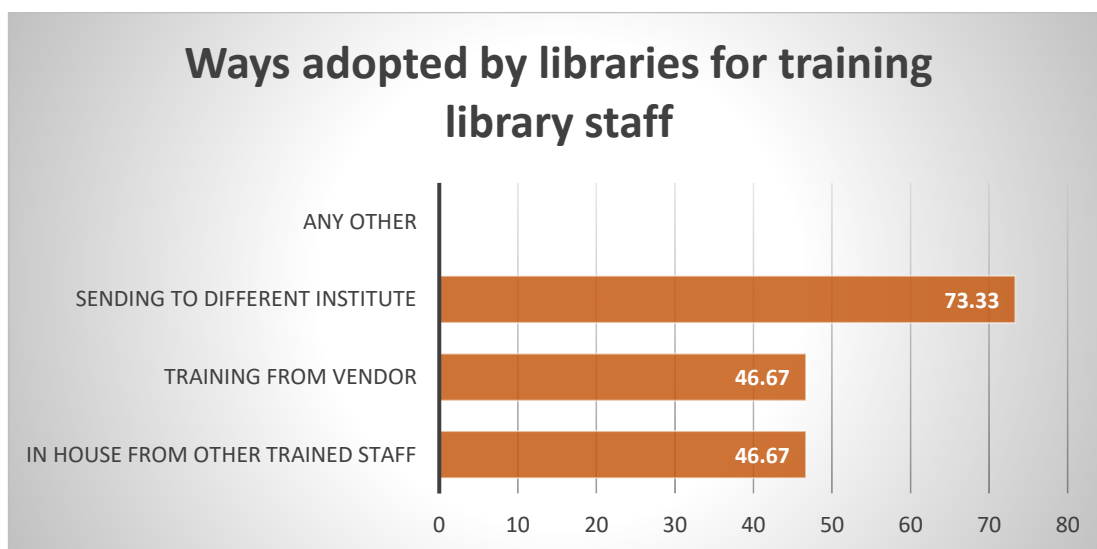
Fig 7.46 –Ways adopted by libraries for training library staff

Observation:

It is found that 46.67% libraries use in-house training from other trained staff, 46.67% arrange training from vendors and 67% libraries send their library staff to different institutes for training.

Q. C.VI.4. Arranging user's training.

To keep the users informed about availability of the e-resources and its features, library need to arrange training programmes for the users.

Table 7.79– Arranging user's training

Response	Respondent	Percentage
Yes	14	77.78
No	4	22.22
Total	19	100
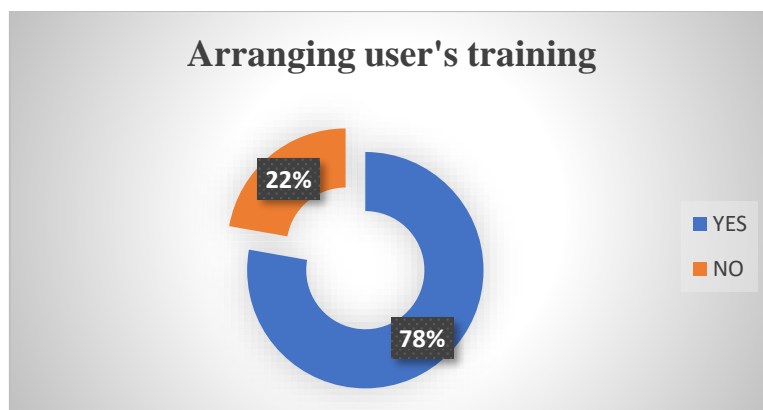
Fig 7.47 – Arranging user's training

Observation:

The data indicates that 78% libraries are arranging training programmes for their users.

Q. C.VI.5. Frequency of user's training Programmes.

Table 7.80 – Frequency of user's training Programmes

Response	Respondent	Percentage
Regularly	08	57.14
Sometimes	6	42.86
Rarely	0	0.00
Total	14	100
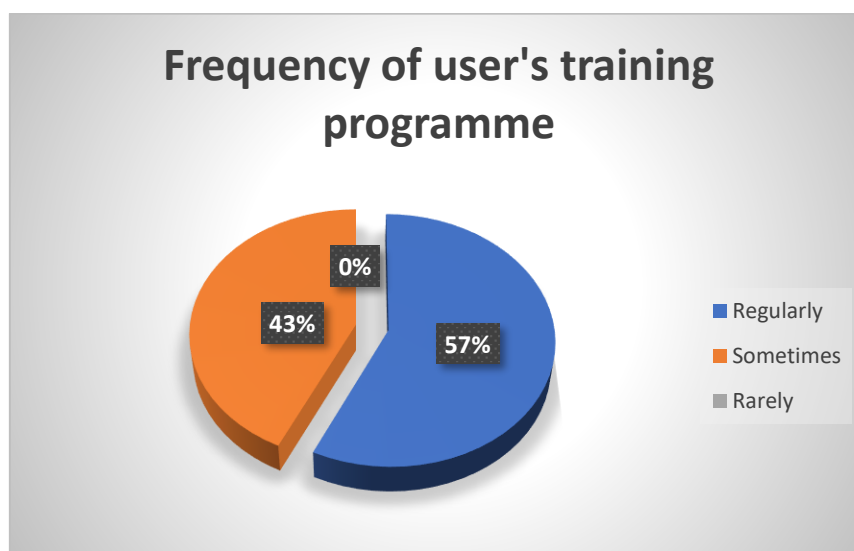
Fig 7.48 –Frequency of user's training Programmes

Observation:

57% libraries arrange user training programmes regularly and 43% libraries arrange user training programmes sometimes in a year.

Q. C.VI.6. Type of users training Programmes.

Table7.81 – Type of users training Programmes

Response	Respondent	Percentage
Library Orientation	11	78.57
Lectures from Vendor/Publisher	8	57.14
Hands on/Demonstrations	6	42.86
Tutorial on website	2	14.29
Distribution Library Pamphlet	2	14.29
Any other	0	00.00

Observation:

78.57% libraries conduct library orientation to train their users, 57.14% libraries arrange lectures from vendor/publisher, whereas 42.86% libraries arrange hands on demonstration and 14.29% libraries uses tutorials on the websites and distribute pamphlets.

C.VII. Promotions of e-resources

To encourage users to use e-resources, promotion of the e-resourcesis very important.

Q. C.VII.1. Techniques used for promotion of e-resources.

Table 7.82 – Techniques used for promotion of e-resources

Response	Respondent	Percentage
Word-of-mouth	13	72.22
Print brochures and posters	5	27.77
Library Catalogue	8	44.44
Newsletters	5	27.77
Library Website	13	72.22
E-Mail Announcements	15	83.33
RSS Feeds	1	5.55
Advertising	2	11.11
Presentation from vendor	9	50

Observation:

It was found that e-mail announcement is most used technique for promotion of e-resources. 83% libraries are using email announcement for promotion of e-resources. Word of mouth (mouth publicity) is used by 72% libraries, 72% libraries uses library website. 50% libraries arrange presentation from library vendor to promote the use of e-Resource. 44% libraries using library catalogue. 27% libraries are using print brochures and posters and newsletters. 11% libraries use advertising. 6% libraries are using RSS Feeds.

Q. C.VII.2. Is separate budget for advertising or marketing e-resources?

Table 7.83–Separate budget for advertising or marketing e-resources available

Response	Respondent	Percentage
Yes	0	00.00
No	18	100
Total	18	100

Observation:

Since libraries are spending major portion of the library budget on subscribing to e-resources, none of libraries are having separate budget for advertising or marketing e-resources. It is done by vendors sometimes by arranging demonstration.

Q. C.VII.3. Any written promotion plans for e-resources.

Table 7.84 – Written promotion plan for e-resources

Response	Respondent	Percentage
Yes	0	00.00
No	18	100
Total	18	100

Observation:

None of the libraries have any written promotion plans for promoting e-resources as this part is vendors to perform.

C. VIII. Renewal

Q. C. VIII. 1. Check usage statistics of e-resources before renewal.

Table 7.85– Check usage statistics of e-resources before renewal

Response	Respondent	Percentage
Yes	17	94.4%
No	1	5.56
Total	18	100
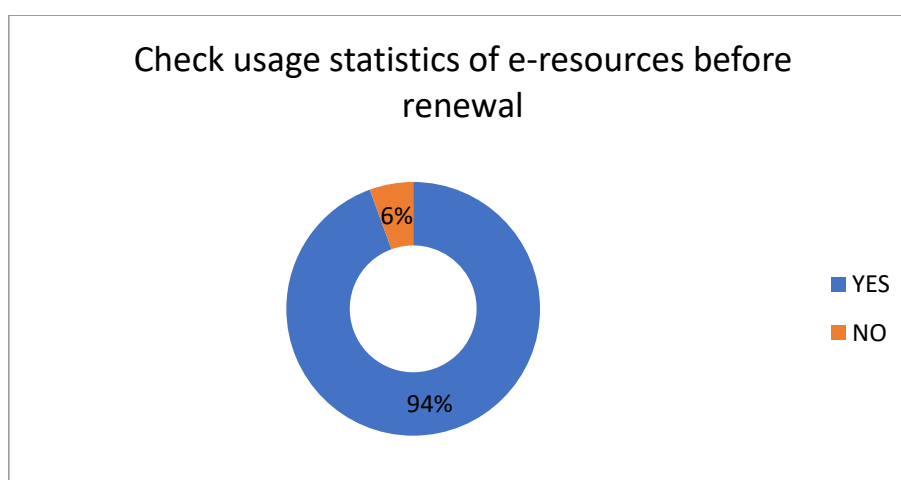
Fig 7.49 – Check usage statistics of e-resources before renewal

Observation:

94% libraries check e-resources usage statistics before renewal of e-resources for following year.

Q. C. VIII. 2. Factors on which e-resources renewal depends.

This multiple-choice question was asked to assess the factors affecting the renewal of e-resources.

Table 7.86 – Factors on which e-resources renewal depends

Response	Respondent	Percentage
Previous year's usage	15	83.33
Vendor/Publishers Promptness	3	16.67
Users Demand	15	83.33
Availability of budget	9	50.00
Any other	0	00.00

Observation:

The data analysis shows that 83.33% libraries renew e-resources depending upon previous years usage data. In 83.33% libraries consider user's demand and in 50% libraries consider availability of budget. 16.67% libraries consider vendor/publisher's promptness in providing access and their terms of supply.

Q. C. VIII. 3. Do you have minimum basic criterion for renewal of e-resources?

Table 7.87 – Do you have minimum basic criterion set for renewal of e-resources

Response	Respondent	Percentage
Yes	3	16.66
No	15	83.33
Total	18	100

Observation:

83% libraries have not prepared any basic minimum criteria for the renewal of e-resources.

Q. C. VIII. 4. Minimum basic criteria used for renewal of e-resources by libraries

Table 7.88 – Minimum basic criteria used for renewal of e-resources by libraries

Libraries set for basic criteria	Criteria
Centre for Development of Advanced Computing (C-DAC)	i. Usage of e-resources ii. Demand against cost
Indian Institute of Tropical Metrology	i. Users demand
National Chemical Laboratory	i. Core journals are subscribed on priority

Observation:

Only 3 libraries have set minimum basic criteria for renewal of e-resources. Centre for Development of Advanced Computing (C-DAC) library considers a certain set of "usage of e-resources" and "demand against cost" as the basic minimum criteria for renewal. Indian Institute of Tropical Metrology library considers "users demand" as

basic minimum criteria and in National Chemical Laboratory tries to "subscribe core journals on priority."

Q. C. VIII. 5. How libraries manage subscription renewal of e-resources.

Table 7.89 –Managing subscription renewal of e-resources

Response	Respondent	Percentage
Preparation of Calendar	9	50.00
Depends upon vendor/publisher notice for renewal	9	50.00
Reminder from ERM system	0	0.00

Observation:

It is observed from the data that 50% libraries depend upon vendor/publisher notice for renewal and remaining 50% libraries prepare calendar year to manage subscription renewal of e-resources.

IX. Preservation

Preservation of e-resources is very important and at the same time very critical due to complex nature of e-resources. But libraries need to have good plans for their preservation of e-resources instead of depending upon publisher for preservation. The library may face problems in accessing old issues of the journals if there is a change in the publisher's policies. Therefore, it is always better to have some preservation policy and arrangement for e-resources at institute level.

Q. IX.1. Are you fully dependent on publishers for preservation of purchased online e-book and e- journals.

Table 7.90– Dependency on publishers for preservation of purchased online E-Book and E-Journals

Response	Respondent	Percentage
Yes	16	88.9
No	02	11.1
Total	02	100

Observation:

Almost 89% libraries still fully depend upon publisher for preservation of purchased online e-book and e-journals. ARDE library and CWPRS library downloads documents from the e-resources and uploading them in institutional repository for preservation and providing access to users abiding copyright issues.

Q. IX.2 Do libraries have any Digital Preservation Programmes.

Table 7.91– Libraries have any Digital Preservation Programmes

Response	Respondent	Percentage
Yes	04	22.22
No	14	77.78
Total	18	100

Observation:

The data shows that 78% libraries do not have any digital preservation programmes at present.

Q. IX.3 Do libraries need digital preservation Programmes?

Table 7.92– Libraries need digital preservation Programmes

Response	Respondent	Percentage
Yes	12	66.66
No	6	33.33
Total	18	100

Observation:

66% libraries felt that they need digital preservation programmes for their library.

Q. IX.4. Methods used by libraries for long term preservation of digital resources

Table 7.93– Methods used by libraries for long term preservation of digital resources.

Response	Respondent	Percentage
Refreshing	0	0.00
Migration	2	20.00

Replication	8	80.00
Emulation	0	0.00
Encapsulation	0	0.00
Any other	0	0.00
Total	10	10

Observation:

Only 10 libraries responded for this question. Out of 10 libraries, 8 libraries (80%) are using Replication method for long term preservation of digital resources and 2 libraries (20%) are using Migration for long term preservation of digital resources.

Q. IX.5. Libraries digitized any library resources for preservation.

Table 7.94– Libraries digitized any library resources for preservation

Response	Respondent	Percentage
Yes	12	66.67
No	6	33.33
Total	18	100

Observation:

It is found that 66.67% libraries have digitized their library material for preservation which is valued to their institute.

Q. IX.6. Documents digitized by libraries for preservation

Table 7.95– Documents digitized by libraries for preservation

Sr. No	Library Name	Digitized library document
1	Agharkar Research Institutes	Theses, Research Papers
2	Armament Research and Development Establishment	Reports, Technical documents
3	Automotive Research Institute of India	Conference Proceedings
4	Central Water Power Research Station	Institutional Publications

5	Centre for Development of Advanced Computing	Old Videos
6	High Energy Material Research Laboratory	Reports, Technical documents
7	Indian Institute of Tropical Metrology	Rare documents, Reports
8	National Centre for Cell Science	Internal publication and PhD Theses
9	National Centre for Radio Astrophysics	Technical reports and Theses
10	National Chemical Laboratory	Microfiche, Microfilm, Old books, Old reports
11	National Institute of Virology	Research papers published by NIV scientist
12	Research and Development Establishment	Project report

Observation:

Most of the libraries have digitized their technical research papers published by their scientists, institutional publications, project reports, etc. Centre for Development of Advanced Computing library has digitized old videos. National Chemical Laboratory library has digitized Microfiche, Microfilm, Old books, old reports etc.

Q. IX.7. How do you provide access to digitized materials?

Table 7.96 – Access to digitized materials

Sr. No	Library Name	Digitized library document
1	Agharkar Research Institutes	Through web
2	Armament Research and Development Establishment	Intranet
3	Automotive Research Institute of India	Digital Library, Common Drive to dept., Temporary access
4	Central Water Power Research Station	Institutional repository

5	Centre for Development of Advanced Computing	Through CD/Access through Intranet
6	High Energy Material Research Laboratory	Intranet
7	Indian Institute of Tropical Metrology	On request basis through email
8	National Centre for Cell Science	Institutional repository
9	National Centre for Radio Astrophysics	On request basis through email
10	National Chemical Laboratory	On request basis through email
11	National Institute of Virology	On request basis through email
12	Research and Development Establishment	Intranet

Observation:

It is observed that libraries are using different tools like intranet, institutional repository and digital libraries for providing access to their digitized material. Some libraries are sending requested digitized material through email also on demand.

Q. IX.8. How libraries managing digitization.

Table 7.97– Managing digitization.

Response	Respondent	Percentage
In House	10	83.33
Outsources	2	16.67
Total	12	100

Observation:

83% libraries have managed digitization in-house and only 17% are outsourcing the digitization of their collection using quotation method.

X. Open Access Publications

Open Access Publications are publication having free access to the public. Many scientific journals are also available in Open Access. It is very important to identify the

resources available in subject areas and take efforts to provide access to these resources to users.

Q. X.1.Access provided to Open access publication from the library.

Table 7.98– Access provided to Open access publication from the library

Response	Respondent	Percentage
Yes	13	72.22
No	5	27.78
Total	18	100

Observation:

It is observed that 72% libraries have taking efforts to provide access to the open access resources from the library. Rest of the libraries do not provide such facilities.

Q. X.2 How are libraries providing access to e-resources.

Respondent were requested to select more than one option if required.

Table 7.99– How libraries providing access to e-resources

Response	Respondent	Percentage
Through separate link on library website	11	90.13
Federated search	2	25.21
Through OPAC	3	30.77
Any other	0	0.00

Observation:

90% libraries are providing the list of open source resources with links to their library website. 25% libraries are providing access through federated search, and 30.77% libraries are providing access to open source resources through OPAC.

XI. Technical Issues

Q. XI.1. Type of internet connection used by libraries.

Table 7.100– Type of internet connection used by libraries

Response	Respondent	Percentage
Leased Line	18	100

V-SAT	0	0.00
Radio Link	0	0.00
DSL	0	0.00
Any other	0	0.00
Total	18	100

Observation:

All the libraries are using leased line for the internet connection.

Q. XI.2. Internet service provider

Table 7.101 - Internet service provider

Response	Respondent	Percentage
BSNL	13	72.22
ERNET	2	11.11
NICNET	0	0.00
Any other	3	16.67
Total	18	100

Observation:

72% libraries are using BSNL, 11% libraries are using ERNET and 17 % libraries are using another internet service provider. NKRC, RILTEL and NKN network providers libraries also uses.

Q. XI.3. Availability of Wi-Fi in the library

Table 7.102 - Availability of Wi-Fi in the library

Response	Respondent	Percentage
Yes	9	50
No	9	50
Total	18	100

Observation:

50% libraries have made available Wi-Fi to their users and remaining 50% libraries do not provide.

Q. XI.4. Are you satisfied with the Internet speed?

Table 7.103 - Are you satisfied with the Internet speed

Response	Respondent	Percentage
Yes	18	100
No	00	00
Total	18	100

Observation:

All the libraries are satisfied with the present internet speed.

Q. XI.5. Availability of separate library server for the library.

Table 7.104- Availability of separate library server for the library

Response	Respondent	Percentage
Yes	14	77.78
No	4	22.22
Total	19	100

Observation:

78% libraries are having separate library server for their library to manage their activities.

XI.6. Name of the library server.

Only 7 libraries responded the question

Table 7.105- Name of the library server which libraries using

Sr. No.	Respondent	Server Name
1	Armament Research and Development Establishment	HP ProLiant DL 380 G9 (Linux)
2	Automotive Research Institute of India	IBM Server, Location ITM Dept.

3	Indian Institute of Science Education and Research	HPDL 160G6 HP MSA2000SA
4	Inter-University Centre for Astronomy and Astrophysics (IUCAA)	HPDL 180 Gen 9
5	National Centre for Cell Science	HP ProLiant ML 350 In Library
6	National Centre for Radio Astrophysics (NCRA)	Fuzitsu
7	National Chemical Laboratory	HP ProLiant DL 380, Generation 9

Observation:

71.44% libraries are using HP server, 14.28% Libraries using IBM server and Fuzitsu Server. These are good producers.

Q. XI.7. Who is managing library server.

Table 7.106- Who is managing library server

Response	Respondent	Percentage
Library Staff	0	00.00
IT Personnel of the institute	6	42.85
Library Staff with the help of IT Personnel of the institute	8	57.15
Total	14	100

Observation:

It is observed that 57% libraries have managed library server by library staff with the help of IT Personnel of the institute and 43% libraries managed with IT Personnel of the institute only.

Q. XI.8. Managing technical requirements of e-resources.

Table 7.107- Managing technical requirements of e-resources

Response	Respondent	Percentage
Library Staff	2	11.11

IT Personnel of the institute	2	11.11
Library Staff with the help of IT Personnel of the institute	14	77.78
Total	18	100

Observation:

78% libraries manage technical issues of e-resources through their library staff and with the help of IT Personnel of the institute. 11% libraries, Library Staff is managing technical requirements of e-resources. In 11% libraries, IT Personnel of the institute are taking care of the technical requirements of e-resources.

XI.9. Availability of separate trained staff for managing e-resources.

Table 7.108- Availability of separate trained staff for managing e-resources

Response	Respondent	Percentage
Yes	5	27.78
No	13	72.22
Total	18	100

Observation:

72% libraries do not have a separate trained staff for managing e-resources.

Q. XI.10. Prompt support from IT personnel

Table 7.109- Prompt support from IT personnel

Response	Respondent	Percentage
Yes	16	88.89
No	2	11.11
Total	18	100

Observation:

89% libraries are getting prompt support from the IT personnel for managing technical issues of e-resources.

Q. XI.11. Do you check and update computer infrastructure required for e-resources before its subscription of e-resources?

Table 7.110–Updating computer infrastructure

Response	Respondent	Percentage
Yes	16	88.89
No	2	11.11
Total	18	100

Observation:

The data shows that 89% libraries updating computer infrastructure required for e-resources before its subscription of e-resources and regular update infrastructure.

Q. XI.12 Efficiency of library staff in handling e-resources.

Table 7.111–Efficiency of library staff in handling e-resources

Response	Respondent	Percentage
All are efficient	9	50
Majority are efficient	8	44.44
Majority are not efficient	1	5.26
None is efficient	0	00
Total	18	100

Observation:

It is observed that 50% librarians felt that all their library staff is efficient in handling e-resources and 44.44% librarians thought that majority of their library staff is efficient in handling e-resources and they are managing it and 5.26% librarians felt that majority of their library staff is not efficient in handling e-resources.

XII. Copyright:

Q. XII.1. Does library staff have knowledge about copyright of e-resources?

Table 7.112– Library staff's knowledge about copyright of e-resources

Response	Respondent	Percentage
Yes	15	88.89
No	3	11.11
Total	18	100

Observation:

89 % libraries indicated that their library staff is having knowledge of copyright of e-resources. When the researcher discussed with the library staff, it was noticed that many of them were not aware of the copyright law for e-resources though they know law for print material.

Q. XII.2. Efforts taken by the libraries to educate users regarding copyright issues.

This was a multiple-choice question asked to understand the libraries efforts to educate their users regarding copyright issues.

Table 7.113– Efforts taken by the libraries to educate users regarding copyright issues

Response	Respondent	Percentage
Explaining in user's education Programmes	5	27.78
Explaining orally to the users	10	55.56
Displaying on the website	5	27.78
Any other	0	0.00

Observation:

The data shows that 56% libraries explained copyright issue to their users orally. 28% libraries explain the copyright issue through user's education programmes. 28% libraries explain the copyright issue by displaying information regarding copyrights on their website. Copyright awareness to users is now essential as e-resources can be easily pivoted.

Q. XII.3. Measures used by libraries to control the copyright /digital rights of e-resources by libraries.

Table 7.114– Measures used by libraries to control the copyright /digital rights of e-resources by libraries

Response	Respondent	Percentage
Special security measures	5	27.78
Anti-plagiarism software	6	33.33
Any other	7	38.89

Observation:

It is observed that 39% libraries are taking special measures to control the

copyright/digital rights of e-resources. 33% libraries are using anti-plagiarism software to control the copyright/digital rights of e-resources and 28% libraries are using other measures like instructing users orally to control the copyright/digital rights of e-resources.

Q. XII.4. Limitations imposed by the library for copyright portions of licensed materials that has been forbidden.

Table 7.115– Limitations imposed by the library for copyright portions of licensed materials that has been forbidden

Response	Respondent	Percentage
Stop access for a specific period	6	60.00
Cancel membership	2	20.00
File a case	0	00.00
Any other	2	20.00
Total Respondent Libraries	10	100

Observation:

60% libraries take action by stopping the user's access for a certain period of time period if they break copyright rules, 20% libraries cancel the user's membership and 20% libraries take other measures like verbal warning etc.

XIII. Challenges and services provided by the libraries.

XIII.1. Rate the challenges that libraries are facing while managing digital library collection.

Questions was asked regarding few challenges, that libraries are facing while managing digital library collection. The response and analysis are mentioned below in the common table, and independent analysis is also provided.

Table 7.116– challenges that libraries are facing while managing digital library collection

Statement	Strongly disagree 1	Disagree 2	Undecided 3	Agree 4	Strongly Agree 5
Lack of Funds	2	3	2	3	8

Variation in Pricing Model of e-resources	3	5	2	4	4
Lack of trained staff	7	4	4	2	1
Lack of Infrastructure	4	2	3	4	5
Lack of Demand	9	3	2	3	1
Lack of Usage	5	8	2	1	2
Lack of awareness about e-resourcesamong users	2	4	2	3	7
Lack of technical support	4	3	2	3	6
Copyright concerns	4	3	6	3	2
Complex licensing agreements	3	4	3	4	4
Library staff's resistance to adopt change	3	5	2	5	3
Problem in preservation and archiving	2	4	5	5	2
Poor Role of Library Consortia	5	3	4	4	2
Lack of autonomy in decision making process	5	4	1	3	5
Technological obsolescence	3	3	2	4	6

The detailed analysisgiven in following tables -

1. **Lack of Funds.**

Table 7.117 - Lack of Funds

Challenge – Lack of fund	Respondent	Percentage	Percentage
Strongly disagree	2	11.11	27.78
Disagree	3	16.67	
Undecided	2	11.11	11.11
Agree	3	16.67	61.11
Strongly Agree	8	44.44	

2. Variation in Pricing Models of e-Resources.

Table 7.118 - Variation in Pricing Models of e-Resources

Challenge – Variation in Pricing Model of e-resources	Respondent	Percentage	Percentage
Strongly disagree	3	16.67	44.45
Disagree	5	27.78	
Undecided	2	11.11	11.11
Agree	4	22.22	44.44
Strongly Agree	4	22.22	

3. Lack of trained staff.

Table 7.119 - Lack of trained staff

Challenge – Lack of trained staff	Respondent	Percentage	Percentage
Strongly disagree	7	38.89	61.11
Disagree	4	22.22	
Undecided	4	22.22	22.22
Agree	2	11.11	16.67
Strongly Agree	1	5.56	

4. Lack of Infrastructure.

Table 7.120 - Lack of Infrastructure

Challenge – Lack of Infrastructure	Respondent	Percentage	Percentage
Strongly disagree	4	22.22	33.33
Disagree	2	11.11	
Undecided	3	16.67	16.67
Agree	4	22.22	50
Strongly Agree	5	27.78	

5. Lack of Demand.

Table 7.121- Lack of Demand

Challenge – Lack of Demand	Respondent	Percentage	Percentage
Strongly disagree	9	50	66.67
Disagree	3	16.67	
Undecided	2	11.11	11.11
Agree	3	16.67	22.22
Strongly Agree	1	5.55	

6. Lack of Usage.

Table 7.122 - Lack of Usage

Challenge – Lack of Usage	Respondent	Percentage	Percentage
Strongly disagree	5	27.78	72.25
Disagree	8	44.44	
Undecided	2	11.11	11.11
Agree	1	5.56	16.28
Strongly Agree	2	11.11	

7. Lack of awareness about e-resources among users.

Table 7.123 - Lack of awareness about e-resources among users

Challenge – Lack of awareness about e-resources among users	Respondent	Percentage	Percentage
Strongly disagree	2	11.11	33.33
Disagree	4	22.22	
Undecided	2	11.11	
Agree	3	16.67	55.56
Strongly Agree	7	38.89	

8. Lack of technical support.

Table7.124 - Lack of technical support

Challenge – Lack of technical support	Respondent	Percentage	Percentage
Strongly disagree	4	22.22	38.89
Disagree	3	16.67	
Undecided	2	11.11	11.11
Agree	3	16.67	50
Strongly Agree	6	33.33	

9. Copyright concerns.

Table 7.125- Copyright concerns

Challenge – Copyright concerns	Respondent	Percentage	Percentage
Strongly disagree	4	22.22	38.89
Disagree	3	16.67	
Undecided	6	33.33	33.33
Agree	3	16.67	27.78
Strongly Agree	2	11.11	

10. Complex licensing agreements.

Table7.126 - Complex licensing agreements

Challenge – Complex licensingagreements	Respondent	Percentage	Percentage
Strongly disagree	3	16.67	38.89
Disagree	4	22.22	
Undecided	3	16.67	16.67
Agree	4	22.22	44.44
Strongly Agree	4	22.22	

11.Library staff's resistance to adopt change.

Table 7.127 - Library staff's resistance to adopt change

Challenge – Library staff's resistance to adopt change	Respondent	Percentage	Percentage
Strongly disagree	3	16.67	44.45
Disagree	5	27.78	
Undecided	2	11.11	11.11
Agree	5	27.77	44.44
Strongly Agree	3	16.67	

12. Problem in preservation and archiving.

Table 7.128 - Problem in preservation and archiving

Challenge – Problem in preservation and archiving	Respondent	Percentage	Percentage
Strongly disagree	2	11.11	33.33
Disagree	4	22.22	
Undecided	5	27.78	27.78
Agree	5	27.78	38.89
Strongly Agree	2	11.11	

13. Poor Role of Library Consortia.

Table 7.129 - Poor Role of Library Consortia

Challenge – Poor Role of Library Consortia	Respondent	Percentage	Percentage
Strongly disagree	5	27.78	44.45
Disagree	3	16.67	
Undecided	4	22.22	22.22
Agree	4	22.22	33.33
Strongly Agree	2	11.11	

14. Lack of autonomy in decision making process.

Table 7.130- Lack of autonomy in decision making process

Challenge – Lack of autonomy in decision making process	Respondent	Percentage	Percentage
Strongly disagree	4	22.22	50.00
Disagree	5	27.78	
Undecided	1	5.55	5.55
Agree	3	16.67	44.45
Strongly Agree	5	27.78	

15. Technological obsolescence.

Table 7.131- Technological obsolescence

Challenge – Technological obsolescence	Respondent	Percentage	Percentage
Strongly disagree	3	16.67	33.34
Disagree	3	16.67	
Undecided	2	11.11	11.11
Agree	4	22.22	55.55
Strongly Agree	6	33.33	

Table 7.132 – Summary - challenges that libraries are facing while managing digital library collection

Sr. No.	Challenges faced while managing digital resources	Comments of professional Agree + Strongly Agree	Comments of professional Disagree + Strongly Disagree
1	Lack of Funds	61.11%	27.78%
2	Variation in Pricing Model of e-resources	44.44%	44.45%
3	Lack of trained staff	16.67%	61.11%

4	Lack of Infrastructure	55.00%	33.33%
5	Lack of Demand	22.22%	66.67%
6	Lack of Usage	16.17%	72.22%
7	Lack of awareness about e-resources among users	55.56%	33.33%
8	Lack of technical support	50%	38.89%
9	Copyright concerns	27.78%	38.89%
10	Complex licensing agreements	44.44%	38.89%
11	Library staff's resistance to adopt change	44.44%	44.45%
12	Problem in preservation and archiving	38.89%	33.33%
13	Poor Role of Library Consortia	33.33%	44.45%
14	Lack of autonomy in decision making process	44.45%	50%
15	Technological obsolescence	55.55%	23.34%

Observation:

Challenges faced by libraries while managing digital resources are analysed and it is notices that libraries are agreeing to following problems faced by them-

1. Lack of funds (61.11%)
2. Lack of awareness about availability of e-resources (55.56%)
3. Lack of technical support (50%)
4. Lack of infrastructure (55.00%)
5. Technological obsolescence (55.55%)

The opinion placed by librarians are reality. Libraries are strongly agreeing on problem lack of funds and this issue stand in first place (61.11%) in ranking position, lack of awareness about availability of e-resources among users stand second (55.56%) in ranking and Technological obsolescence third (55.55%) in ranking.

The librarians are disagreeing for the issues like

1. Lack of trained staff in library (61.11%)
2. Lack of demand of e-resources from users (66.67%)
3. Lack of usage (72.22%)
4. Lack of autonomy in decision making process (50%)

These opinions are also true and this indicate that libraries have properly marked priorities of issues.

XIII.2. Services provided by the libraries using e-resources:

The question was asked to understand the services provided by the libraries using e-resources.

Table 7.133–Services provided by the libraries using e-resources

Services offered	Respondent	Percentage
Reference Service	18	100
Current Awareness Service	14	77.78
Selective Demission Service	13	72.22
Document Delivery Service	15	83.33
Table of Content Service	8	44.44
Bibliography Services	12	66.66
Translation Service	1	5.55
Reprographic Service	14	77.77
Referral Services	13	72.22
Any other	00	100
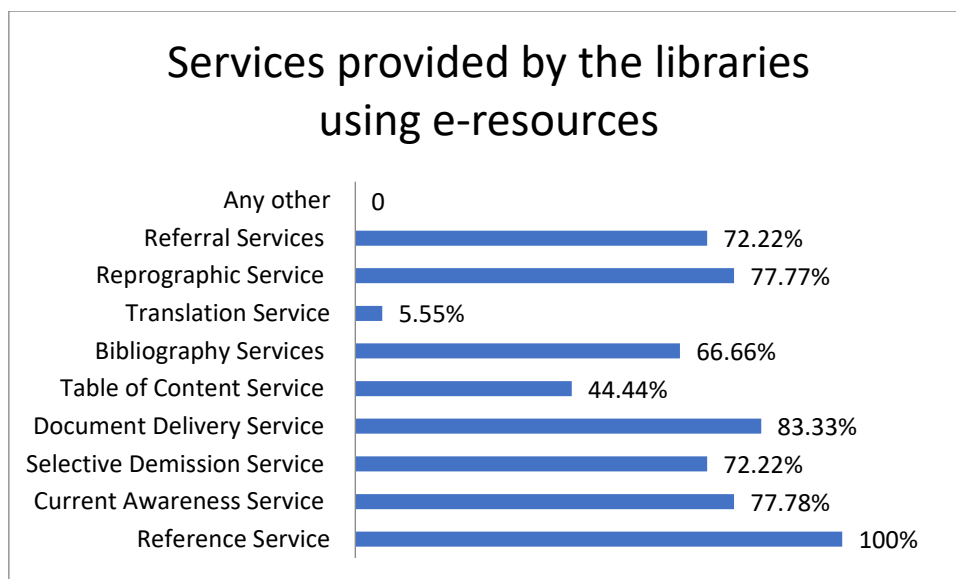
Fig 7.50–Services provided by the libraries using e-resources

Observation:

All the libraries are providing reference services. Document Delivery Services are provided by 83.33% users, Reprographic Services and Current Awareness Services are provided by 78% libraries. 72% libraries providing Referral Services and Selective Demission Service. 67% libraries offer Bibliography Services. 44% libraries are providing, Table of Content Service. Although Translation Service is very important to service in S&T libraries but only one library is providing it.

Summary of Librarians Survey:

From the libraries survey and responses received from the librarians it is understood that although libraries are spending major portion of their budget on e-resources, still most the libraries don't have written collection development policy for e-resources management. Librarians of research libraries are well qualified but they need special training for managing e-resources. Libraries efforts for user's orientation are not up to the mark. None of the libraries are having separate trained library staff for managing e-resources. 83% libraries provide campus-wide access to the e-resources and most of them provide access to e-resources from the library website and OPAC. It is very positive sign that most of the libraries (72%) have digital repositories. None of the library have written promotion plans for e-resources. Libraries are agreeing to problems faced by them- lack of funds, lack of awareness about availability of e-resources, lack of technical support, lack of infrastructure, technological obsolescence etc. The

librarians are disagreeing for the issues like -lack of trained staff in library, lack of demand of e-resources for users, lack of usage, lack of autonomy in decision making process etc. These opinions are also true and this indicate that libraries have properly marked priorities of issues.

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7.1 Introduction

The researcher used structured questionnaire for collection of user's data to assess the use of e-resources by them and also to identify issues and problems faced while consulting e-resources by users. The questionnaires were distributed among the users of Science Research Institutes in Pune city. The data collected from the users of the Science Research Institutes was analyzed and systematically presented in this chapter.

The researcher has personally visited all the selected research institutes and met the users to collect the data. It was a great opportunity for the researcher to interact with the users and to understand their difficulties and opinion regarding the use of e-resources. Since researcher personally contacted users and faculties for the collection of the data, the responses received for the user survey is 100% (628 received out of 628 circulated among the users.). The strength of the users is presented in the following table 7.134.

Table 7.134- Strength of the users

Sr. No	Institute Name	Courses Conducted	Total PG Students	Sample Population (10%)	Research er Scholar/S cientific Staff	Sample Population (10%)	Faculty Populat ion	Sampl e Popul ation
1	Agharkar Research Institutes	Ph. D	50	5	50	5	40	4
2	Armament Research and Development Establishment	Continuing Education Programme	100	10	500	50	-	-
3	Automotive Research	B. Tech, M. Tech and Ph. D	262	26	461	46	9	1

	Association of India							
5	Central Institute of Road Transport.	Short Course Transport Management	-	-	85	9	9	1
6	Central Water Power Research Station (CWPRS)	Training Programme and Workshop	-	-	256	26	-	-
7	Centre for Development of Advanced Computing (C-DAC)	PG Diploma	700	70	600	60		
8	Defence Institute of Advance Technology	M. Tech, Ph. D	495	50	116	12	80	8
9	High Energy Material Research Laboratory	-	-	-	300	30	-	-
10	Indian Institute of Science Education and Research	BS-MS, Ph. D	353	35	80	8	140	14
11	Indian Institute of Tropical Metrology	M. Tech, M. Sc., Ph. D	9	1	243	24	-	-
12	Inter-University Centre for Astronomy and	-	10	1	36	4	23	2

	Astrophysics (IUCAA)							
13	National AIDs Research Institute	Ph. D	15	2	-	-	20	2
14	National Centre for Cell Science	Ph. D, Cell Culture	-	-	125	12	32	3
15	National Centre for Radio Astrophysics (NCRA)	MSc, Integrated PhD, PhD, Post Doc, Visiting Research Programme	6	1	20	2	20	2
16	National Chemical Laboratory	Ph. D, M. Tech	33	3	194	19	63	6
17	National Institute of Virology	Ph. D, M.Sc.	43	4	17	2	38	4
18	National Research Centre for Grapes	Ph. D	-	-	45	4	17	2
19	Research and Development Establishment	-	-	-	580	58	-	-
	Total		2076	208	3708	371	491	49

Observation:

Eighteen science research institutes in Pune are considered for the survey. The population of the student on campus is 2076. This includes students in Master degree and Ph.D. programme. Only PG students are considered for the study and UG are excluded from the survey. The students sample selected for the study is 10% i.e. 208. The strength of scientist/scientific staff is 3708 and the sample selected for the study of scientist/scientific staff is 371. There are total 491 full-time faculties in selected science research institutes and for survey out of which 10 % faculties i.e. 49 are selected for

this study. Researcher has personally visited to all the respondent and got questionnaires filled from them. Librarians of all science research institute have helped the researcher while survey and provided all the facilities to meet users.

The overall population of survey which includes Ph.D. students, researcher, scientist, faculties among 18 research institute is 6275. Researcher has selected 10 % sample from each population individually i.e. from Ph.D students, Researcher Scholar/Scientific Staff and faculties. Thus 628 sample is selected for this study. As per Morgan Table for the known population 6275, the sample selection can be 361-364 (6000-7000). However, the sample selected 10% is higher than the figure of Morgan Table and researcher has fixed sample size as 628 for the user's survey.

Part A: Personal Information.

In Part A, consist of question on personal information and many respondents have not disclosed the personal information, some aspects were optional like name, age department etc. The researcher received information from respondent noticed that in R&D institutes women participation is almost 30%. The researchers have varied qualifications but almost all are PG in scientific field and faculties and scientists all are Ph.D. holders. The area of interest of users is science of respective institutes e.g. NCL – Chemistry and chemical technology, ARI – biological sciences, TIFR-NCRA astronomy and astrophysics etc.

Part B: Awareness about e-resources.

The researcher asked few questions to assess users' awareness about e-resources. The questions like type of resources they are using for study and research, awareness about the availability of e-resources in the library, how do they get information about the availability of electronic resources in libraries etc. were asked.

Q. B.1 Type of resources used for research.

Table 7.135- Type of resources used for research

Resources	Respondent	Percentage
Electronic	156	25
Print	117	19

Both	355	56
Total	628	100
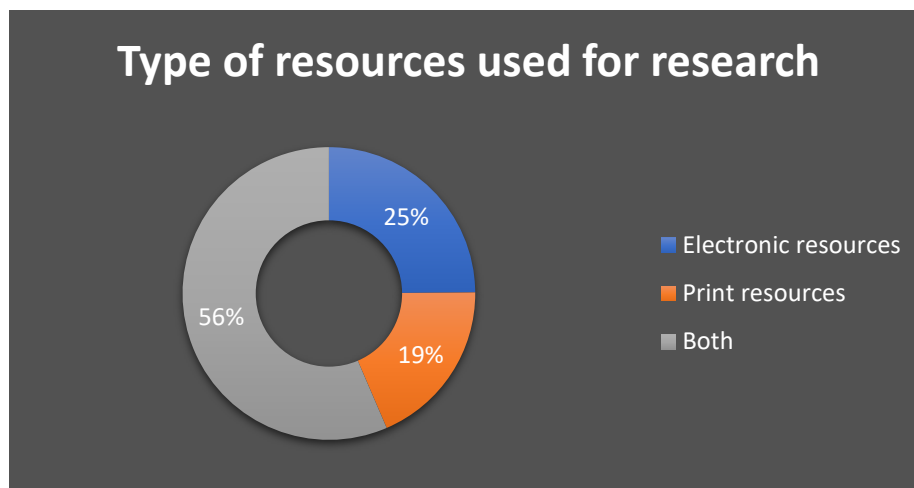
Fig 7.51- Type of resources used for research

Observation:

The data clearly indicate that though e-resources are more popular than print resources (25% users only use e-resources for their research work), but 19% users are still using print resources for their research work. 56% users are using both print and electronic resources i.e. print and e-resources for their research purpose. But it is very clear that e-resources use is prominent in research S&T libraries.

Q. B. 2. Awareness about availability e-resourcesin your library.

The multiple-choice question and was asked to assess the user's awareness about the availability of e-resourcesin the library.

Table 7.136 Awareness about availability e-resources in your library

Resources	Yes		No	
	Respondent	Percentage	Respondent	Percentage
CD ROM	293	47	335	53
E-Journals	557	89	71	11
E-Books	490	78	138	22

E-Theses	301	48	327	52
Free Online Resources	538	86	90	14
Video/Lectures	288	46	340	54

Observation:

The data shows that users are more aware of the availability of the e-resources like e-journals, e-books, free online resources (more than 78%). But users are not aware of the availability of CD-ROM (53%) in the library as well video lectures (54%). 86% users are aware of availability of free online resources accessible through internet as open access.

Q. B.3 Information about availability of e-resources in library?

The multiple-choice question was asked to know the habit of users in getting information about the availability of e-resources from library.

Table 7.137- Channel informing users about availability of e-resources

Channel	Respondent	Percentage
Through library website	412	65.61
Through library notices, training	281	44.75
Through colleagues	254	40.45
Through own knowledge	176	28.03
Through conferences/seminars	111	17.68
Referred personally by Librarian	195	30.89
Library Alert services	194	30.89
Library visit	326	51.91
Any other	000	00.00
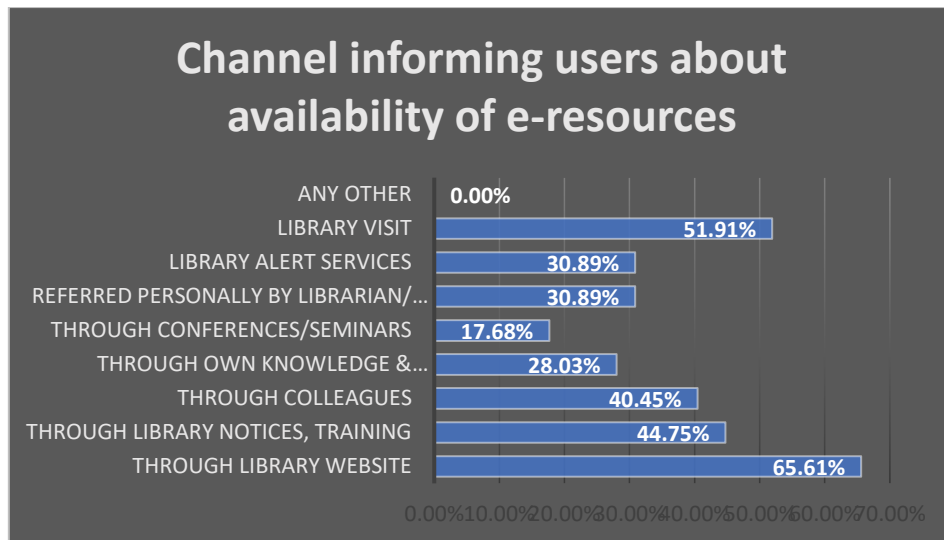
Fig 7.52- Channel informing users about availability of e-resources

Observation:

The users of libraries are getting information about e-resources from library website which is most used platform to display the library resources. 66% users get information about the availability of e-resources through library website. Visits to libraries also plays an important role in keeping users informed about the e-resources in libraries. 52% get information from visit to libraries. 45% users get information through library notices, training etc. whereas 40% get information through colleagues. Library alert service help 30.89% users to get the information about availability of e-resources and librarians personal reference help users to get information about availability of e-resources. 31% users get information thought their own knowledge and experience and 17.68% users get it through conferences/seminars etc.

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Part C: Preferences

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In this part, researcher tried to understand the user's preference about use of resource for their study. Questions like - user's opinion about advantages of e-resources over print resources, user's choice - print resources or e-resources and user's degree of preference for e-resources were asked.

Q. C.1 Users opinion about advantages of e-resources over print resources.

This question was asked to understand user's opinion about advantages of e-resources over print resources.

Table 7.138- Advantages of e-resources over print

Users Opinion	Responses	Percentage
Strongly Agree	155	25
Agree	426	68
Disagree	46	7
Strongly Disagree	1	0.2
Total	628	100
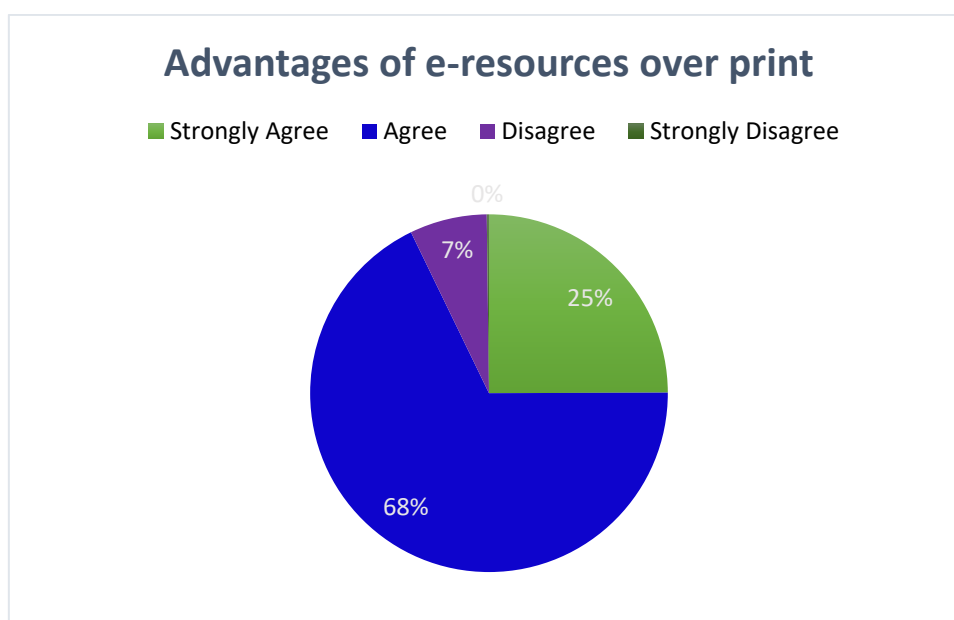
Fig 7.53 - Advantages of e-resources over print

Observation:

Almost 93% users indicated that the e-resources are strongly useful and agreed to the opinion of use. The reason for agreeing is more e-resources are available in S&T area.

C.2 Degree of preference to the electronic resources.

The question was asked to understand user's degree of preference of users for e-resources.

Table 7.139- Degree of preference to e-resources

E-resources	Most Preferred	Preferred	Less Preferred	Not Preferred
E-Books	136	110	187	39
e-Journals/Databases	340	238	33	17
CD-ROM	59	151	237	181
Patents/Standards	110	186	207	125
Internet/The Web Information	390	164	34	40
Open Sources Resources	266	230	77	55

Observation:

It is evident from the data that Internet resources are most preferred-resources followed by the e-journals/databases and Open Source Resources. CD-ROM and e-books are less preferred by users in S&T libraries. Patent are used by very limited users, those who work in R&D center labs.

D. Searching

e-Resources are very user-friendly, but still, the use of search tool and technique always helps to get the required data quickly and accurately. In this part, researcher tries to assess the user's searching habit and skills used while consulting e-resources.

Q. D.1 Searching for electronic resources.

This is a multiple-choice question and was asked to find out how users search for the e-resources.

Table 7.140- Searching for electronic resources

Source	Response	Percentage
General Search Engine	547	87.10
Academic Search Engine	253	40.29
Publishers Website	268	42.52
Subject Databases	195	31.05

Library Catalogue	230	36.62%
Federated Search	1	0.16%
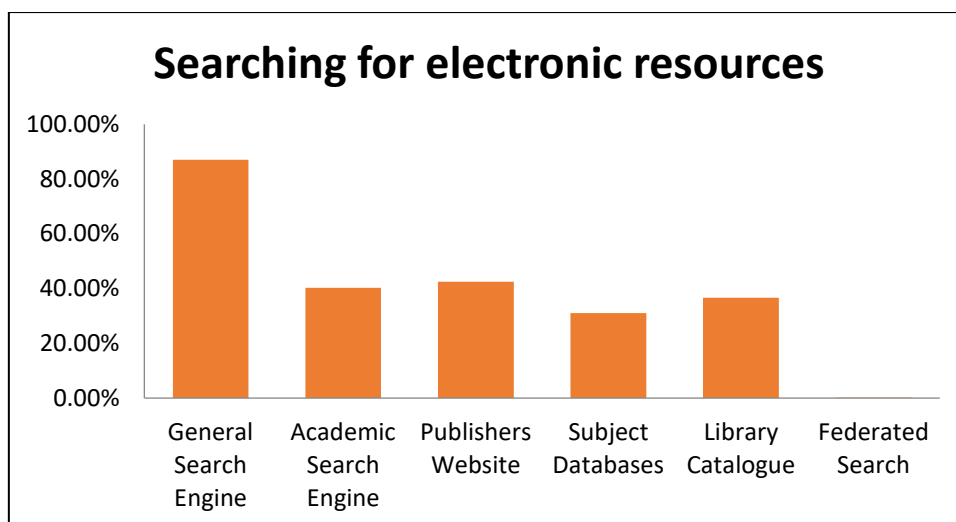
Fig 7.54 - Searching for electronic resources

Observation:

Most of the users (87%) prefer general search engines for searching e-resources followed by publishers' website (42.52%), academic search engine (40.29%) etc. Only 37% users using the library catalogue and 31% prefer subject database. Almost none of the users are using the federated search facility. The reason behind this is most of the libraries doesn't have the federated search service facilities.

Q. D.2 Frequency of getting required information.

Table 7.141- Frequency of getting required information

Getting	Response	Percentage
Always	313	49.84
Mostly	285	45.38
Rarely	22	3.50
Never	8	1.27
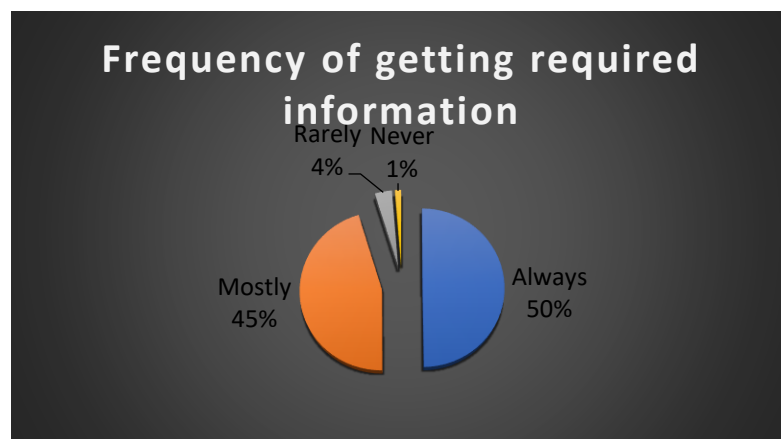
Fig 7.55 - Frequency of getting required information

Observation:

The collected data indicates that users are very much satisfied with e-resources since 95% users opinioned that they need information regularly on the area they work, 50% users opinined that always required information available in the e-resources and 45% users mostly required information in e-resources form.

Q. D.3 Assistance for Searching e-resources.

Table 7.142- Assistance for searching e-resources

Sr. No.	Assistance for Searching e-resources	Responses	Percentage
1	Your own efforts	313	49.84
2	With the help of library staff	285	45.38
3	Colleagues/friends guidance	16	2.54
4	Any other	14	2.24
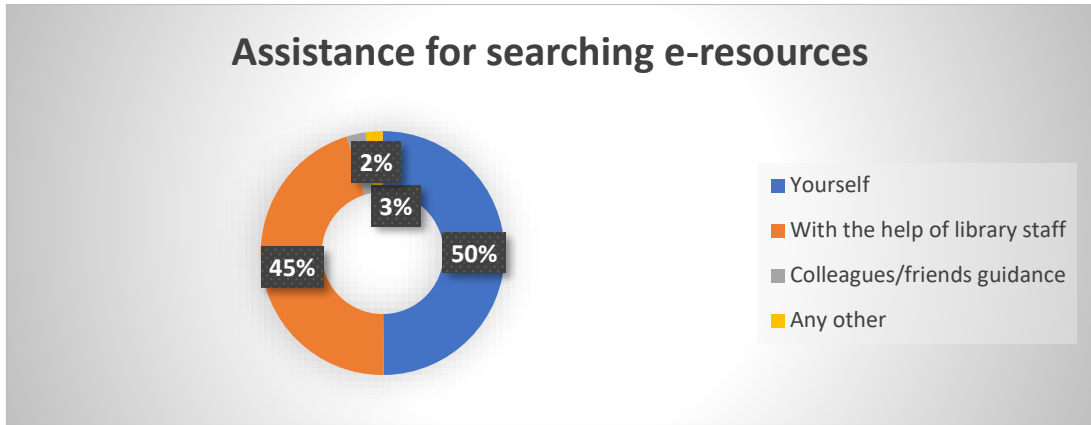
Fig 7.56 - Assistance for searching e-resources

Observation:

50% users search e-resources with their own knowledge. 45% users take help from library staff and 2.54 % seeking help from the colleagues/friends etc.

Q. D.4 Frequency of taking assistance for searching e-resources.

Table 7.143- Frequency of taking assistance for searching e-resources

Sr. No.	Assistance for Searching e-resources	Responses	Percentage
1	Always	61	9.71
2	Sometimes	67	10.67
3	Rarely	495	78.82
4	Never	5	0.80
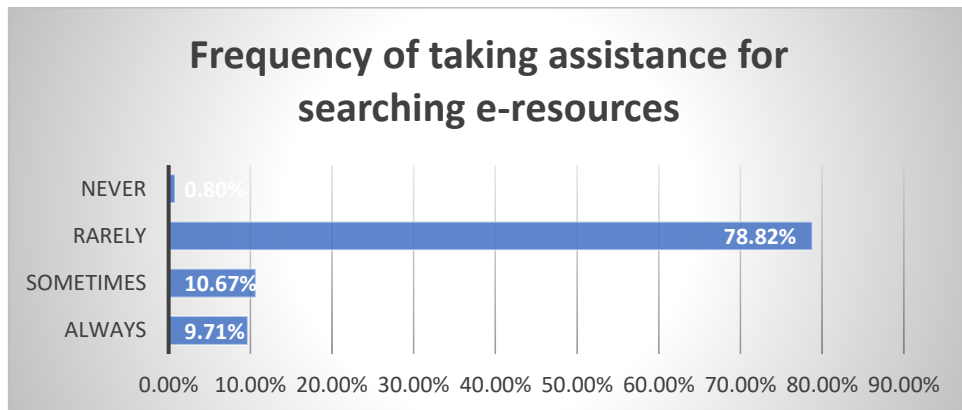
Fig 7.57 - Frequency of taking assistance for searching e-resources

Observation:

Mostly R&D/research libraries users are aware of searching tools and methods for getting information from e-resources. Most of the users (79%) rarely need assistance from others for searching e-resources. 10.67% users take help sometimes while exploring e-resources.

Q. D.5 Search options used while searching information from e-resources.

Table 7.144- Preferred search options

Sr. No.	Preferred search option	Responses	Percentages
1	General Search	421	67.04
2	Advanced search	206	32.80
3	Federated Search	1	0.16
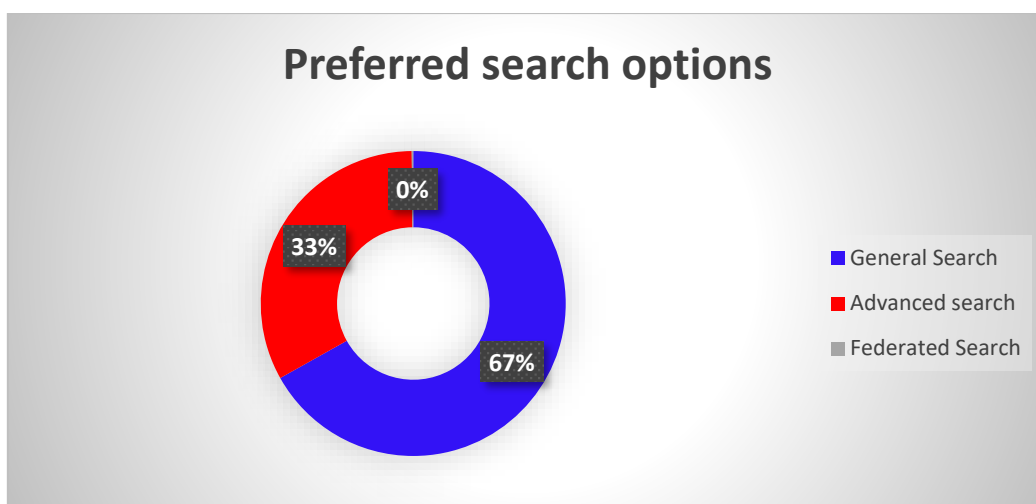
Fig 7.58 - Preferred search options

Observation:

Most of the users (67%) prefer general search option while searching for the information from e-resources. 33% users use advanced search option. None of the users are using federated search.

Q. D.6 Preferred search access approach.

Table 7.145- Preferred search access approach

Sr. No.	Preferred search approach	Responses	Percentage
1	Author	95	15.12
2	Keyword	294	46.82
3	Journal Title	32	5.09
4	Article Title	53	8.44
5	Date of Publication	10	1.59
6	DOI	17	2.72
7	Subject	127	20.22
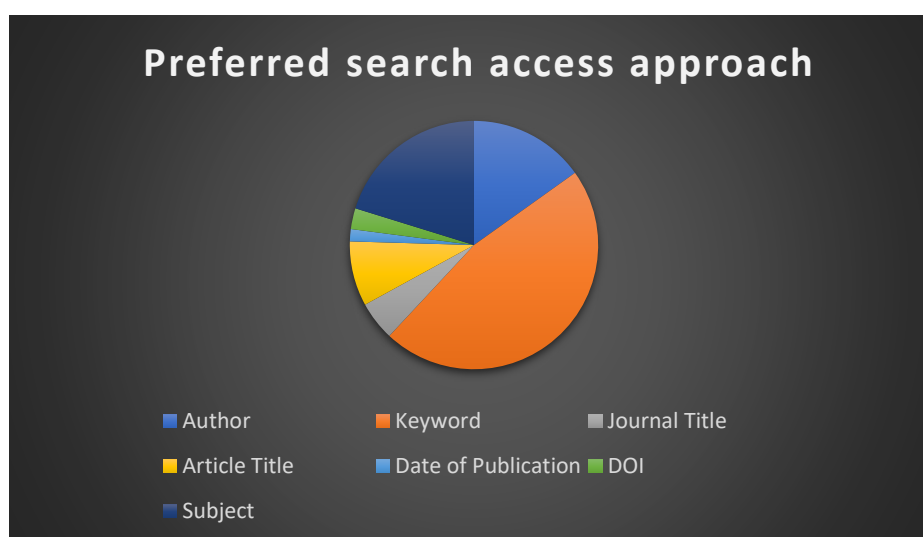
Fig 7.59 - Preferred search access approach

Observation:

Keyword approach (47%) is most preferred approach by users while searching information from e-resources. The subject approach (20%) is used by research users. 15% users are preferring author approach. Other approaches like journal title, article title, date of publication, DOI are very less preferred. This clearly indicate that R&D/research library users are searching information using access points like keywords, subjects more as compared to other search elements.

Q. D.7 Use of advanced search options.

594 Users responded to this question.

Table 7.146- Use of advanced search options

Sr. No.	Use of advanced search options	Responses	Percentage
1	Boolean Operators	175	29.60
2	Truncation Search	59	9.90
3	Field Searching	126	21.20
4	Phrases	225	37.80
5	Wild Card Searching	9	1.50

Observation

Phrases searching are more commonly used by 38% users, followed by Boolean operators by 30% users. Truncation Search, Field Searching, Wild Card searching are also used but very few users know these skills.

Q. D.8 Acquiring electronic resources searching skills/techniques.

Searching skills are very much essential for getting required information quickly and accurately, hence question was asked to understand how users acquire these skills.

Table 7.147- Acquiring electronic resources searching skills/techniques

Sr. No.	Acquiring electronic resources searching skills/techniques	Responses	Percentage
1	Self-Study	424	67.52
2	Library Training from staff	82	13.06
3	Help from friends/colleagues	92	14.65
4	Training Programs	30	4.77
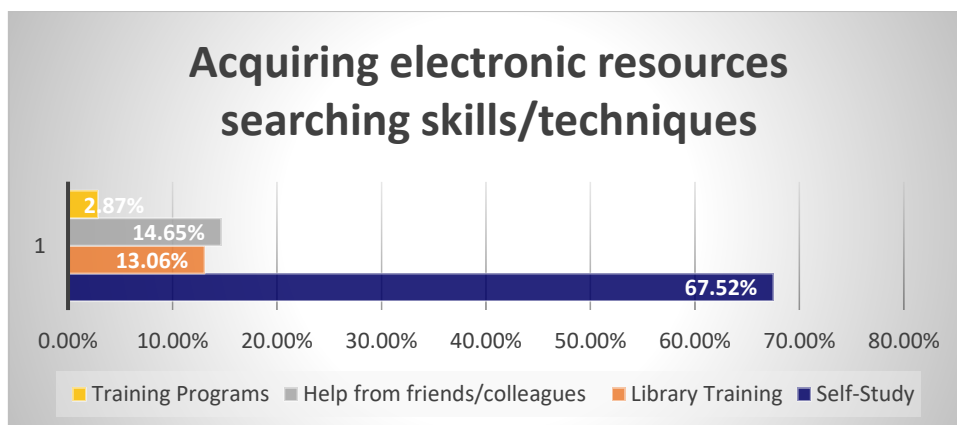
Fig 7.60 - Acquiring electronic resources searching skills/techniques

Observation:

It is observed that 68% users acquire searching skills by self-experience of searching and study. 15% users take help from friends/colleagues, and only 13 % users take help from library staff. 4.77% users attend training programme for acquiring electronic resources searching skills/techniques.

E. Use of e-resources

Q. E.1 Experience in Using e-resources:

Table 7.148- Experience in Using e-resources

Sr. No.	Use of E-resources	Responses	Percentage
1	1-2 Years	47	7.48
2	2-5 Years	215	34.24
3	More Than 5 Years	366	58.28
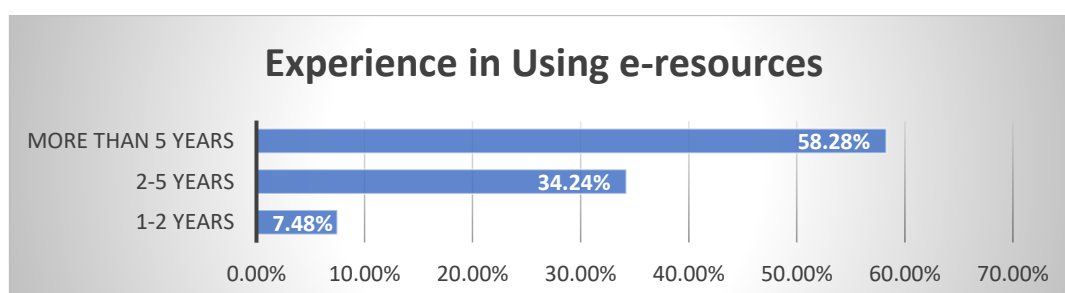
Fig 7.61 - Experience in Using e-resources

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Observation:

Most of the users (58%) are having expertise in using e-resources as they are using it for more than five years. 34% users are using e-resources for nearly 2- 5 years. Only 7% users are using it since year.

Q. E.2 Reasons for choosing e-resources.

The multiple-choice question was asked to understand why users select e-resources more than print resources.

Table 7.149- Reasons for choosing e-resources

Sr. No.	Characteristics of e-resources	Responses	Percentage
1	User-friendliness	421	67.04
2	24*7	473	75.32
3	Hyperlinking and Multimedia	176	28.03
4	Easy searching	371	59.08
5	Multiple user's access	121	19.27
6	Easy availability to download	199	31.69
7	Globally availability	344	54.78
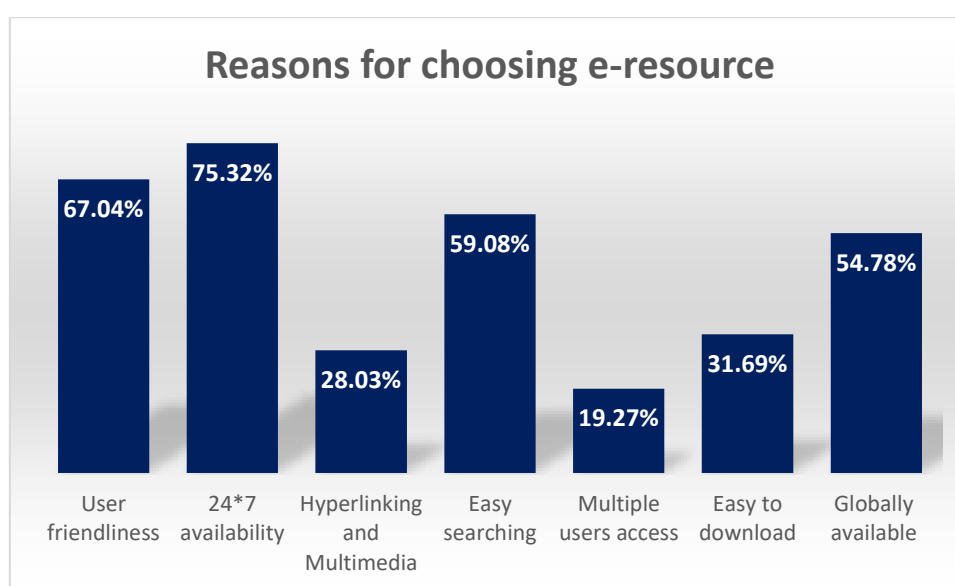
Fig 7.62 – Reasons for choosing e-resources

Observation:

Users are now preferring use of e-resources more due to its qualities like user friendly, 24*7 accessibility, easy search and downloads and global access to information. It is also observed in survey that 75.32% opted preference using e-resources due to its 24*7 availability of e-resources. 67 % users like the user-friendliness of e-resources, 59% users like easy searching facility available in e-resources and 54% like the characteristic globally availability of the e-resources. 32 % users like the characteristic easy to download, 28% users like hyper linking and multimedia and 19% users like multiple users' access.

Q. E.3 Most used part from e-journals.

Table 7.150- Most used part of e-Journal

Sr. No.	e-Journal Part	Responses	Percentage
1	Table of contents	107	17.04
2	Articles abstract	215	34.23
3	Article References	82	13.05
4	Alerting Services	26	4.16
5	Full Text	198	31.52

Observation:

The article abstract is most used part of the journal articles. 34.23% users just read article abstract from the e-Journals. 32% users read full articles. 17% users use table of contents, 13% users use article references and 4 % users use alerting services.

Q. E.4 e-Resources reading pattern.

Table 7.151- e-Resources reading pattern

Sr. No.	E-Journal Pattern	Responses	Percentage
1	Read abstract online	136	21.66
2	Read Full text online	115	18.31

3	Read online and print if required	102	16.25
4	Download without reading	29	4.61
5	Download and print without reading	61	9.71
6	Read online, download and print if required	185	29.46
7	Any other	00	00.00
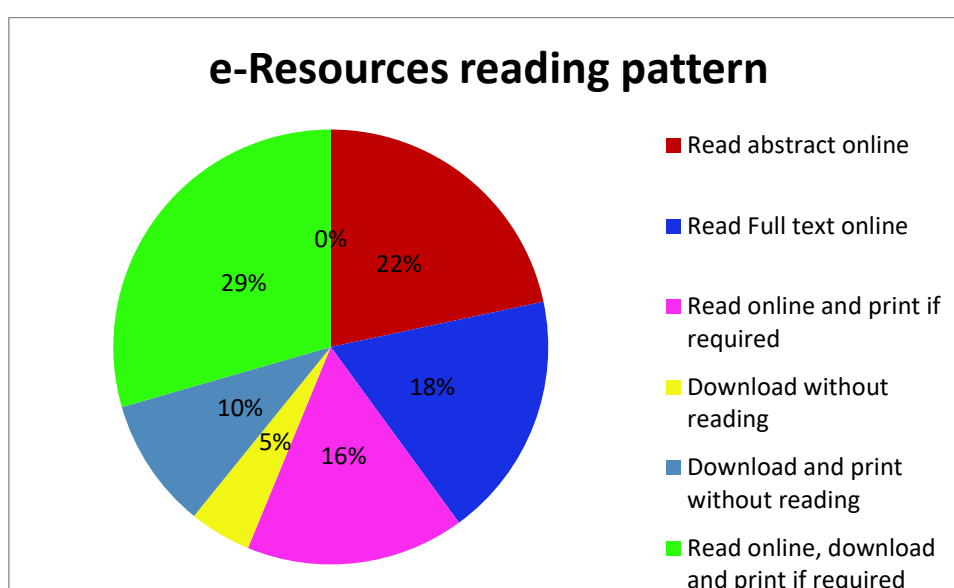
Fig 7.63 – e-Resources reading pattern

Observation:

29% users read e-resources online, download and print if required and 22% users read only abstract online, but 18% users prefer to read the full text online. 16% users read the article online and take print if required. Very few users download without reading 5% and 10% users download and print without reading.

Q. E.5 Authenticity of e-resources.

The authenticity of e-resources is essential to ensure accuracy and validity of the information. To understand how users, judge the authenticity a question was asked.

Table 7.152- Authenticity of e-resources

Sr. No.	e-Resources	Responses	Percentage
1	Journal Publisher	363	57.80
2	Author	104	16.56
3	Database Publisher	76	12.10
4	Ownership of the website	85	13.54
5	Any other	00	00

Observation:

For authenticity of the information 58% users trust on journal publishers whereas 16% users trust on the authors. 12% users have faith on database publishers, and 14% users have belief on ownership of the website.

Q. E.6 Use of similarity checking software.

To ensure originality of the publication author use similarity checking software before sending it to the publisher. The question was asked to understand how many users use similarity checking software.

Table 7.153- Use of similarity checking software

Use of similarity	Responses	Percentage
Yes	223	35.50
No	405	64.50
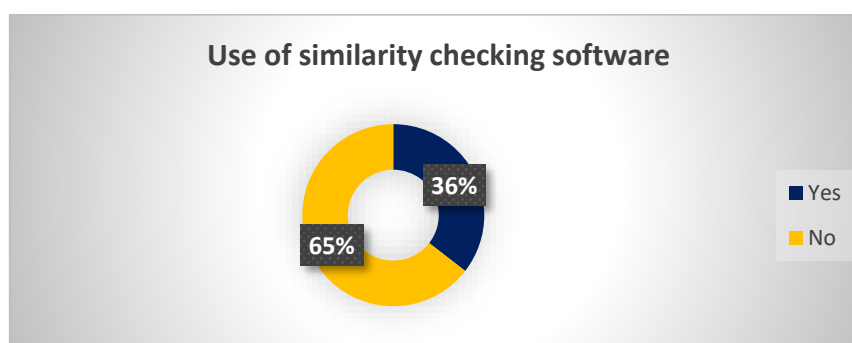
Fig 7.64 – Use of similarity checking software

Observation:

In all the research institutes outcome of the research work is published in the research paper and similarity checking software helps to ensure the originality of the publication. But only 35 % users are checking the originality of their research papers before sending for publication. Rest users either unaware of such facilities or do not have software information for checking similarity.

Q. E.7 Preferred publishers of electronic resources.

An open-ended question was asked to respondents regarding publishers that they preferred most for submitting communications or reading articles and referring journals.

Observation:

Though the question asked, was open-ended, most of the users indicated preferences for the publishers like Elsevier, Springer, Wiley, Taylor and Francis, Nature, Cambridge, Blackwell, American Chemical Society, Royal Society of Chemistry, Institute of Physics, etc. These publishers major and popular in the field of the science and users want to publishes literature in some of these publishers which are high impact factor journals too.

F. Access

Providing proper access facility to the users is very much essential to ensure the usage of the e-resources. To assess how, where, which e-resources users are accessing, which type of internet connectivity they are using and how they are using offline e-resources like CD ROM etc. some questions were asked.

Q. F.1 Access to e-resources

A multiple-choice question was asked to understand how users are accessing to e-resources.

Table 7.154- Access to e-resources

Sr. No.	Access to E-resources	Response	Percentage
1	ID/Password based access through	110	17.52
2	Remote access through campus	405	64.49
3	Wi-fi enabled access in the campus	190	30.25
4	Any other	00	00
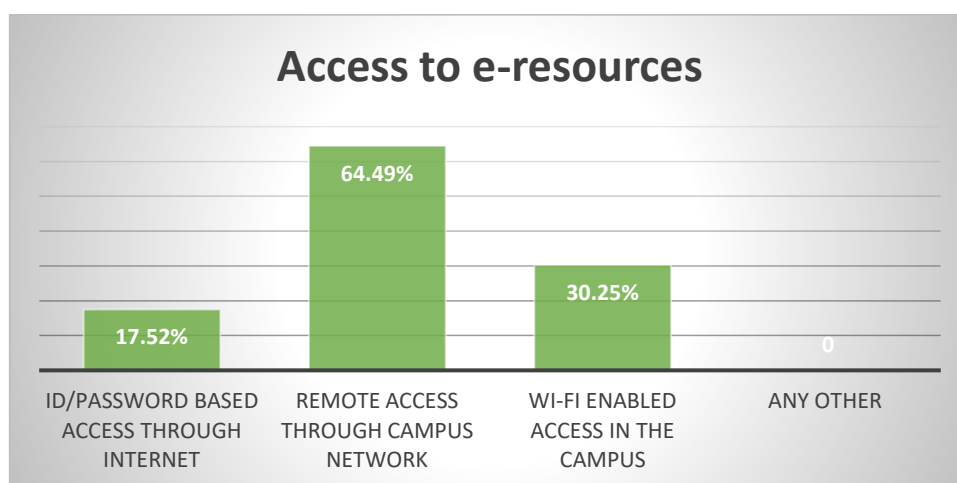
Fig 7.65 – Access to e-resources

Observation:

Most of the users (64.49%) use e-resources through the campus network. Campus-wide access help 'n' number of users to access the e-resources simultaneously throughout the campus through LAN. 30.25% users use Wi-Fi for accessing e-resources and very few users (18%) use ID password-based access for the e-resources. ID and Password access restrict the use of e-resources as limited no of users can access it at a time.

Q. F.2 Preferred location for access to e-resources.

Table 7.155- Preferred location for access to e-resources

Sr. No.	Access Point	Response	Percentage
1	Own Laptop	260	41.40
2	Office Desktop	230	36.63

3	Computer Lab	86	13.69
4	Library PC	52	8.28
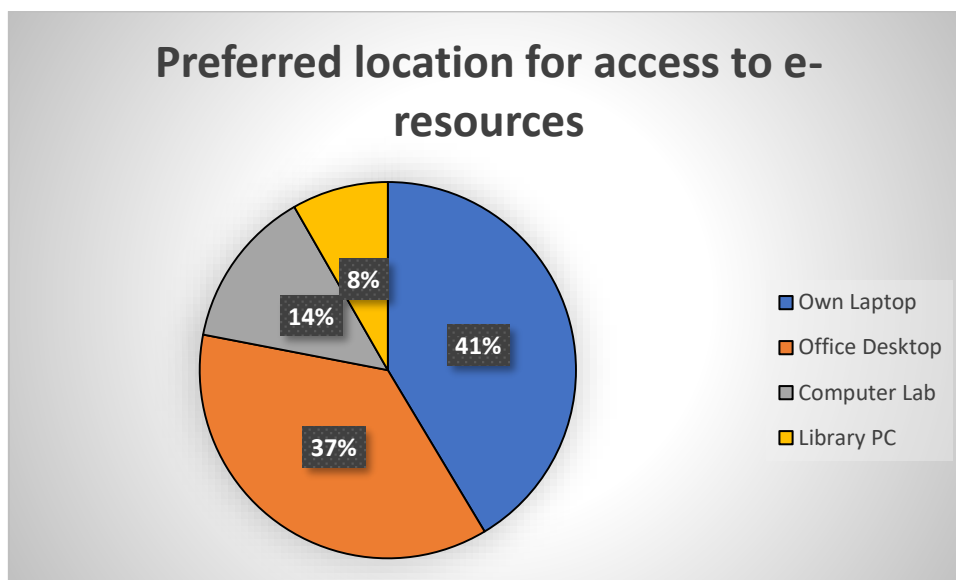
Fig 7.66 – Preferred location for access to e-resources

Observation:

Most of the researchers prefer institutes LAN and Wi-Fi facility to access e-resources through their laptops (41%) and office desktops (37%). All the e-resources can be access on desk and hence very few users use computer lab (14%) and library PC (8%) for accessing e-resources.

Q. F.3 Type of e-resources accessed by the users.

Multiple-choice question was asked to know which e-resources users are accessing.

Table 7.156- Type of e-resources accessed by the users

Sr. No.	E-resources access	Responses	Percentage
1	Free resources available on internet	556	88.54
2	Subscribed e-resourcesby library	445	70.86
3	Professional association membership	105	16.71
4	Another Libraries Subscription	29	4.62
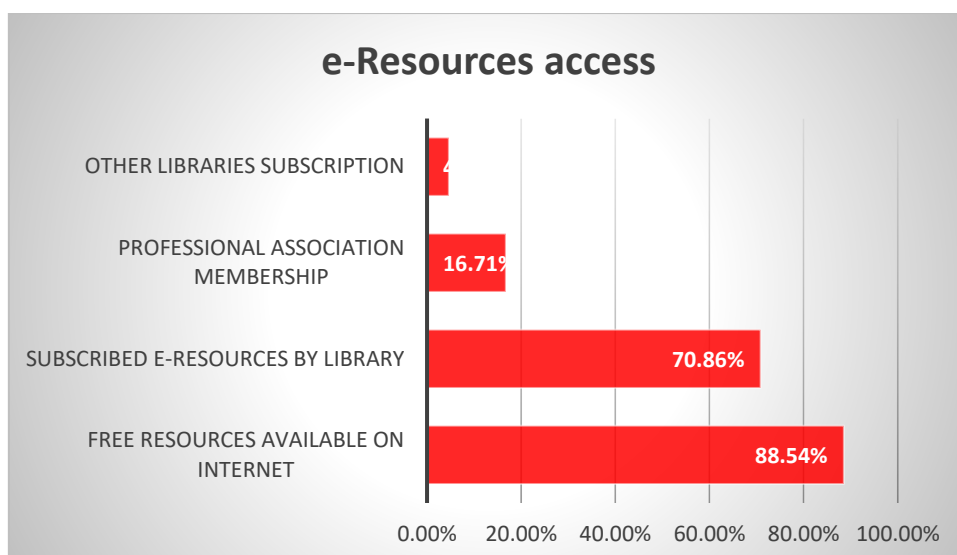
Fig 7.67 – e-Resources access

Observation:

Since lot of information is freely available on the internet, most of the users, uses internet for getting the required information. 89% users access free resources available on the internet. 71% users access e-resources subscribed by the library. Some users are members of the professional association, and they (17%) can access the e-resources of such associations. However only 5 % users are getting access to e-resources subscribed by other libraries.

QF.4 Access to databases of e-resources

Single database may include thousands of e-journals, e-books and other e-resources. To understand how user's approach the particular e-resource from the database a multiple-choice question was asked.

Table 7.157- Access to databases of e-resources

Sr. No.	Access to e- Resources included in databases	Responses	Percentage
1	List from library website	245	39.01
2	Publishers website	191	30.41
3	Search engines	464	73.89
4	Any other	20	3.18

Observation:

The users are very much interested in using search engines like google, yahoo, google scholar to get information by accessing to e-resources included in databases. 74% users prefer to use the search engines. 39% users use a list from the library website, whereas 30% users access these resources through the list available on the publisher's websites.

Q. F.5 Do libraries take trial access before purchasing.

Table 7.158- Does libraries take trial access before purchasing

Trial Access	Responses	Percentage
Yes	368	58.60
No	260	41.40
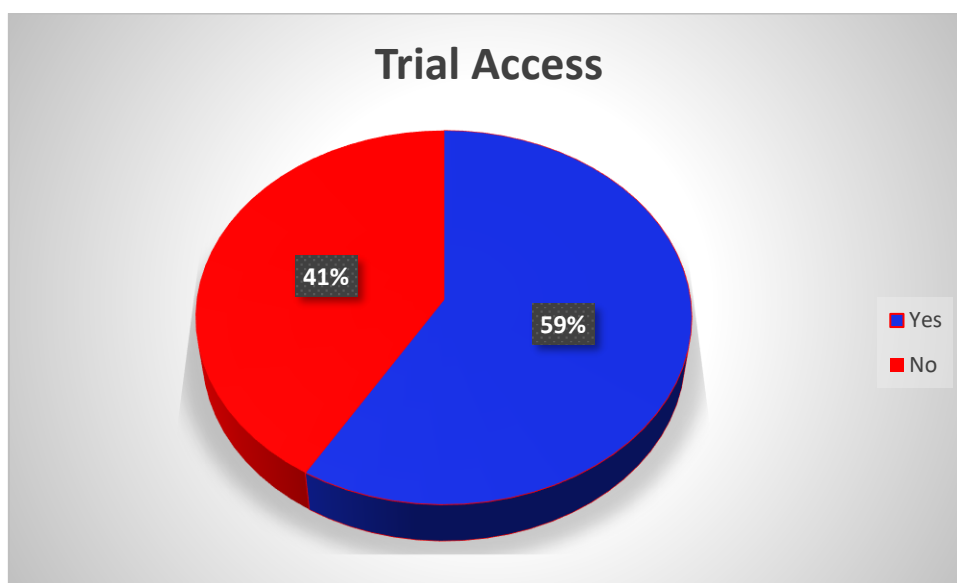
Fig 7.68 – Trial Access

Observation:

According to 59% users, their libraries are arranging trial access for the e-resources before its procurement. It helps to understand the usefulness of e-resources in the user's research work.

Q. F.6 Type of internet connection.

Table 7.159- Type of internet connection

Sr. No.	Type of internet connection	Responses	Percentage
1	Dial – up	9	1.43
2	USB/On-the-go	15	2.38
3	Broadband	604	96.19
4	Any other	0	0
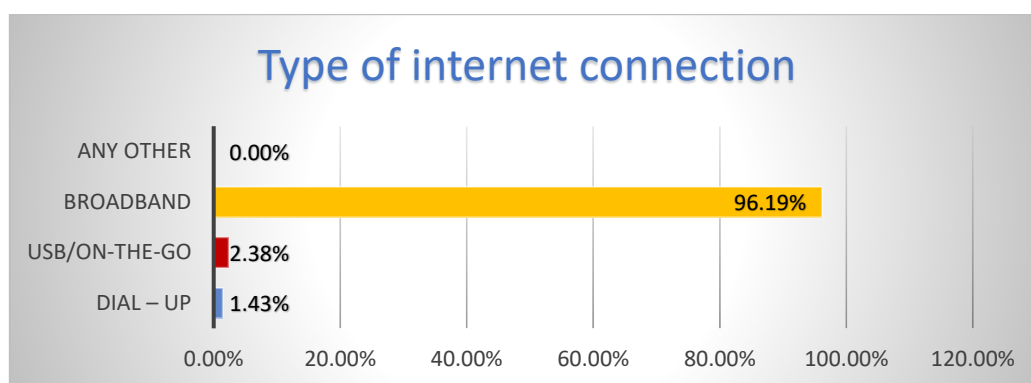
Fig 7.69 – Type of internet connection

Observation:

All the users are using broadband connection for the internet connectivity.

Q. F.7 Access to offline e-resources.

Table 7.160- Access to offline e-resources

Sr. No.	Access to offline e-resources	Responses	Percentage
1	Own Laptop	280	44.59
2	Office Desktop	238	37.89
3	Computer Lab	48	7.64
4	Library PC	62	9.87

Observation:

82.48% users prefer to use offline resources on their desk either computer or laptop. From the data, it is deduced that most of the users prefer to get information from own

laptop (45%) and office desktop (38%) for accessing off-line e-resources like CD ROM/ DVD, Off-Line databases etc.

Q. F.8 Quality of information acquired from electronic resources.

This question was asked to understand user's opinion about the quality of information acquired from e-resources.

Table 7.161- Quality of information acquired from electronic resources

Sr. No.	Response	Respondent	Percentag
1	Very High-Quality	115	18.31
2	High-Quality	504	80.26
3	Poor Quality	9	1.43
4	Very Poor Quality	0	0.00
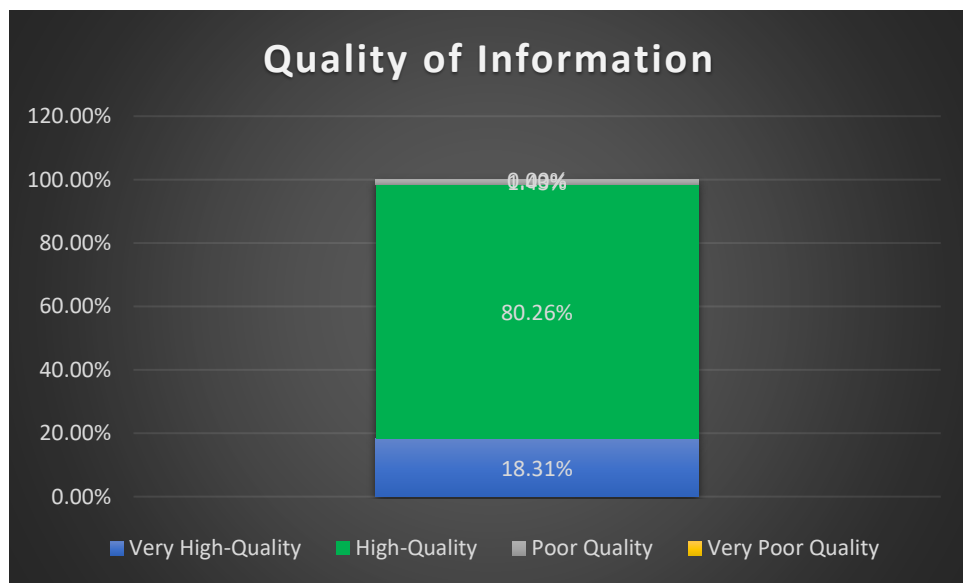
Fig 7.70 – Quality of information

Observation:

The data indicates that users find quality of the information from e-resources. 80%, users felt information getting from the e-resources is high quality and 18% users felt that it is of very high quality.

Q. F.9 Use of CD-ROM for research.

Table 7.162- Use of CD-ROM for research

Response	Respondent	Percentage
Yes	167	26.59
No	461	73.41
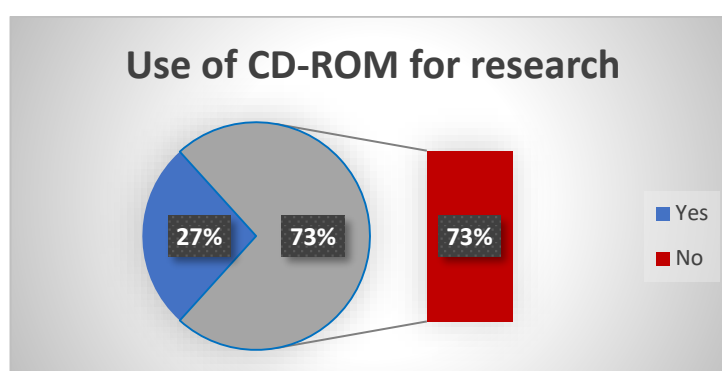
Fig 7.71 – Use of CD-ROM for research

Observation:

73% users are not using CD ROM for acquiring stagnant information for the research work. Users use online e-resources most of the time for current and dynamic information.

Q. F.10 How users access CD-ROM.

This question was asked to users who answered YES to Question F.9 (i.e. Use of CD-ROM for research)

Table 7.163- How users access CD-ROM

Sr. No.	Response	Respondent	Percentag
1	CD-ROM network	12	7.18
2	Reading single CD-ROM using	142	85.02
3	Any other	13	7.78
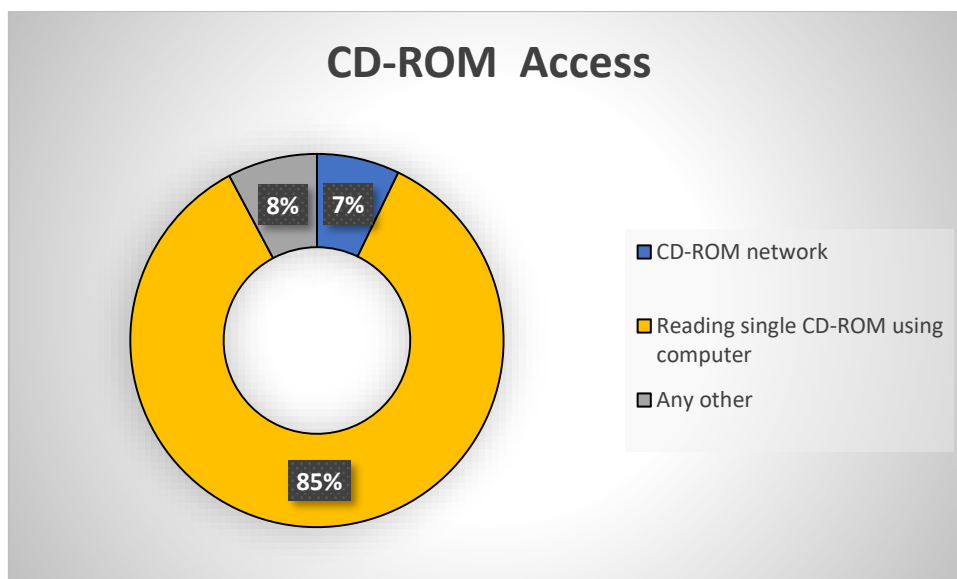
Fig 7.72 – CD ROM Access

Observation:

Maximum users are using e-resources available in single CD-ROM.

Q. F.11 Type of CD-ROM users mostly using.

Multiple choice question was asked to know which type of CD-ROM users prefer to use. This question was asked to the users who answered YES to Question F.9 (i.e. Use of CD-ROM for research)

Table 7.164- Type of CD-ROM users mostly using

Sr. No.	Response	Respondent	Percentag
1	CD- ROM which comes along with	148	88.62
2	Indexing and Abstracting CD-ROMs	20	11.97
3	Full-text Journal CD-ROMs	61	36.52
4	Electronic Book in CD-ROM	35	20.95
5	Recreational/Entertainment	10	5.98
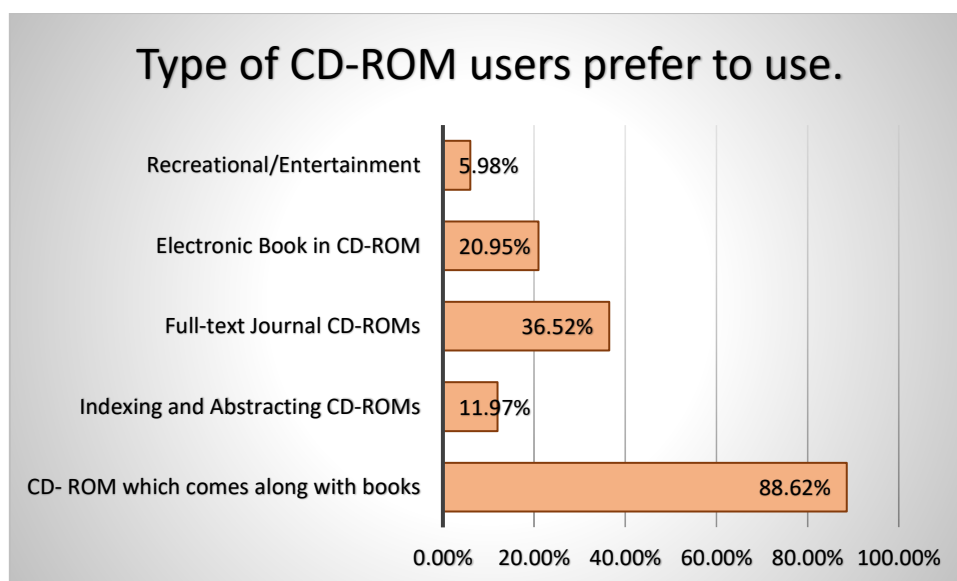
Fig 7.73 – Type of CD-ROM users prefer to use

Observation:

88.62% user use CD ROMs which received along with the books. 36.52% users prefer Full-text Journal CD-ROMs, 20.95% users prefer Electronic Book in CD-ROM, 11.97% users prefer Indexing and Abstracting CD-ROMs. Very few users (6%) users use CD-ROM for recreational/entertainment purpose.

Frequency

To understand how frequently the users, uses e-resources, how much time they spend on e-resources, the access to e-resources increased or decreased, and to know users plans regarding use of e-resources some questions were asked.

Q. G.1 Frequency of use of e-resources

Table 7.165- Frequency of use of e-resources

Sr. No.	Response	Respondent	Percentage
1	Everyday	470	74.84
2	Weekly	106	16.88
3	Monthly	13	2.07
4	Occasionally	39	6.21
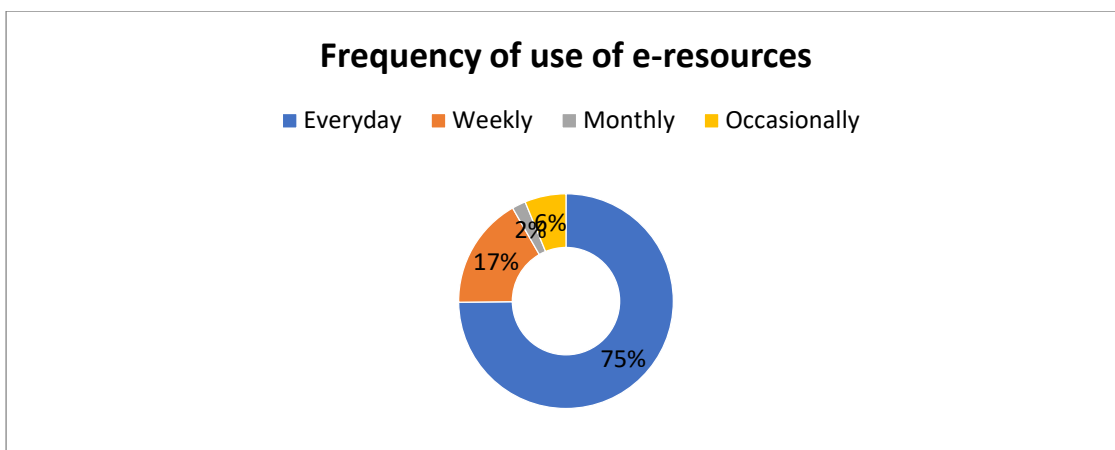
Fig 7.74 – Frequency of use of e-resources

Observation:

For all research institutes, e-resources are the rich source of information hence almost 75% users use e-resources every day. 17% users use e-resources weekly, 2% monthly and 6.21% use e-resources occasionally as and when required.

Q. G.2 Weekly time spend on e-resources

Table 7.166- Weekly time spend on e-resources

Sr. No.	Response	Respondent	Percentag
1	Less than hour	67	10.66
2	1 to 20 Hours	432	68.79
3	20 to 30 hours	104	16.57
4	More than 30 hours	25	3.98
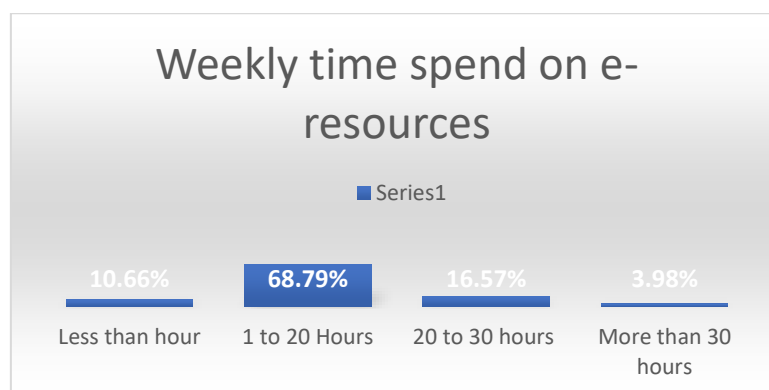
Fig 7.75 – Weekly time spend on e-resources

Observation:

It is observed that 69% users spend 1 to 20 hours in a week on e-resources whereas as 16% users spend 20-30 hours for using e-resources. 11% users spend less than one hour and 4% users spend more than 30 hours of the week.

Q. G.3 e-Resources access in a week.

Table 7.167- e-Resources access in a week

Sr. No.	Response	Respondent	Percentag
1	5 or less	218	34.71
2	6 to 10	243	38.70
3	More than 10	167	26.59
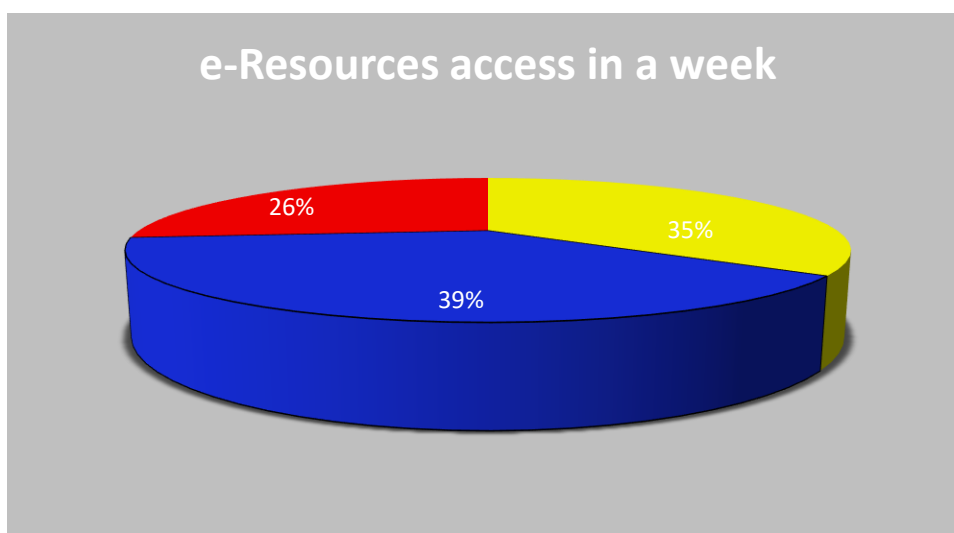
Fig 7.76 – e-Resources access in a week

Observation:

39% users are accessing 6-10 e-resources in a week, 26% users accessing more than 10 e-resources in a week. 35% users are accessing 5 or fewer e-resources in a week.

Q. G.4 Level of use of e-resources

Table 7.168-Level of use of e-resources

Response		Respondent	Percentage
Increased	Yes	575	91.56
Decreased	No	53	8.44

Observation:

92% users have indicated that use of e-resources is increased and they have accessed more e-resources recently.

Q. G.5 Future plan for use of e-resources

Table 7.169- Future plan for use of e-resources

Response	Respondent	Percentage
Yes	602	95.85
No	26	4.15
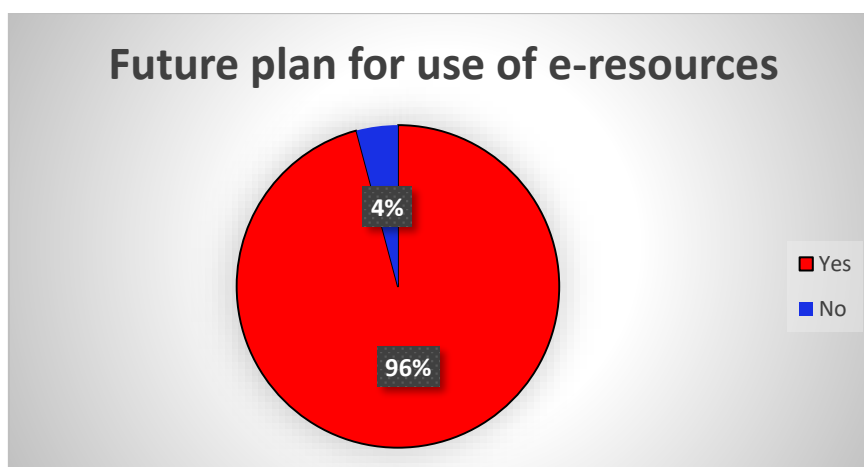
Fig 7.77 – Future plan for use of e-resources

Observation:

95% users pointed out that e-resources use in future also increased as more resources will explore in R&D and S&T.

Users are using e-resources for different purposes, so some questions were asked to assess the user's purpose for using e-resources.

Q. H.1 Purpose for using electronic resources.

Multiple choice question was asked to understand user's purpose behind using e-resources.

Table 7.170- Purpose for using e-resources.

Sr. No.	Response	Respondent	Percentag
1	Keeping yourself update in the	406	64.65
2	For research purpose	520	82.80
3	For teaching	154	24.52
4	For learning	391	62.26
5	To publish papers in	197	31.36
6	To know the recent trends in a	368	58.60
7	For leisure reading	150	23.89
8	Any other	20	3.18
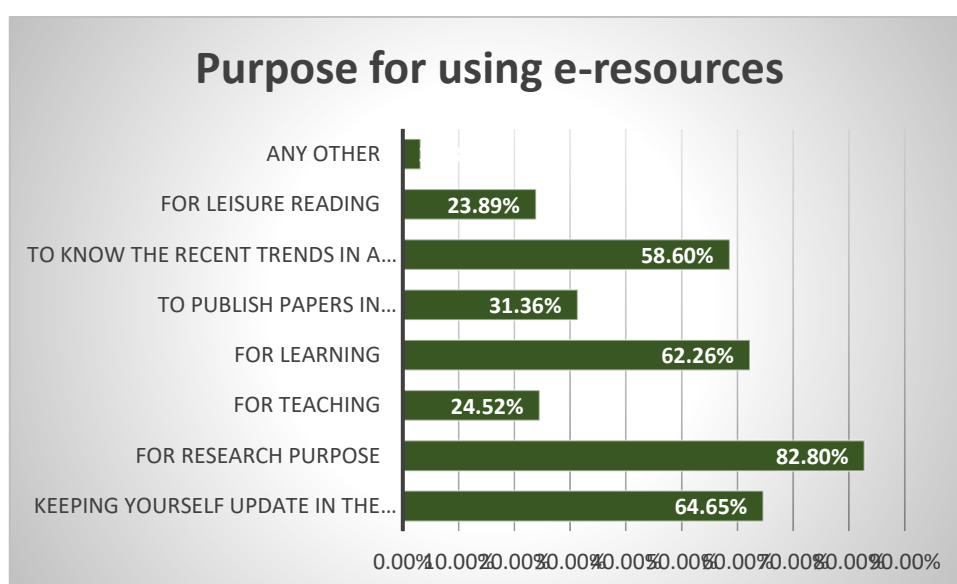
Fig 7.78 – Purpose for using e-resources

Observation:

From the responses, it is very clear that users are using e-resources for various purposes. 83% users are using e-resources for research purpose, whereas 65% users are using e-resources for keeping themselves update in their subject. To know the recent trends in a particular subject 59% user are using e-resources. The purpose of 47% users is to publish papers in journals/proceedings. 25% users are taking help of e-resources for teaching. Only 24% users are using e-resources for leisure reading.

Q. H.2 Does e-resources helps in exchanging ideas and developing collaborations in research.

Table 7.171- Use of e-resources for collaborations in research

Response	Respondent	Percentage
Yes	571	90.92
No	57	9.08
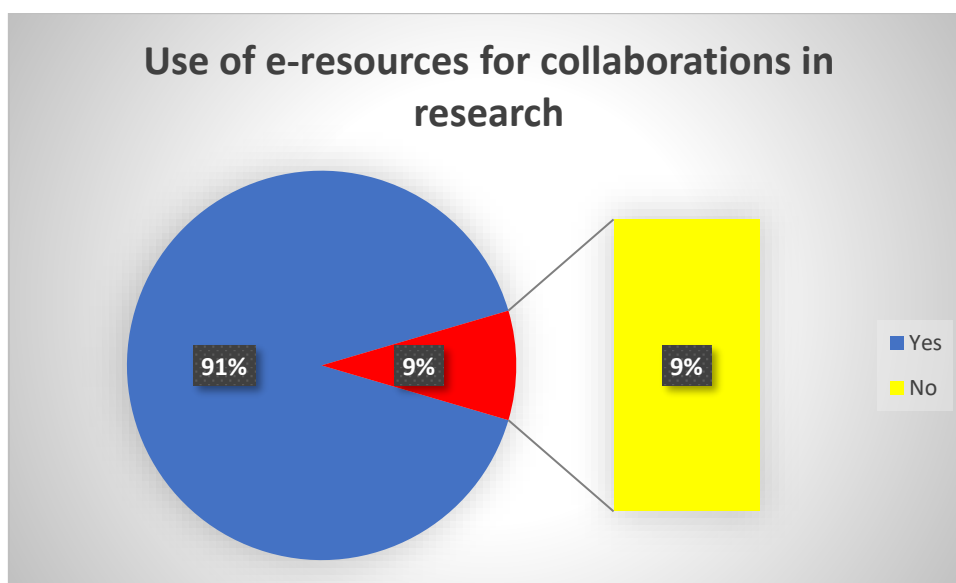
Fig 7.79 – Use of e-resources for collaborations in research

Observation:

91% users opinioned that e-resources help in exchanging ideas and developing collaborations in research areas.

Q. H.3 User's perception on usefulness of e-resources.

Table 7.172- User's perception on usefulness of e-resources

Sr. No.	Response	Respondent	Percentage
1	Most satisfied	203	32.32
2	Satisfied	413	65.76
3	Least satisfied	12	1.92
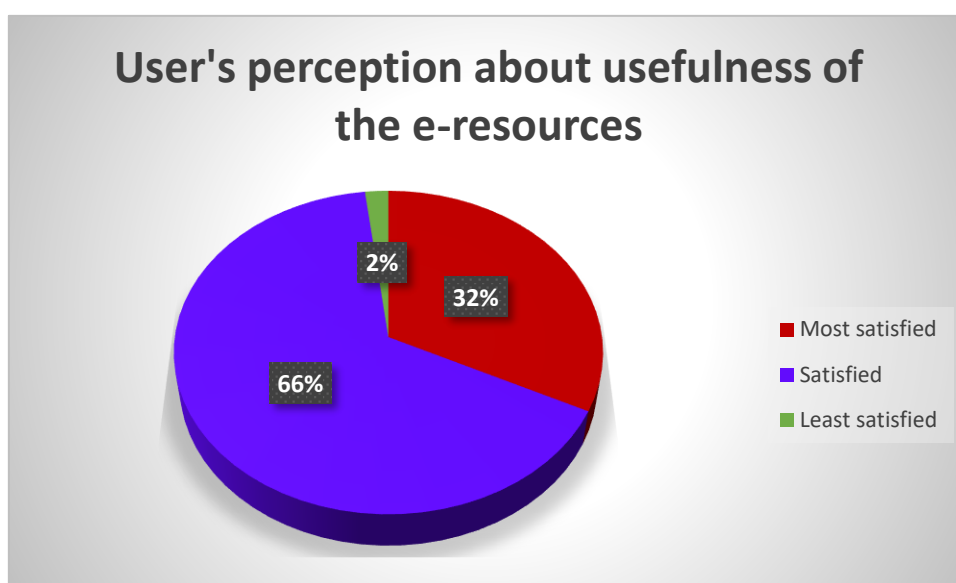
Fig 7.80 – User's perception about usefulness of the e-resources

Observation:

It is observed that all the users are satisfied with the usefulness of the e-resources.

I.   Download.

Some questions were asked to assess how users prefer to download the e-contents.

Q.I. 1 Format used for download papers/articles.

Table 7.173- Format used for download papers/articles

Sr. No.	Response	Respondent	Percentag
1	PDF	614	97.77
2	HTML	33	5.25
3	TXT	6	0.96
4	RTF	00	00
5	JPG	00	00
6	SGML	00	00
7	Any other	00	00

Observation:

From the data analysis, it is very clear that all the users download papers/articles in the pdf format as these formats are used by researcher for publishing their scholarly communication.

Q. I.2. While downloading documents are users check copyright issues?

Table 7.174- Checking copyright before downloading

Response	Respondent	Percentage
Yes	310	49.37
No	318	50.63
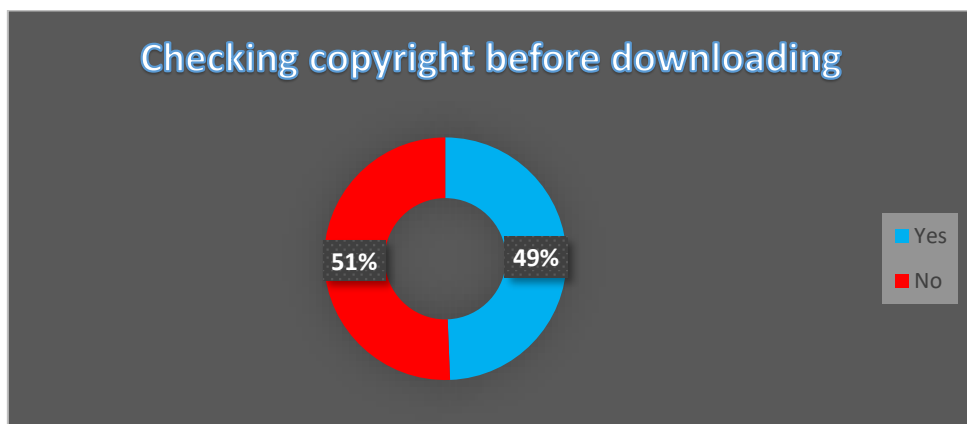
Fig 7.81 – Checking the copyright before downloading

Observation:

While downloading, 51% users are still not checking whether the downloaded martial is under copyrighted or not.

J. Reading.

To understand how users are reading e-resources, if they know copyright for e-resources, how they get information about copyright issues and how library educates about copyright issues of e-resources some questions were asked.

Q. J.1 How users reading e-resources.

Table 7.175-Reading e-resources

Sr. No.	Response	Respondent	Percentag
1	On the screen	383	60.99
2	Use Kindle/e-readers	57	9.07
3	Take a print and read	188	29.94
4	Any other	0	0
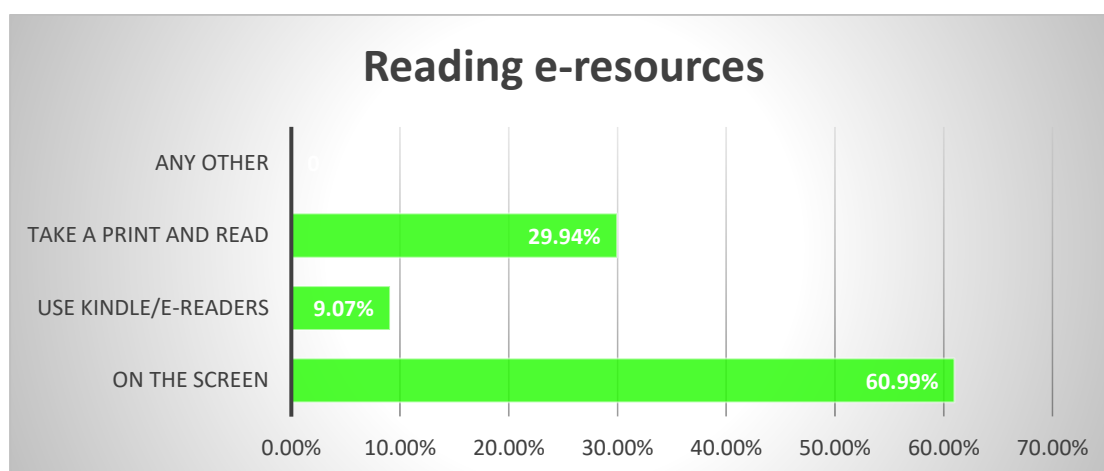
Fig 7.82 – Reading e-resources

Observation:

61% users read e-resources on the screen whereas 30% users take print and then read. Only 9% users use Kindle/e-readers.

Q. J.2 Awareness about the copyright law.

Table 7.176- Awareness about the copyright law

Response	Respondent	Percentage
Yes	423	67.36
No	205	32.64
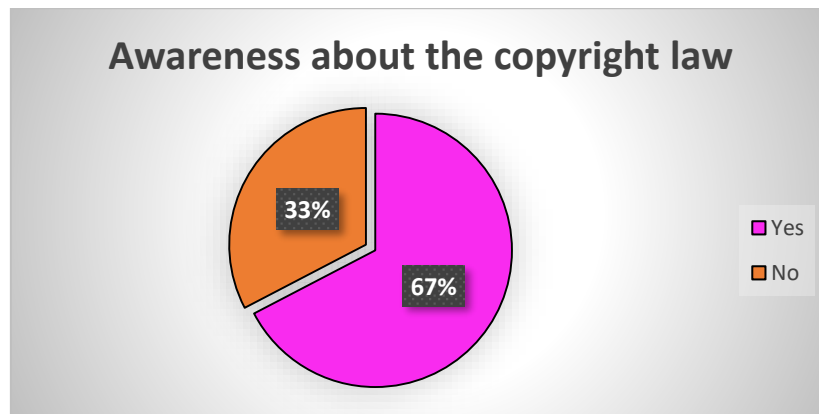
Fig 7.83 – Awareness about the copyright law

Observation:

The data shows that 67% users are aware of the copyright laws of e-resources. Still 33 % are unaware of the copyright laws.

Q. J.3 How users come to know about copyright law.

The users who are aware copyright law have answered the question.

Table 7.177- How users come to know about copyright law

Sr. No.	Response	Respondent	Percentage
1	Own reading	237	56.00
2	Informed by library Staff	127	30.20
3	Through discussions with colleagues	59	13.80
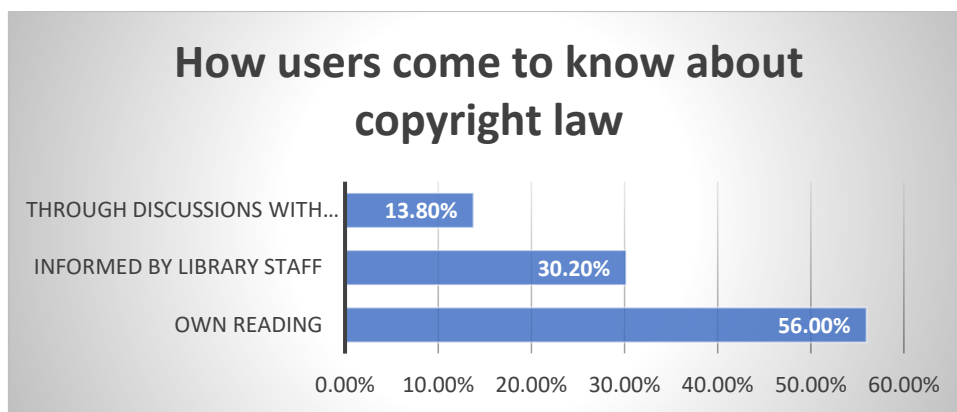
Fig 7.84 – How users come to know about copyright law

Observation:

56% get knowledge about copyright law through their reading. 14% users get it through discussions with colleagues and 30% users developed awareness from library staff on copyright issues.

Q. J.4 Does your library educate users regarding copyright issues of e-resources.

Table 7.178- Libraries efforts for developing awareness on copyright issues

Response	Respondent	Percentage
Yes	325	51.75
No	303	48.24
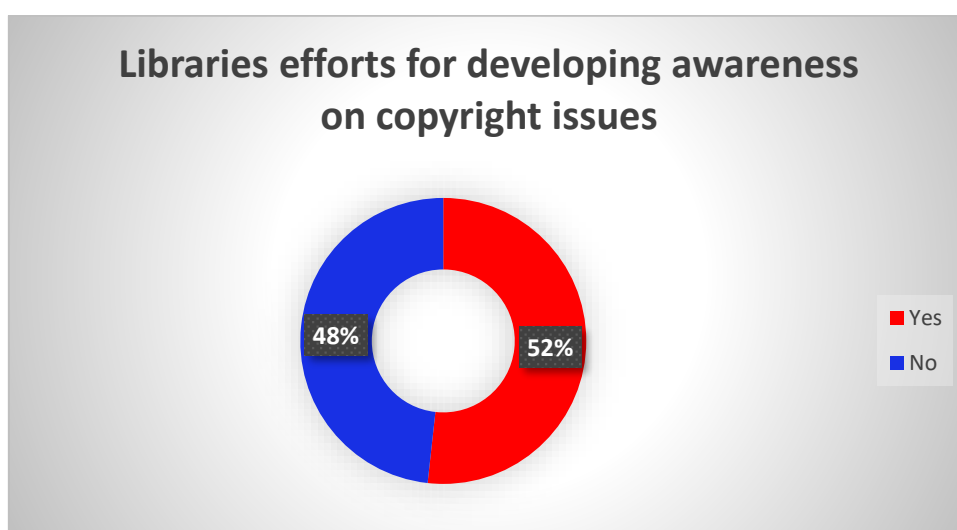
Fig 7.85 – Libraries efforts for developing awareness on copyright issues

Observation:

Though knowledge of copyright laws is very essential, it is observed that almost 50% users indicated that library is not taking any efforts for developing awareness on copyright law.

Q. J.5 How library educates users regarding copyright laws.

Multiple choice question was asked to know how libraries educate users for copyright laws related to e-resources. Only half of the users are aware of library's efforts for educating users for copyright laws of e-resources.

Table 6.179- How library educate users regarding copyright laws

Sr. No.	Response	Respondent	Percentage
1	Explaining in users' education programme	144	44.30
2	Explaining orally to the users	232	71.38
3	Displaying it on website	176	54.15

Observation:

Data analysis indicates that 71% users indicated that libraries are explaining orally about the copyright laws to the users, whereas according to 54% users, libraries are displaying information about copyright on their website. 44% users indicated that library explains copyright law during the user's education programme.

K. Users satisfaction.

Some questions were asked to understand user's satisfaction about use of e-resources collection, its arrangement, infrastructure, internet speed, assistance from library staff, etc. The responses are analysed in the following table and also independently in sub tables followed.

Table 7.180- Library e-resources- Users satisfaction

Sr. No.	Response	Fully Satisfied	Partially Satisfied	Least Satisfied	Not Satisfied
1	Availability of e-resources in library.	367	172	58	31

2	Management of e-resources	274	314	40	0
3	Infrastructure available for using e-resources	269	284	54	21
4	Internet speed	268	296	39	25
5	Assistance from library staff	370	231	22	5
6	Promotion of e-resources by library	255	274	64	35
7	Library services using e-resources	305	223	77	23

Observation:

The data analysis indicates that users are fully satisfied with assistance from library staff, availability of e-resources in the library and library services using e-resources but users are partially satisfied with the management of e-resources, internet speed and infrastructure available for using e-resources.

1. Availability of e-resources in the library**.**

Sr. No.	Response	Respondent	Percentage
1	Fully Satisfied	367	58.43
2	Partially Satisfied	172	27.38
3	Least Satisfied	58	9.25
4	Not Satisfied	31	4.94

2. Management of e-resources

Sr. No.	Response	Respondent	Percentage
1	Fully Satisfied	271	43.15
2	Partially Satisfied	314	50
3	Least Satisfied	40	6.36
4	Not Satisfied	00	00

3. Infrastructure available for using e-resources

Sr. No.	Response	Respondent	Percentage
1	Fully Satisfied	269	42.83
2	Partially Satisfied	284	45.23
3	Least Satisfied	54	8.59
4	Not Satisfied	21	3.35

4. Internet speed

Sr. No.	Response	Respondent	Percentag
1	Fully Satisfied	268	42.67
2	Partially Satisfied	296	47.14
3	Least Satisfied	39	6.21
4	Not Satisfied	25	3.98

5. Assistance from library staff

Sr. No.	Response	Respondent	Percentage
1	Fully Satisfied	370	58.91
2	Partially Satisfied	231	36.79
3	Least Satisfied	22	3.50
4	Not Satisfied	5	0.80

6. Promotion of e-resources by libraries

Sr. No.	Response	Respondent	Percentag
1	Fully Satisfied	255	40.60
2	Partially Satisfied	274	43.63
3	Least Satisfied	64	10.20
4	Not Satisfied	35	5.57

7. Library services – using e-resources

Sr. No.	Response	Respondent	Percentage
1	Fully Satisfied	305	48.56
2	Partially Satisfied	223	35.52
3	Least Satisfied	77	12.26
4	Not Satisfied	23	3.66

Observation:

Analysis of user's satisfaction for e-resources available in libraries are based on the response of user's researcher concluded that

- 58% users are satisfied e-resources collection of libraries,
- 59% users indicated that library staff helps in identifying e-resources and searching information from available resources

Some users have indicated partial satisfaction from following factors

- 50% users are partially satisfied on management of e-resources
- 45% infrastructure of libraries
- 47% unhappy with internet speed
- 43% users indicated that do not explore the availability of e-resources hence promotion is needed
- 35% users indicated that e-resources are not used for providing advanced services like alerts,

L. Users Training.

Q. L.1 Users' opinion about necessity of training for using e-resources.

Table 7.181- Necessity of training for using e-resources

Response	Respondent	Percentage
Yes	492	78.34
No	136	21.66
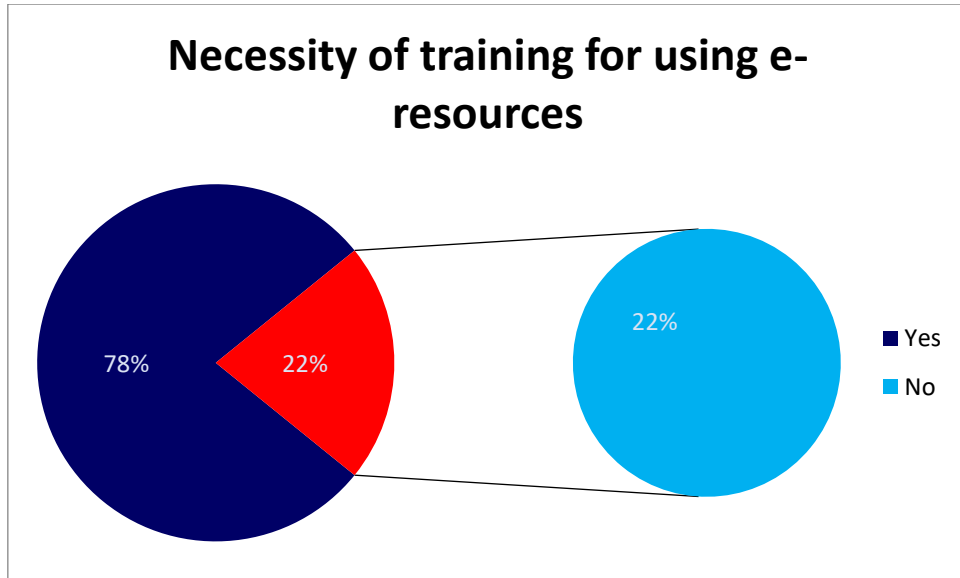
Fig 7.86– Necessity of training for using e-resources

Observation:

78% users indicated training for effective use of e-resources is necessary for them.

Q. L.2 Training for use of e-resources

Table 7.182- Training for use of e-resources

Response	Respondent	Percentage
Yes	163	25.96
No	465	74.04
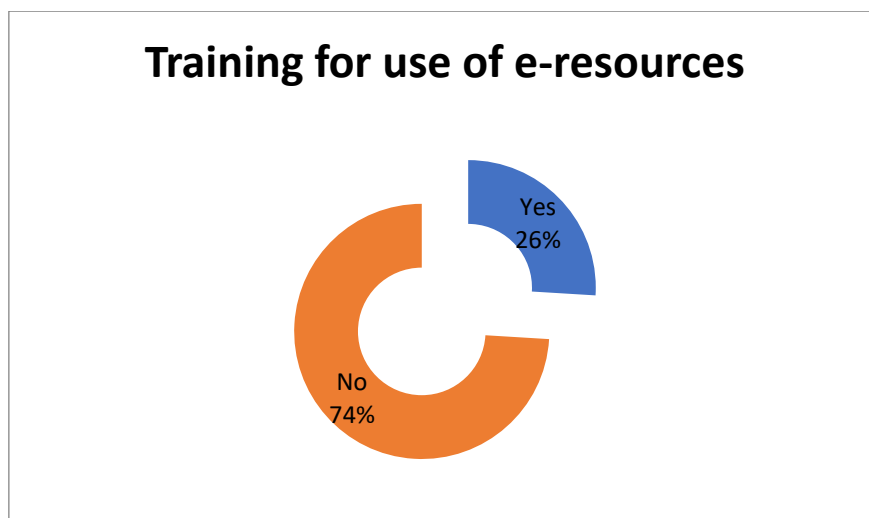
Fig 7.87– Training for use of e-resources

Observation:

74% users have not received any training regarding use of e-resources.

Q. L.3 Users opinion on providing adequate training on use of e-resources

Table 7.183- Users opinion on providing adequate training on use of e-resources?

Sr. No.	Response	Respondent	Percentag
1	Strongly Agree	40	6.36
2	Agree	305	48.56
3	Disagree	252	40.15
4	Strongly Disagree	31	4.93
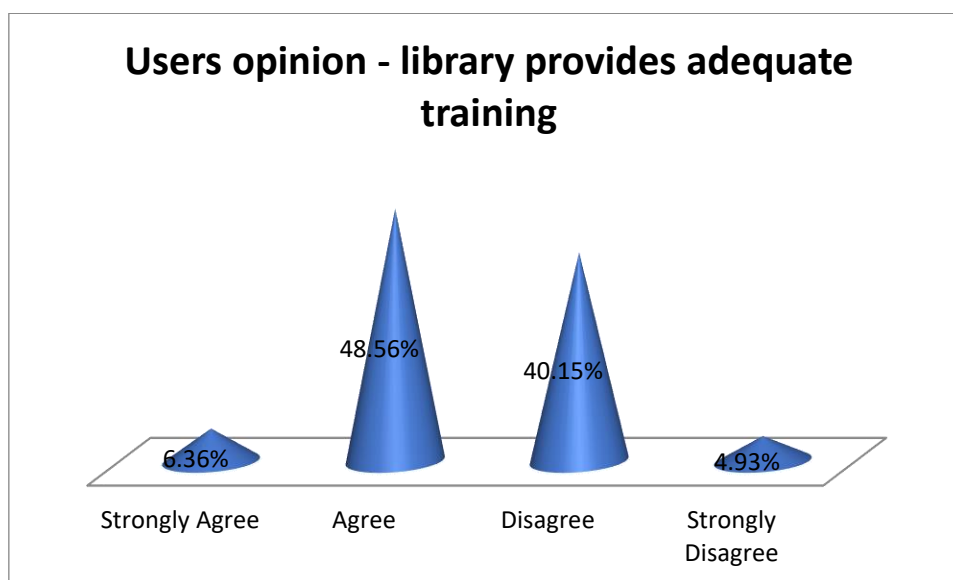
Fig 7.88 – Users opinion on providing adequate training on use of electronic resources

Observation:

It is observed that 55 % users agree to receive training for use of e-resources, and 45% users disagree for this.

L.4 Types of training programs conducted by the library.

To understand the ways in which libraries educate users on the use of e-resources, a multiple-choices question was asked.

Table 7.184- Types of training programs conducted by the library for users

Sr. No.	Response	Respondent	Percentage
1	Library Orientation	377	60.03
2	Lectures from Vendor/Publisher	206	32.80
3	Hands on/Demonstrations	116	18.47
4	Tutorial on website	15	2.39
5	Distribution of Library Pamphlet	1	0.16
6	Any other	8	1.27
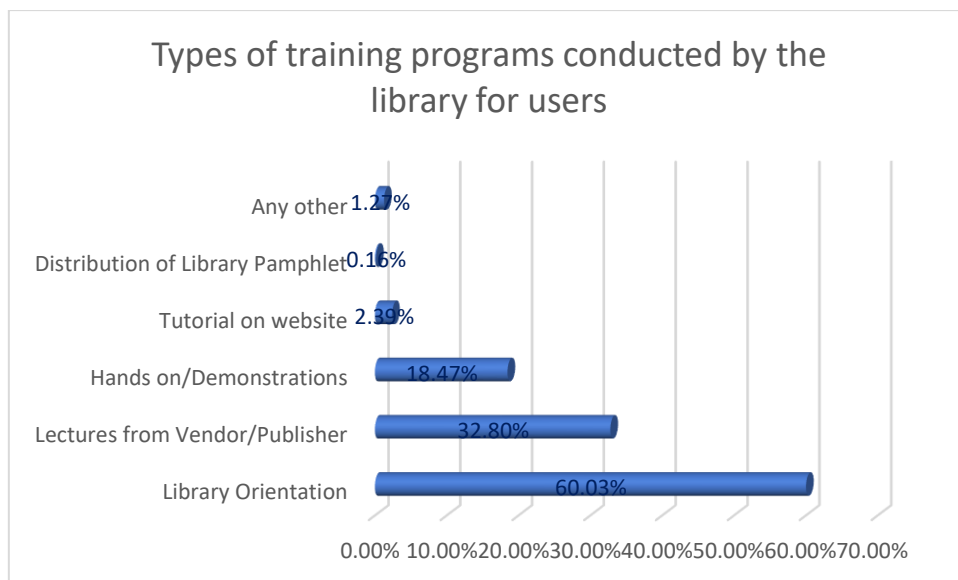
Fig 7.89 – Type of training programs conducted by the library

Observation:

As per the user's feedback 60% of libraries conduct library orientation sessions, 33% libraries arrange lectures from vendor/publishers. Only 18% libraries are taking hands-on /demonstration. Very few libraries are using a tutorial on the website (2%) and distribution of library pamphlet (0.16%) for a user's training.

M. Open Access Resources and Search Engines.

Online resources are freely available to access and use them through net and use of search engines. These resources are free. Researcher would like to find the knowledge of search engines to users.

Q. M.1 Knowledge of search engines available in your field.

Table 7.185- Knowledge of search engines available in your field

Response	Respondent	Percentage
Yes	519	82.64
No	109	17.36
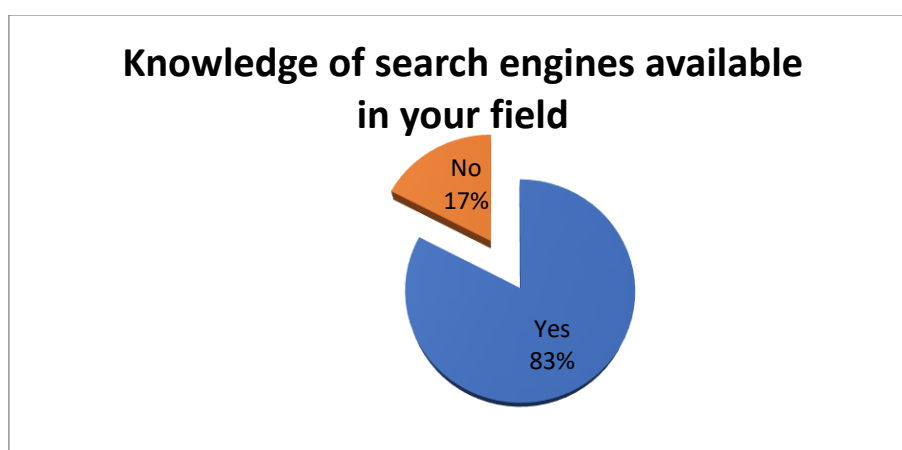
Fig 7.90 – - Knowledge of search engines available in your field

Observation:

83% users are having knowledge of search engines available in their field.

Q. M.2 Which search engine users use more to search the information on internet.

This open-ended question was asked to the users for understanding search engine they are using. Though the question was open-ended, all users mentioned Google search engine used mostly to search the information on the internet.

Q. M.3 Awareness of open access resources available in subject.

Table 7.186- Awareness of open access resources available in subject

Response	Respondent	Percentage
Yes	528	84.07
No	100	15.93
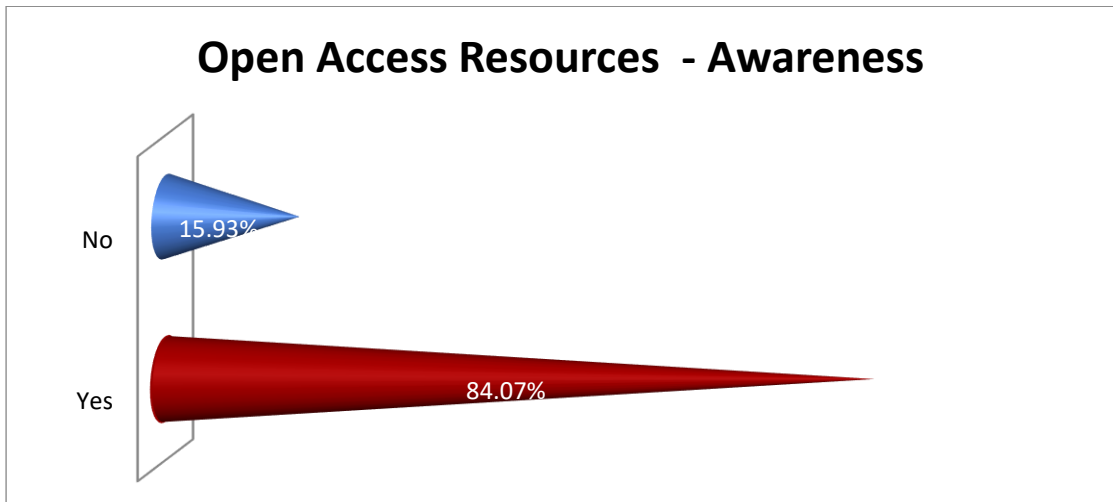
Fig 7.91 – Awareness of open access resources available in subject

Observation:

Data analysis clearly shows that users are aware of the Open Access resources available in their subject area (84%).

Q. M.4 Use of open access resources in the research.

Table 7.187- Use of open access resources in the research

Response	Respondent	Percentage
Yes	540	85.99
No	88	14.01

Observation:

86% users are using Open Access Resources in their research work.

Q. M.5 Preferred Open Access Resources

This multiple-choice question was asked to users, who are using open access resources for their research work.

Table 7.188-Preferred Open Access Resources

Sr. No.	Response	Respondent	Percentage
1	Open Access Journals	368	68.14
2	Open Access databases	184	34.07
3	Open Sites	99	18.33
4	Any other	12	2.22
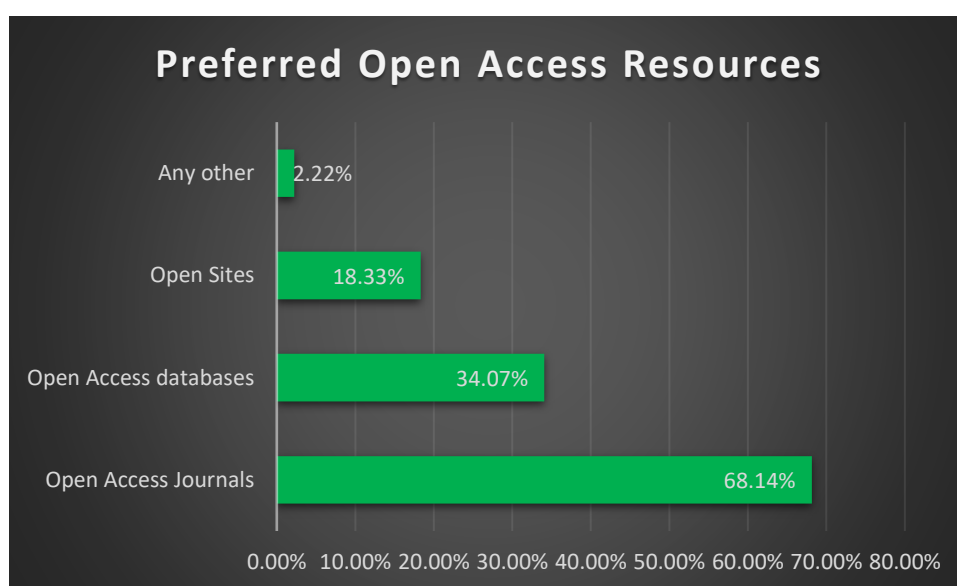
Fig 7.92 – Preferred Open Access Resources

Observation:

The data analysis shows that 68% users prefer Open Access Resources, 34% users prefer open access database, and 18% users prefer free sites.

Q. M.6 Use of Open Access Resource/Free Resources and paid-Resources.

Table 7.189 - Use of the Open Access Resource/Free Resources and paid-Resources

Resources	Open Access Resource/Free Resources		Paid resources	
	Respondent	Percentage	Respondent	Percentage
≥ 25 %	38	6.05	142	22.61
25% - 50%	155	24.68	17	2.71

51% - 75 %	151	24.04	156	24.84
75 % ≤	182	28.98	130	20.70
Don't Know	38	6.05	176	28.03

Observation:

Open access/free resources are used more as compare to paid resources. 77.70% users uses open access resources/free resources are more than 25% resources are used whereas 48.25% users are used which are paid resources more than 25% of the total resources they use.

N. Some questions were asked to understand user's view about e-resources.

N.1

Table 7.190- Lack of sufficient funds is important reason for insufficient collection of e-resources

	Strongly Agree	Agree	Disagree	Strongly Disagree
Lack of sufficient fund is an important reason for insufficient collection of e-resources.	177 (28.18%)	320 (50.95%)	110 (17.53%)	21 (3.34%)

Table 7.191- No availability of proper Hardware/Software is a hindrance in getting access to electronic resources

	Strongly Agree	Agree	Disagree	Strongly Disagree
No availability of proper Hardware/Software is a hindrance in getting access to electronic resources	121 (19.26%)	314 (50%)	171(27.22%)	22 (3.5%)

Table 7.192- e-resources are less convenient than print resources

	Strongly Agree	Agree	Disagree	Strongly Disagree
e-resourcesare less convenient than print resources	28 (4.45%)	119 (18.94%)	304 (48.40%)	177 (28.19%)

Observation:

From data collected on user's opinion about e-resources collection in libraries the opinions of users are:

- Lack of sufficient fund is an issue in not getting e-resources (78%) efficiently in libraries.
- 69% users indicated that hardware/software are not sufficient and updated.
- 22% users are more consistent in use of print resources as compared to e-resources.

N.2 Problems faced by users while accessing to electronic resources.

Multiple choice question was asked to understand difficulties of users facing while using e-resources.

Table 7.193- Problems users facing while accessing to e-resources

Sr. No.	Response	Respondent	Percentage
1	Limited terminals	90	14.33
2	Slow internet	307	48.89
3	Lack of searching skills	131	20.86
6	Lack of remote access	99	15.76
7	Lack of skilled staff	68	10.83
8	Lack of helpful staff	36	5.73
9	Lack of knowledge regarding availability of electronic resources	209	33.28
10	No subscription for desired journals	271	43.15

11	No printing facility	64	10.19
12	Incomplete access/Absence of back	82	13.06
13	Printing Problem	42	6.69%
14	Failure of library staff to keep users aware of availability of electronic	91	14.49%
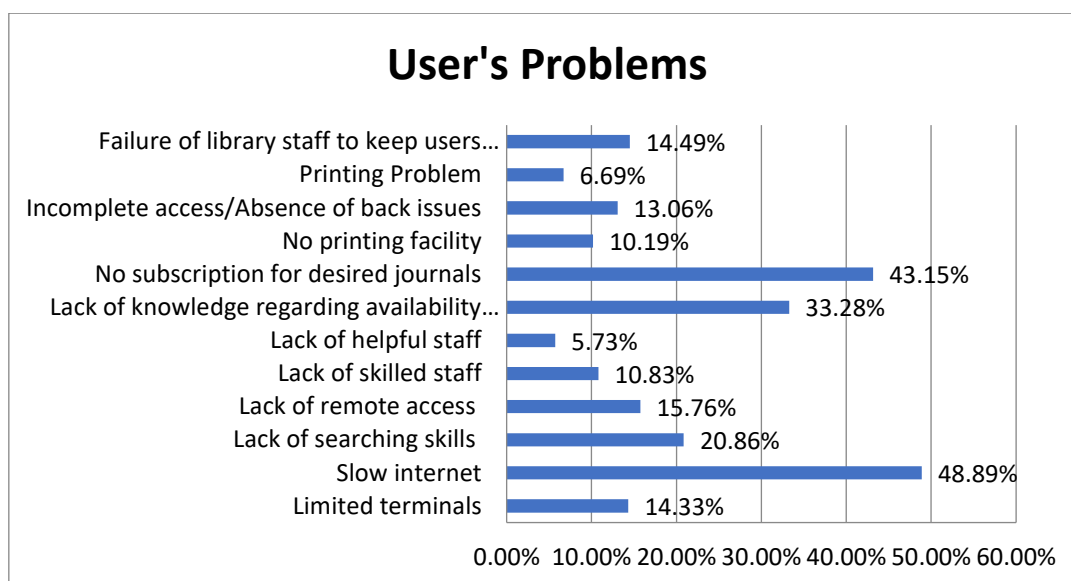
Fig 7.93 – Problems users facing while accessing to e-resources

Observation:

Response to problems faced by users while accessing to e-resource, users opinion received are tabulated in table 7.189

Users major problem faced are

- Slow internet speed (49%)
- Lack of information searching skills (21%)
- Lack of knowledge regarding availability of electronic resources (33%)
- Desired/required journals are not subscribed in library (43%).

Q. O.1 Library services used by users.

A multiple-choice question was asked regarding the library services used by users.

Table 7.194- Library services used by users

Sr. No.	Response	Respondent	Percentage
1	Reference Service	477	75.96
2	Current Awareness Service	266	42.36
3	Selective Demission Service	127	20.22
4	Document Delivery Service	259	41.24
5	Table of Content Service	135	21.50
6	Bibliography Services	191	30.41
7	Translation Service	30	4.78
8	Reprographic Service	437	69.59
9	Referral Services	97	15.44
10	Any other	17	2.71
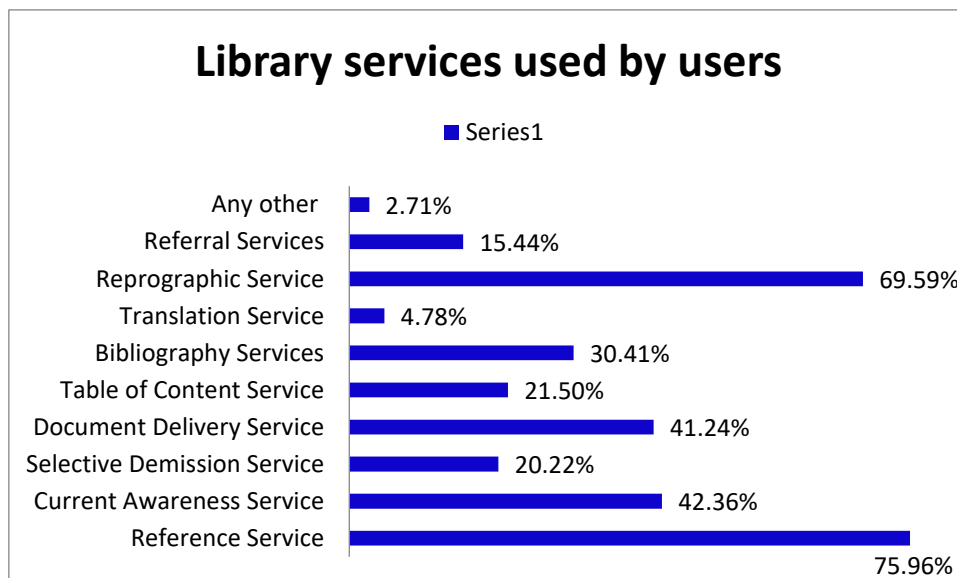
Fig 7.94 – Library services used by users

Observation:

The data analysis clearly indicates that reference service is the most used by the users (76%), followed by reprographic service (70%), Current Awareness Service (42.36%)

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and Document Delivery Service (41.24%). Bibliographic service used by 30% users whereas Table of Content Service used by 21.50% users and Selective Demission Service is used by 20.22% users. 15% users are using referral service and only 4.78% users need translation service.

Q. O.2 User's overall perception about the library services.

Table 7.195- User's overall perception about the library services

Sr. No.	Response	Respondent	Percentage
1	Most satisfied	125	19.90
2	Satisfied	367	58.44
3	Least Satisfied	107	17.05
4	Not satisfied	29	4.61

Observation:

All users are satisfied about the library services provided by libraries.

Highlights of the user's data analysis:

1. Users are using both print as well as e-resources for their research and study, but e-resources are more popular than print resources.

2. Most of the users (80%) are aware of availability of e-resources but 50% users are not aware of the availability of CD ROM, e-Theses and video/lectures. Library website is the mostly used platform to know the availability of the e-resources.

3. Users agree with advantages of e-resources over print resources and information in e-resources available on the web/internet is more used by users.

4. Users use general search engines to search information for e-resources. 50% users, still need assistance for searching e-resources. Keyword is more preferred search approach, followed by subject and author. Users acquires searching skills themselves by experience.

5. 24*7 availability, user-friendliness, easy searching, global availability are the most important characteristics of e-resources which make users to choose e-resources. Articles abstract are the most used part from e-journals. Most of the user's trust publishers of e-resources for the authenticity of information.

6. User access e-resources through campus network and Wi-Fi enabled access in their Campus. Users prefer to access e-resources through their laptop or office desktop. Most of the users use free resources available on internet and e-resources subscribed by their library. All the users have broadband internet connection.

7. Users feel that information getting from the e-resources are of high quality.

8. Only 27% users, use CD-ROM for their research purpose, preferably the CD -ROM which comes along with the books.

9. Users require scientific information in their day today research and they access e-resources every day.

10. Users use e-resources for various purposes like research, keeping themselves updated in their interesting subject, learning, teaching etc. to publish the papers, Users believe that e-resourceshelps in exchange of ideas and developing collaborations for research and user's perception about the usefulness of e-resourcesis more satisfied.

11. Users prefer to download the e-documents in pdf format and read them on the screen. Most of the users are aware of the copyright law pertaining to e-resources.

12. Users are fully satisfied with the assistance from library staff, availability of e-resources in the library and library services using e-resources. Users are partially satisfied with the arrangement of e-resources, internet speed, and infrastructure available for using e-resources.

13. Though users are aware of the use of e-resources, 78% users said that training of e-resources is necessary but only 26% of the users personally received training.

14. Users are aware of the open access resources available in their field and they are using these resources in their research work. Open Access Journals and databases are popular among the users.

15. Users agree to the point "Lack of sufficient fund" is an important reason for insufficient collection of e-resources and "Non-availability of proper Hardware/Software causes problems in getting access to electronic resources". But they disagree with the statement "e-resourcesare less convenient than print resources".

16. Users are having different difficulties while using of e-resources like slow internet connection, no subscription for desired journals and lack of knowledge regarding availability of electronic resources.

17. Users are using various services like reference service, reprographic service, Current Awareness Service and Document Delivery Service, Bibliographic service, Table of ContentService, Selective Demission Service and referral service etc. from libraries.

18. Overall users are satisfied with library services and library support.

Summary:

Users of science research libraries are special users with the specific need for information. Though they are technically sound and know how to use e-resources, they pointed out that training is necessary for use e-resources effectively. Libraries need to take more efforts for conducting training. Only library orientation is not sufficient so libraries need to give personalized training and assistance. Data analysis also indicates that library also needs to play a vital role in making users aware about copyright issues regarding e-resources. Library need to take more efforts to create awareness about e-resources availability, search strategy and other related issues to increase use of e-resources by users.

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Chapter 8: Findings, Suggestions and Conclusion

The researcher has deduced finding from the observations noticed from the data analysis (Chapter 7A and Chapter 7B) of librarians/libraries and users of libraries and reported major findings in this chapter. Some findings are also deduced from literature scanned by researcher.

8.1 Finding: based on librarian's data

A. Institute profile:

1. Among the 18 institutes the oldest institution is High Energy Material Research Laboratory established in 1908 and the youngest institution is Indian Institute of Science Education and Research established in 2006. Among 18 institutes 14 institutes are autonomous institutes under different department/ministry of the Government of India and 4 institutes are purely central government institutes.

2. All the organisations receiving funds from Government of India except Central Institute of Road Transport and Automotive Research Association of India. The institutes which are conducting Ph. D Programmes are recognised as the Ph.D. Centres under various universities except DIAT, IISER and NCL. DIAT is Deemed University having accreditation from NAAC and NBA. IISER is an autonomous institute awarding its own master and doctoral degree and students gets Ph D degree from AcSIR.

B. Library Profile:

1. Nearly 18 research institute have well developed libraries and using ICT and procuring e-resources out of 25. The oldest is HEMRL (1908) and IISER (2006) is newest. Major institutes and libraries receiving funds from central government (GOI) and along with research import in education system and conduct PG programmes or Ph.D. in respective fields.

2. Most of the research libraries are kept open for 8 to 9 hours except IISER Pune and IUCAA library. IISER Pune and IUCAA libraries are kept open for nearly 12 and 15 hours (per day) respectively. Only IISER Pune and

IUCAA libraries kept open on holidays for users/scientist. This is due to availability of e-resources and its access over the desktop as well as over the campus wi-fi.

3. It is observed that libraries managers/heads have different designations as per their parent institute's structure and policies. All the library heads are well-qualified librarians and are capable of managing their library very well. Out of 18 library, 8 heads are Ph. D, 6 are having Master degree in Library and Information Science. Remaining 4 are either graduates in LIS or similar qualifications other than library science.

4. All the (18) science research libraries have total 114 library staff out of which 69 are professional staff, 14 technical staff, 7 administrative staff and 24 support staff. Managing operation in minimum staff might be due procurement of e-resources which might have impact on hiring staff.

5. Research institutes libraries serves subject based needs of research students, PG students, faculties, scientists etc. They need pinpointed as well as retrospective information on particular topic.

6. All science research libraries in Pune are having good collection of print and e-resources. But electronic collection in science research libraries is increasing fast and have e-journals, e-books, databases, Ph. D theses in their collection. Use of internet resources is also increasing fast.

7. All the libraries have acquired e-resources and databases either full text or bibliographical as per their user's needs. In full-text databases, Science Direct, Indian Standards, ACM Digital Library and in bibliographic databases Web of Science, Scopus, J-Gate and SciFinder are common in these libraries.

8. It is observed that 55% libraries are having adequate library staff for managing the e-resources. 28% libraries do not have sufficient library staff to maintain e-resources and 17% libraries have not opinioned on this issue.

9. 66.67% libraries are fully automated, 27.78% libraries still automation is in process. But in general it is observed that in general all most all libraries are automated in S&T area. Different software packages are used in libraries for library management. 50% libraries are using LIBSYS software, 22.22% libraries are using SLIM, whereas 11 % libraries using LIBSUITE and 5.88% Libraries using LIBRARIAN and KOHA. It is observed that most of

S&T and research libraries in Pune are using commercial software but not shifted to OSS.

10. It is observed that 89 % research libraries are part of their institutes LAN and only 11% libraries are not yet part of the institute's LAN. 61% libraries have established separate internet labs for searching internet, OPAC and using e-resources in libraries. But 39% libraries do not have separate internet labs yet. Only 61% libraries made their OPAC available on the web for users of other institutes.

Part C - e-Resources Collection Management

- Written collection development policy is basic need for the development of good collection in the libraries, but Only 22 % libraries have written library collection development policy for acquisition and management of e-resources, but 78% libraries don't have written collection development policy.

C.I. Budget:

- It is observed that 72% libraries do not have separate budget for procurement to e-resources and only 27.78% libraries have separate budget for subscription to e-resources. 78% libraries have sufficient budget to subscription of e-resources whereas 22% libraries do not have sufficient budget. 78% libraries are not getting fixed percentage from there institutes total budget but only 22 % are getting fixed percentage form their institutes' total budget. Many libraries have not provided their annual budget details due to administrative policies, hence analysis is not properly produced. However, those libraries have provided the data and it can be noticed that the budget varies from institute to institute as per their requirements and policies. Indian Institute of Science Education and Research library National Chemical Laboratory Library and DIAT library receive good budget. Libraries are now spending significant portion of library budget on acquiring e-resources.

B. II. Selection

1. 77.78% libraries receive information about new e-resources from the publisher's advertisements and 66.67% libraries get this information from the faculties. About 50% librarians get information through conference whereas 38.89% librarians get this information through consortia meetings.

2. It is observed that library staff (78%), faculties (61%), researchers/students (33%) plays important role in the collection development of e-resources in research library. 78% libraries are taking trial access of the e-resources before acquiring/subscribing to it. 36% libraries evaluate e-resources/information resources with the help of library staff and their users for procurement. 36% libraries, indicated that library committee members are evaluating e-resources and 28% libraries indicated that their users are evaluating e-resources for the procurement.

3. The analysis of the criteria used while selecting e-resources by libraries includes user requirements (100%), contents (83.33%), usage (72.22%), supply (66.66%), licensing terms (61%), cost (55.55%), technical feasibility (55.55%), vendor support (55.55%), functionality and reliability (50%). Apart from these evaluations of e-resources and access mode is 100% considered by all libraries.

Q.C.III. Licensing Agreements

1. Libraries are entered into Licensing Agreements with the publisher at the time of subscribing to it. 93.75% libraries renewed licensing agreements after receiving renewal notice issued from the licensor and 6.25% libraries automatically renew their licensing agreements. It is observed that after subscribing to e-resources all the licensors are providing access to subscribed databases. 68.75 % licensors are providing electronic links, 62.50 % licensors allowing photocopying, 50 % licensor are providing the archival and backup copy, 37.5% allowing scholarly sharing and 18.75% allowing electronic reserves. 83% libraries provide campus-wide access to the e-resources and 38.89 % libraries providing remote access via web where as 5.56% libraries have stand-alone access to the e-resources. It is observed that 83.33% libraries are paying for the annual subscription with

perpetual access 44.44% libraries use annual subscription with access only model whereas 16.67 % paying for subscription with onetime payment and only 5.56% libraries using pay per view model of subscription.

2. 61.11% libraries provide the IP addresses to the service provider, and their server authenticates library users through IP address. IP address enables the users to use resources simultaneously within institute.16.67% providing login ID and password to their users which provide limited access to the users.22.22% libraries use both IP address and login ID and password for user's authentication.

3. It is noticed that 78% libraries are paying subscription directly through bank transfer, whereas 22% libraries using both bank transfer and the cheque for paying subscription amount of e-resources. 62.50% librarians noticed inequality in the bargaining power and inflexibility on the part of the vendor are difficulties faced by librarians. 50% librarians observed difficulties in fitting license agreement to the needs of library. 44% librarians said that lack of legal advice is main difficulty while dealing with the licensor. 12% librarians are afraid of jurisdiction while dealing with the licensor.

4. It is observed that 61.11% libraries using IP based access to provide 'n' number of users who can access the resources simultaneously, 16.67% libraries use ID and password so one user can access the resources at a time, whereas 22.22 libraries are using both types of access as per requirement of the users.

5. In all the libraries, librarian checks the terms and condition mentioned in the License Agreements. Some librarians take help of the library committee, administrative officer for understanding the terms and conditions mentioned in the License Agreement.

Q. C. IV. Acquisition

1. Librarian has no authority to approve titles for the subscription of e-resources. In 33.33% libraries, director of the institute approves the subscription of e-resources. In 33.33% libraries, library committee approves the subscription of e-resources. In 33.33% libraries, Director of Institute with the recommendation from Library Committee approves the e-resources

subscription. It is also observed that none of the libraries are having a separate committee to take the decision on the e-resources subscription.

2. 89% libraries subscribe e-books directly through publishers. 22% libraries procure e-books through subscription agency and only 11% libraries take help of consortia for the procurement of e-books. 78% libraries are the member of library consortia. 94% librarians felt that favourable pricing is one of the advantages of the consortia, 75% librarians mentioned that consortia help in negotiation of terms and conditions. 68% said that consortia help in bargaining number of titles provided by the publisher. Consortia is overall beneficial as it provides maximum access to information in average cost of products.

3. It observed that irrespective of many advantages of consortia purchase, libraries may face some difficulties at the individual level. As the small libraries don't have the big voice in consortia, they may suffer more.

C. V. Management of e-resources:

1. It is noticed that 89% libraries provide campus-wide access to e-resources, 61% libraries provide access to the library on library computers, 39% libraries provide access through the internet using ID and password and 33% libraries provide Wi-Fi enabled access in the campus.

2. The data shows that 39% libraries use libraries website as access point for the e-resources, 28% libraries use libraries catalogue as the access point of e-resources and 33% libraries use both libraries website and libraries catalogue as the access point of e-resources. Only 28% libraries have federated search facility.

3. It is observed that 72.22% libraries display compiled list of e-resources on their library website so that the user can find its availability. In 33.33% libraries display list on their intranet (LAN) and 33.33% libraries include in OPAC which helps users in finding the availability of e-resources. It is observed that most of the libraries are regularly updating e-resources information on their library website. 30.77% libraries update information monthly, and 15.38 update it biannually, whereas 46.15% libraries update annually and 7.69% libraries updating website once in a while.

4. 67% libraries use random check for access to e-resources and take user's feedback to ensure smooth access of e-resources. 28% libraries use only random check for access of e-resources. 5% libraries take only user's feedback.

5. Although cataloging important part of e-resources management, it was observed that 61% libraries are not doing cataloging of e-resources. The data shows among the respondent libraries, 43% libraries are using AACR cataloguing rules, 43% libraries using MARC records for cataloguing of e-resources. Only 14% libraries using Dublin code standards.

6. 55.56% libraries are still using excel software for managing e-resources information where as 38.88% libraries using library management software and 5.56% libraries using other methods like printed register and email for managing e-resources information. The data shows that 94% libraries are not using Electronic Resource Management System.

7. It is very positive sign that in most of the research libraries (72%) are managing and developing digital/institutional repository. 54% libraries are using DSPACE for developing the digital/institutional repository, 15.39% libraries use Green Stone, 7.69% libraries are using E-Prints and 15.38% libraries use in-house developed software for developing digital/institutional repository. All the libraries upload institutional publications in digital/institutional repository. 61.54% libraries upload their theses in IR. 53.84% libraries upload institutional news in media, 46.15% libraries upload dissertations and 15.38% libraries upload seminars in the digital/institutional repository. 76.92% libraries are providing access to digital/institutional repository through intranet for internal users in the campus, users can access the resources uploaded in IR. 38.46% libraries are providing access through web and all the users over the globe can access to the resources available in IR. Two libraries provide access through both intranet and web.

8. 73.33% vendors provide trial and hands on demonstration for evaluation, 60% vendors provide user training and support, 46.67% vendors give technical/customer support and system notification processes, 33% vendors only customize and 7% vendors helps in data security and archiving. Only

50% libraries insist publisher to customize e-resources as per the need of users.

9. Out of 18 libraries only 14 libraries have CD/DVDs collection. Out of 14 libraries, 13 libraries i.e. 93% arrange collection in racks and only 7% library having CD Server for preservation of CD/DVD.

C.VI. Training Programmes for staff and users

1. 83% libraries are arranging e-resources training Programmes for the library staff. Though training is highly required for the library staff, it is found that only 27% libraries are arranging library staff training programmes regularly. 67% libraries arrange library staff training programmes sometimes. It is found that 46.67% libraries use in-house training from other trained staff members, 46.67% arrange training from vendors and 67% libraries send their library staff to different institutes for training.

2. 57% libraries arrange user training programmes regularly and 43% libraries arrange user training programmes sometimes.78.57% libraries conduct library orientation to train their users, 57.14% libraries arrange lectures from vendor/publisher, whereas 42.86% libraries arrange hand on hand demonstration and 14.29% libraries use tutorials on the website and distribute pamphlets.

C.VII. Promotions of e-resources

- It was found that e-mail announcement (83%) is most used technique for promotion of e-resources usage. Word of mouth (mouth publicity) is used by 72% libraries,72% libraries uses library website. 50% libraries arrange presentation from library vendor to promote the use of e-Resource. 44% libraries using library catalogue. 27% libraries are using print brochures and posters and newsletters.11% libraries use advertising. 6% libraries are using RSS Feeds. Though libraries are spending major portion of the library budget on subscription to e-resources, none of libraries are having separate budget for advertising or marketing e-resources. None of the libraries have written promotion plans for e-resources.

C. VIII. Renewal

94% libraries check e-resources usage statistics before renewal of e-resources for following year. The data analysis shows that 83.33% libraries renew e-resources depending upon previous years usage data. In 83.33% libraries consider user's demand and in 50% libraries consider availability of budget. 16.67% libraries consider vendor/publisher's promptness in providing access and their terms of supply. Only 3 libraries have set minimum basic criteria for renewal of e-resources.

Centre for Development of Advanced Computing (C-DAC) library considers a certain set of "usage of e-resources" and "demand against cost" as the basic minimum criteria for renewal. Indian Institute of Tropical Metrology library considers "users demand" as basic minimum criteria and in National Chemical Laboratory tries to "subscribe core journals on priority." It is observed from the data that 50% libraries depend upon vendor/publisher notice for renewal and remaining 50% libraries prepare calendar year to manage subscription renewal of e-resources.

IX. Preservation

Almost 89% libraries still fully depend upon publisher for preservation of purchased online e-book and e-journals. ARDE library and CWPRS library downloads documents from the e-resources and uploading them in institutional repository for preservation and providing access to users, abiding copyright issues. The data shows that 78% libraries do not have any digital preservation programmes at present but 66% libraries feel that they need digital preservation programme for their librarty. 80% are using Replication method for long term preservation of digital resources and 20% libraries are using Migration for long term preservation of digital resources. It is found that 66.67% libraries have digitized their library material for preservation which is valued to their institute. Most of the libraries have digitized their technical research papers published by their scientists, institutional publications, project reports, etc. Centre for Development of Advanced Computing library has digitized old videos. National Chemical Laboratory library has digitized Microfiche, Microfilm, Old books, old

reports etc. It is observed that libraries are using different tools like intranet, institutional repository and digital libraries for providing access to their digitized material. Some libraries are sending requested digitized material through email also on demand. 83% libraries have managed digitization in-house and only 17% are outsourcing the digitization of their collection using quotation method.

X. Open Access Publications

It is observed that 72% libraries are taking efforts to provide access to the open access resources from the library. Rest of the libraries do not provide such facilities. 90% libraries are providing the list of open source resources with links to their library website. 25% libraries are providing access through federated search, and 30.77% libraries are providing access to open source resources through OPAC.

XI. Technical Issues

All the libraries are using leased line for the internet connection. 72% libraries are using BSNL, 11% libraries are using ERNET and 17 % libraries are using another internet service provider. NKRC, RILTEL and NKN network providers libraries also uses. 50% libraries have made available Wi-Fi to their users and remaining 50% libraries do not provide. All the libraries are satisfied with the present internet speed. 78% libraries are having separate library server for their library to manage their activities. 71.44% libraries are using HP server, 14.28% Libraries using IBM server and Fuzitsu Server. These are good producers. It is observed that 57% libraries have managed library server by library staff with the help of IT Personnel of the institute and 43% libraries managed with IT Personnel of the institute only. 78% libraries manage technical issues of e-resources through their library staff and with the help of IT Personnel of the institute. 11% libraries, Library Staff is managing technical requirements of e-resources. In 11% libraries, IT Personnel of the institute are taking care of the technical requirements of e-resources. 72% libraries do not have a separate trained staff for managing e-resources. 89% libraries are getting prompt support from the IT personnel for managing technical issues of e-resources. It is

observed that 50% librarians felt that all their library staff is efficient in handling e-resources and 44.44% librarians thought that majority of their library staff is efficient in handling e-resources and they are manage it and 5.26% librarians felt that majority of their library staff is not efficient in handling e-resources.

XII. Copyright:

- 89 % libraries indicated that their library staff is having knowledge of copyright of e-resources. When the researcher discussed with the library staff, it was noticed that many of them were not aware of the copyright law for e-resources though they know law for print material.

- 60% libraries take action by stopping the user's access for a certain period of time period if they break copyright rules, 20% libraries cancel the user's membership and 20% libraries take other measures like verbal warning etc.

XIII. Challenges and services provided by the libraries.

- From the data analysis it is very clear that librarians are strongly agreeing on the issues like lack of funds (61.11%), lack of awareness about availability of e-resources (55.56%), lack of technical support (50%), lack of infrastructure (55.00%), technological obsolescence (55.55%). Librarians disagree on the problems like lack of trained staff in library (61.11%), lack of demand of e-resources from users (66.67%), lack of usage (72.22%), lack of autonomy in decision making process (50%) etc.

- All the libraries are providing Reference Services for the users. Document Delivery Services are provided by 83.33% libraries, Reprographic Services and Current Awareness Services are provided by 78% libraries. 72.22% libraries provide Referral Services and Selective Demission Service. 67% libraries offer Bibliography Services and 44% libraries are providing, Table of Content Service. Although Translation Service is very important to service, only one library is providing it.

8.2 Findings based on users' data:

The overall population of survey which includes Ph. D students, researcher, scientist, faculties among 18 research institute is 6275. Researcher has selected 10% sample from each population individually i.e. from Ph. D students, Researcher Scholar/Scientific Staff and faculties. Thus 628 sample is selected for this study. The researcher has distributed and collected the questionnaires and received 100% response from the users.

❖ **Personal Information**

- The users have varied qualifications but almost all are PG in scientific field and faculties and scientists all are Ph. D holders. The area of interest of users is science of respective institutes e.g. NCL – Chemistry and chemical technology, ARI – biological sciences, TIFR-NCRA astronomy and astrophysics etc.

❖ **Awareness about e-resources**

- The data clearly indicate that e-resources are more popular than print resources. 25% users are using only e-resources. More than half of the users (56%) are using both the resources i.e. print and e-resources for their research. The data shows that users are more aware of the availability of the e-resources like e-journals, e-books, free online resources (more than 78%). But users are not aware of the availability of CD-ROM (53%) in the library as well video lectures (54%). 86% users are aware of availability of free online resources accessible through internet as open access.

- The library website is popularly used platform to display the library resources. 66% users get information about the availability of e-resources through library website. Visits to libraries (52%) also plays an important role in keeping users informed about the e-resources in libraries. Few users get information through library notices (45%), colleagues (40%). Librarians help users to get information about availability of e-resources. Almost 93% users are happy with e-resources.

❖ **Preferences**

- Users are now preferring use of e-resources more due to its qualities like user friendly, 24*7 accessibility, easy search and downloads and global

access to information. It is observed in survey that 75.32% opted preference using e-resources due to its 24*7 availability of e-resources. 67 % users like the user-friendliness of e-resources, 59% users like easy searching facility available in e-resources and 54% like the characteristic globally availability of the e-resources. 32 % users like the characteristic easy to download, 28% users like hyper linking and multimedia and 19% users like multiple users' access.

- Internet resources are most preferred-resources followed by the e-journals/ databases and Open Source Resources. CD-ROM and e-books are less preferred by users in S&T libraries. Patent are used by very limited users, those who work in R&D center labs.

❖ **Searching**

- Most of the users (87%) prefer general search engine for searching e-resources followed by publisher's website (42.52%), academic search engine (40.29%) etc. Only 37% users using the library catalogue and 31% prefer subject database None of the users are using the federated search facility. The reason behind this is most of the libraries doesn't have the federated search service facilities. The users are very much interested in using search engines like google, yahoo, google scholar to get information by accessing to e-resources included in databases. 74% users prefer to use the search engines. 39% users use a list from the library website, whereas 30% users access these resources through the list available on the publisher's websites.

- Keyword approach (47%) is most preferred approach by users while searching information from e-resources followed by Phrases searching (38%) and Boolean operators (30%). The subject approach is used by 20% research users. Truncation Search, Field Searching, Wild Card searching are also used but very few users know these skills. It is observed that 68% users acquire searching skills by self-experience of searching and study. 15% users take help from friends/colleagues, and only 13 % users take help from library staff. 4.77% users attend training programme for acquiring electronic resources searching skills/techniques.

❖ **Access**

- Most of the users (64.49%) use e-resources through the campus network. Campus-wide access help 'n' number of users to access the e-resources simultaneously throughout the campus through LAN. 30.25% users use Wi-Fi for accessing e-resources and very few users (18%) use ID password-based access for the e-resources. ID and Password access restrict the use of e-resources as limited no of users can access it at a time.

- According to 59% users, their libraries are arranging trial access for the e-resources before its procurement. It helps to understand the usefulness of e-resources in the user's research work.

- 73% users are not using CD ROM for acquiring stagnant information for the research work. Users use online e-resources most of the time for current and dynamic information. 88.62% user use CD ROMS which received along with the books. 36.52% users prefer Full-text Journal CD-ROMs, 20.95% users prefer Electronic Book in CD-ROM, 11.97% users prefer Indexing and Abstracting CD-ROMs.

❖ **Use of e-resources**

- The article abstract is most used part from the journal article. 34.23% users just read article abstracts from the e-Journals. 32% users read full articles. 17% users use table of contents, 13% users use article references and 4 % users use alerting services. 29% users read e-resources online, download and print if required and 22% users read only abstract online, but 18% users prefer to read the full text online. 16% users read the article online and take print if required.

- For authenticity of the information 58% users trust on journal publishers whereas 16% users trust on the authors. 12% users have faith on database publishers, and 14% users have belief on ownership of the website.

- In all the research institutes outcome of the research work is published in the research paper and similarity checking software helps to ensure the originality of the publication. But only 35% users are checking the originality of their research papers before sending for publication. Rest users either unaware of such facilities or do not have software information for checking similarity.

- Elsevier, Springer, Wiley, Taylor and Francis, Nature, Cambridge, Blackwell, American Chemical Society, Royal Society of Chemistry, Institute of Physics, etc. these publishers major and popular in the field of the science and users want to publishes literature in some of these publishers which are high impact factor journals too.

- For all research institutes, e-resources are the rich source of information, 75% users use e-resources every day. 17% users use e-resources weekly, 2% monthly and 6.21% use e-resources occasionally as and when required. It is observed that 69% users spend 1 to 20 hours of a week on e-resources whereas as 16% users spend 20-30 hours on e-resources. 11% users spend less than the hour and 4% users spend more than 30 hours of the week on e-resources. 39% users are accessing 6-10 e-resources in a week, 26% users accessing more than 10 e-resources in a week. 35% users are accessing 5 or fewer e-resources in a week.

- From the responses, it is very clear that users are using e-resources for various purposes. 83% users are using e-resources for research purpose, whereas 65% users are using e-resources for keeping themselves update in their subject. To know the recent trends in a particular subject 59% user are using e-resources. The purpose of 47% users is to publish papers in journals/proceedings. 25% users are taking help of e-resources for teaching. Only 24% users are using e-resources for leisure reading.

❖ **Copyright:**

- The data shows that 67% users are aware of the copyright laws of e-resources. Still, 33 % are unaware of the copyright laws. 56% get knowledge about copyright law through their reading. 14% users get it through discussions with colleagues and 30% users developed awareness from library staff on copyright issues. Though knowledge of copyright laws is very essential, it is observed that almost 50% users indicated that library is not taking any efforts for developing awareness on copyright law. Data analysis indicates that 71% users indicated that libraries are explaining orally about the copyright laws to the users, whereas according to 54% users, libraries are displaying information about copyright on their website.

44% users indicated that library explains copyright law during the user's education programme.

❖ **Users satisfaction.**

- Users are fully satisfied with assistance of library staff, availability of e-resources in the library and library services using e-resources etc. but users are partially satisfied with the management of e-resources, internet speed and infrastructure available for using e-resources.

❖ **Users Training**

- 78% users indicated training for effective use of e-resources is necessary for them but 74% users opinined that they have not received any training regarding use of e-resources. It is observed that 61.36 % users agreed on the statement that library provide adequate training to users. 60% llibraries conduct library orientation sessions; 33% libraries arrange lectures from vendor/publishers. Only 18% libraries are taking hands-on /demonstration. Very few libraries are using a tutorial on the website (2%) and distribution of library pamphlet (0.16%) for a user's training

❖ **Open Access Resources and Search Engines**

- 83% users are having knowledge of search engines available in their field and also aware of the Open Access resources available in their subject area. 86% users are using Open Access Resources in their research work. 68% users prefer open access journals, 34% users prefer open access database, and 18% users prefer free sites. Open access/free resources are used more as compare to paid resources.

- Users agreed with "Lack of sufficient fund" is an issue in not getting e-resources efficiently in libraries and "Non-availability of proper hardware/software is another hindrance in getting access to electronic resources. But they do not agree for "e-Resources are less convenient than print resources"

❖ **Difficulties Faced**

- User's major problem faced are slow internet connectivity (49%), desired/required journals are not subscribed in library (43%), lack of

knowledge regarding availability of electronic resources (33%), lack of information searching skills (21%), Lack of remote access (15.76%), failure of library staff to keep users aware of availability of electronic (14.49%), limited terminals (14.33%).

❖ **Library services used by users**

- The data analysis clearly indicates that reference service is the most used by the users (76%), followed by reprographic service (70%), Current Awareness Service (42.36%) and Document Delivery Service (41.24%). Bibliographic service used by 30% users whereas Table of Content Service used by 21.50% users and Selective Demission Service is used by 20.22% users. 15% users are using referral service and only 4.78% users availed translation service.

8.3 Finding from the Literature Review:

1. Developments in ICT plays an important role in managing e-resources well. Hence, all the library personenel needs to enhance the ICT skills which helps them in providing better access and services of e-resources.

- Libraries role is becoming more critical due increase in scientific research and urgent need of information for the research. Iinformation professionals need to be involved in research team for understanding need of users and management, analysis, and preservation of research publications.

- The libraries associated with research institute are called special libraries since its collection is specific and based on subject as well. Users of special libraries need topic/subject based information.

- Special libraries are also called as Knowledge Research Centre (KRC), Information Centre (IC), Information Resource Centre (IRC) etc.

- The role of librarians in special libraries is to develop proper need based/mission-based collection useful for users.

- Special libraries are using more ICT for different activities and services in the libraries and transformation is very fast.

- It is observed that more e-resources are being acquired in libraries along with print resources.

- Special libraries are migrating to DL development and also uses digital resources, internet resources for R&D staff.

- It is observed that users of R&D libraries are well aware of needs and capable of searching their information resources.
- Users of research libraries are efficiently using e-resources, web resources, internet resources along with print resources.
- Impact of e-resources is high in research libraries. The reason may be more e-resources are available in all branches of science. e.g. e-books, e-journals, databases, reports, theses, patents etc.
- Users are fully aware of e-resources available in their subject and also search for information in simple ways.
- Librarian are getting training for preservation and maintenous of e-resources since these are new and complicated problems. However, many librarians are deeply looking in "digital preservation challenges".
- Librarians are of the opinion that guidelines or policies for management of e-resources are to be developed and best practices and procedures need to be discussed.
- Users are aware about electronic information services and most of them the users are using the electronic resources regularly for research, teaching and professional developments.
- While accessing e-resources majority of the users facing common problems like slow internet, lack of infrastructure etc.
- Nature of e-resources is different from print resources; hence there is need of more proactive, anticipatory management techniques for managing e-resources.
- For acquisition of e-resources librarian need to know licensing models, file compatibility, system requirements, authentication, interface design and proxy servers etc. Libraries need to use technology and management techniques to improve workflow of e-resources.
- For managing e-resources, libraries need to use best practices for managing e-resources like digital library, institutional repository, electronic thesis and dissertations, library consortium, dynamic library website/library portal, CD Mirror Server Facility, Local Area Network and User Feedback Mechanisms, use of Blogs, wikis etc.
- All libraries should develop written collection management policy for e-resources for better research management.

8.4 Suggestions:

From the findings of survey researchers would like to state some prominent suggestions to improve collection management and use of e-resources in science research libraries.

- Libraries have to prepare written collection development policy for e-resources and update it time to time. Collection development policy includes the guidelines for selection, deselection, vendor selection, acquisition, processing, renewal, preservation and weeding, etc.

- It is suggested that all the science libraries need to develop consortia for purchasing core databases and e-journals for qualitative, economic collection development.

- All the libraries need to come together to form library network at local level which enables easy sharing of the resources. Similarly holding list and union catalogue need to prepare for actively resource sharing.

- It observed that budget crunch and delay in getting library fund is hampering subscription of the e-resources, which may lead to interrupted access or no access to the desired e-resources. Therefore, it is suggested that institutes need to enhance the libraries budget and provide it on time.

- It is suggested that library need to identify the non-users of the e-resources and proper steps need to be taken to convert them into potential users for the use of e-resources.

- To enhance the use of subscribed e-resources proper advertisement is very necessary among users. It is suggested that along with traditional ways, the libraries need to use modern web 2.0 tools for advertising and display its resources.

- It is observed that libraries do not have specialized and train personnel to handle e-resources. Managing e-resources need some skills and expertise. Therefore, it is suggested that for effective management of the e-resources libraries need to hire separate trained staff.

- It is suggested to organize regular training programmes for staff and users, to understand features of the e-resources for effective use.

- Many users are not aware of searching techniques and skills. Hence it is suggested that libraries need to arrange information literacy programme for the users. Libraries also need to arrange tutorials and guides on use of e-resources, which can help users while searching e-resources in their subject areas.

- Many open source resources are available in science field out of them some are free for access and use. Libraries need to identify such resources as per their user's requirements and direct the potential users to url of such e-resources.

- To understand the user's requirements and find out target users, libraries are suggested to conduct users' surveys, which helps to initiate user-oriented services and to develop library collection.

- Most of the libraries have digital repositories and they are uploading institutes publication in it. It suggested to make their digital repositories available on the internet so that users from other institutes can access to the resources easily.

- There is need for developing OPAC for print and well e-resources and putting them on web.

- It is suggested that special orientation for awareness of copyright and plagiarism to be organized for avoiding IPR issues. Library needs to conduct special awareness programme on copyright laws from time to time. Further library needs to put copyright information on the website to make users aware of it.

- Only library orientation is not enough for the users to make them aware about e-resources. Libraries have to provide a personal assistant for using e-resources hands on sessions.

- Many resources are now available in the open access and libraries need to keep users aware of these resources. The library can encourage users to publish their papers in Open Access journal by providing necessary information, help required for it.

- It is observed that all the libraries are fully dependent on the publisher for the preservation of the e-resources, but libraries need to have their own preservation programmes. Hence it suggested that libraries have to prepare

digital preservation programmes for their e-resources. Science libraries can come together to develop such preservation programme collectively.

- Regular survey of users is to be assessed for proper and qualitative collection development.

- It is highly recommended to organize trial access and critical review of the e-resources to justify their cost and to avoid procurement of unwanted e-resource. Evaluation of e-resources is to be done be librarians

- The libraries need to prepare the subject guides and library guides to enhance the use of e-resources. For easy access, these can be put on the library website with proper hyper linking to the subject resources, for direct access of resources to users.

- For effective utilization of funds, regular, periodical and critical review of the usage of the e-resources is necessary which helps to unsubscribe the e-resources, which are not used prominently.

- Most of the libraries provide access to the e-resources through their web site. Hence to enhance the use of e-resources, libraries need to develop attractive, user friendly website with essential links to it.

- Librarians of all the science research libraries need to join together to develop the union catalogues of Library's collection. This helps in document delivery services, inter library loan, resource sharing and consortia purchase etc.

- The syllabuses of the LIS schools also need to be modified as per the need of the present library management of e-resources.

- Some libraries have old valuable print collection in their library. To preserve and provide access to old and valuable print collection library need to digitalize it and provide access through the digital repository or any other convenient way. Libraries can use open source content management software to manage and provide access to the digitized collection.

- Science research libraries are special libraries and having fine collection on their subject they can start various services like Document Delivery Reserive, Reference Service, outside side membership, translation service for outside users to generate revenue.

8.5 Fulfillment of Objectives and Hypothesis:

The objectives and hypothesis set for conducting this study in the beginning are discussed in the different chapters and also proved true.

The objectives set for this study are:

1   To Identify Science Research Libraries either funded or established under the aegis of Central Government in Pune Metropolitan Area. In chapter 1 point 1.4 the researcher has presented a list of science research libraries in Pune metropolitan area (Table 1.1). This list is useful for libraries as well as users of libraries.

2. To assess the collection of Science Research Institute Libraries including e-resources. This objective is elaborately discussed in the Chapter 7 A. (Table 7.8, Table 7.9, Table 7.10). This data is helpful for the librarians in document delivery services, resources sharing, inter library loan, etc.

3. To assess the use of e-resources by users in Science Research Institute Libraries. This objective is discussed in point E of Chapter 7B.

4. To identify issues and problems for consulting e-resources by users. This objective is discussed in the chapter 7B in table 7.193. This discussion is helpful for the libraries to find out the solution to the user's problems.

5. To record few prominent e-resources useful in Science Research Institute Libraries. This objective is elaborated in the chapter 7A in tables 7.10 This data is helpful for the librarians in document delivery services. This objective is elaborated in Chapter 4-e-resources available in S&T also.

6. To suggest best practices to enhance the use of e-resources by Science Research Institute Libraries Users. This point is discussed in Chapter 8-point number 8.7.

The following hypotheses considered at the beginning of the study are also proved true i.e. Positive

1. Use of e-resources by users is increasing in Science Research Institute Libraries.

(This hypothesis is proved from data analysis which shows that almost 91% users have been increased in using e-resources since last 2 years and 96% users are planning to use more electronic resources in future. This indicated that use of e-resources increasing and one of the reasons is also more and more e-resources are made in S&T area. The benefit of e-resources over print resources is also another reason).

2. e-Resources collection is also increasing in science research libraries. (This hypothesis is proved true in literature review and from libraries data analysis which shows major portion of the library budget is now spent on the procurement of e-resources. Users data analysis also indicated that most of the users are using e-resources.

8.6 Scope for Further Research:

This study is mainly focused on the collection management of e-resources in the science research libraries in Pune. There is a need for undertaking such studies in detail for other areas like engineering, medical, arts, commerce, architecture, etc. There are many private organizations doing scientific research. Study of similar type is needed for the libraries of private organization. These can be topics for the continuous research in similar areas.

The researcher suggests following few best practices which can be followed in the science libraries for better management and preservation of e-resources.

8.7 Best practices for collection management of electronic resources in science research libraries.

1. **Written collection development policy (CDP):**
    All S&T research libraries have to prepare written collection development policy for the e-resources in addition to print. Collection development policy provides overall guidelines for the selection criteria, selection responsibilities, acquisition process, evaluation procedure, licensing, organizing and management including weeding. The library authorities have to get the collection development policy approved by

competent authority. Collection development policy needs to be evaluated and modified from time to time.

2. **Dynamic Library Website:**

The library website is best access point for all resources libraries has including electronic resources and services. The purpose of the website is to keep users informed about library resources and services. Library website can display the library e-resources by providing the systematic list of the e-resources, along with hyperlinks, users get access to e-resources directly from the website. The website can also provide links to digital library, institutional repository, Web OPAC, internet resources etc. Library website can also offer "Ask a Librarian" facility to interact with the users. Library can also provide the link to various open sources resources available in their subject. Every library has to develop dynamic web page of its own.

3. **Digital Repository/Institutional repository**

The digital Repository/institutional repository is the mechanism to collect, organizes, preserve and provide access to the intellectual output of the institute. Digital Repository/institutional repository contains a wide variety of digital resources such as annual reports of institutes, articles/papers published by the institute's members, theses, and dissertations of the students, course materials for the different study programmes, student projects; e-books, institute's magazines, photographs, video recordings, patents, digitized documents, etc. Libraries can provide access to the IR through their website and make it accessible to all the users. Libraries can restrict the access to IR resources if required. The IR policy is also to be formed for inclusion of material on it.

4. **CD Mirror and Proxy Server Facility**

To provide access to the content from the CD/DVD, CD server can be used. CD/DVD can be mounted on CD mirror server; the users can access these documents through the campus LAN. CD Mirror server definitely

enhances the use of the CD/DVD. Most of the libraries have the policy not to issue a CD or issuing it for a less period, so users are not able to use the CD properly. Therefore, CD Mirror Server can solve this problem. Libraries can copy digitized resources on CD for preservation and can provide access to the digitized content by mounting CD on the CD server.

5. **Consortia Purchase**

For qualitative economic purchase and more access to e-resources consortia are essential. To deal with big publishers jointly and to get maximum benefits from the minimum investment science research libraries are coming together for consortia purchase. Science research libraries have to first identify the common and core e-journals, databases, e-books and other e-resources for the procurement. There is also need to have guidelines in CDP.

6. **Science Research Libraries Network**

Most of the science research libraries in Pune are automated and having good ICT infrastructure. With the help of ICT, it is possible to create a network of all the science research libraries. This helps in resource sharing, consortia purchase, etc.

7. **Arranging User Awareness Programme and Information Literacy**

The libraries have to organize user awareness programme regularly to keep the user's informed about the library collection and the library services. Only user orientation once in the year is not enough, have individual library has to organize presentation and product demonstration from the vendors, website tutorials, users guide for the e-resources, etc. which may be useful.

For developing search skills among the users, libraries have to arrange information literacy programme for the user. This helps users to learn how to use e-resources, searching strategies for online searching, use of the thesaurus and controlled vocabulary for getting accurate and quick information from the e-resources.

8. **Staff Training Programme**

Staff training programme is necessary for developing proficiency in use of e-resources and providing services using e-resources. It helps in understanding access type, basic and advanced searching skills, content in the e-resources, etc. Libraries can invite database vendor for the product demonstration or experienced library staff can train other staff of the library. The library can also use hands-on practice, system tutorials, outside trainer, the study of e-resources, manual for staff training, etc. Staff training should just not be a one-time event, but it should be an ongoing programme.

9. **Advertising library e-Resources**

To enhance the use of e-resources proper advertising of the same is very essential. For advertising, libraries can use various methods like displaying the list of the e-resources on their library website, email announcements of the procurements of new e-resources, product demonstration from the vendor, distribution of library pamphlet, word of mouth publicity, etc.

10. **User Feedback System**

Libraries are procuring all the resources to satisfy, information need of the users. Therefore, user's feedback is very much important for improving management of the e-resources. User's feedback can be collected through suggestion boxes, library website, email, online/offline feedback form etc. Along with improving management of the e-resources, it also helps to increase user's satisfaction. Feed back as well as use Information seeking behavior of users need to be assessed at regular frequencies.

11. **Conduct user's study and use study**

To evaluate user's need and the resources accessible in the library, library need to take the user's study and use study time from time to time. It gives exact idea of user's requirement, along with the strength and

weakness of the library collection. It also helps the library to start new user's-oriented services, collection development of the library. SWOT analysis, information audit also few solution to use by librarians.

12. **Separate Committee for Procurement of e-resources and preservation of e-resources.**

Nature of the e-resources is different from the print resources. It is more complicated due to the involvement of the various aspects like the type of access, the period of access, type of procurement, negotiation with the publishers, license agreement, etc. To deal with all such aspects, the library needs to have a separate committee for e-resources procurement. The committee needs to have the power to approve or reject the subscription and provide guidelines for preservation of e-resources.

13. **Providing Users Oriented Services**

Librarians of the research libraries are not the custodian of the resources, but they are information manager. The library has to understand the specific information need of the users in anticipation by in-depth study of user's requirements. Libraries have to identify the group of users having similar information, need and channelize the specific information to target users. Libraries need to analyze, synthesize and provide the information in a format as per user's requirements.

14. **Preparation Subject Guides/Library Guides**

To enhance the use of the e-resources libraries can prepare subject guides with the help of a subject expert. The subject guide gives the comprehensive list of all the resources accessible through the library on a particular subject and its use. By hyper linking resources, it can also act as an access point for the resources. The subject guide also helps in evaluation and development of the library collection. Library guide help can help user to understand the services provides by library and how to use these resources.

15. State of the Art Infrastructure

Libraries have to provide best ICT infrastructure for accessing e-resources. It includes enough number of computer terminals, availability of necessary hardware and software, Wi-Fi connectivity, access through LAN, enough printers, scanners, etc. Infrastructure need to be updated at regular intervals as per the trends.

16. Preservation Policy

All the libraries are fully dependent on the publishers, for the preservation of the e-resources but libraries need to have their own preservation policy to ensure streamline and uninterrupted access to the procured e-resources in the future. Libraries having similar collection may come together to discuss and form a policy collectively. They can share the responsibilities together. Preservation policy need guidelines for the preservation programme by providing all the information like type of document to be preserved, the method used for preservation and providing access, role and responsibilities of the personnel involved in the process.

17. Digitization of old and valuable resources.

To preserve and provide access to the old and valuable resources library need to have written policy of digitization. The policy will cover all the aspects of the digitations like which resources be digitized, how to digitize, who will digitize, when and where to digitizes, how to preserve and provide access to the digitized material, assessment and evaluation etc.

18. Union Catalogue

Compilation of union catalogue of e-resources at local level may help users and libraries to identify resources available which need to be accessed.

8.8 Model Collection Development and Management Policy for e-Resources in the lines of IFLA guidelines:

Collection development policy is basic requirement for development of proper collection in the library. Collection development policy provides base and authority to take decisions in collection development process. From the survey, it is observed that most of the libraries do not have collection development policy. It is very essential that every library should prepare collection development policy as per their requirement. The researcher has prepared a draft 'Collection Development and Management Policy for e-Resources' based on guidelines provided by IFLA, OCLC, British Library, Library of Congress.

- **Elements of Collection Development Policy**

  - **Introduction:**

    ✓ It includes goal of the library, objective of the collection development policy and audience of the policy. It can also include brief information about library users, description about the library services, library collection, budget allocation for different sections of the library, etc.

    ✓ **Selection and evaluation of e-Resource:**

      The basic function of collection development policy is to provide guidance for selection and de-selection of the library resources. The collection development policy clearly clarifies scope and purpose of the library collection. It mentions criteria for selection of the e-Resources, points for evaluation of the e-Resources. Statement of selection and evaluation of the e-Resources minimize personal based in selection of e-Resources; help in maintaining consistency in selection and finding gap in library collection to develop comprehensive collection. Basic guidelines for Content, Cost, Technical requirements, purchasing mode, Licensing terms, Vendor support Supply should be mentioned in the CD policy.

Collection Development and Management Policy for e-Resources

Introduction to Policy

Selection and evaluation of e-resource

Licensing Agreement

Procurement

Provision Access

Users and Library Staff Training

Preservation /Archiving

- **Content**
- **Cost**
- **Technical requirements**
- **Purchasing mode**
- **Licensing terms**

- **Access concerns**
- **Use of e-resources**
- **Vendor support**
- **Flexibility & enhancements**

- **Manage Budgeting**
- **Place order**
- **Update knowledge base**

- **Provision of fund for training**
- **Method of training**
- **Frequency of Training**

Renewal/Disco ntinuation

- **Set up Access**
- **Find or create catalog record**
- **Update Information**
- **Inform Users**
- **Provide support if requires.**

- **Usage data review**
- **Other Point to consider**

- **Identification of documents to preserve.**
- **Selection of method for preservation.**
- **Selection of way for preservation**

Fig.8.1 Model Collection Development and Management Policy for e-Resources

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- ✓ **Licensing Agreement:**

  A license is a legal document which defines the terms and conditions of use, liabilities and responsibilities of the Licenser i.e. (vendor) and licensee i.e. libraries. Licensing agreement expresses the selector's expectations before purchase of the e-resources so all the purchase term should have been mentioned clearly in licensing agreement. As licensing agreement define authorized users, authorized sites, method of access, archiving policy and perpetual access institutional archives/self-archiving, rights regarding use of e-Resources like interlibrary loan, viewing, downloading and printing, user statistics, privacy and confidentiality of user information; vendor support and technical considerations; right of cancellations, drop-out clause, etc. should be mentioned in the licensing agreement

  As licensing agreement is important legal document, CD policy should mention all the clauses which are required to be included in licensing agreement. It should also include the authority to review licensing agreement terms and signing authority of licensing agreement.

- ✓ **Procurement:**

  Procurement of the e-Resources involves jobs like selecting vendors, fixing mode, placing order, updating budget, start subscription, etc. Collection development policy define all these jobs, authority and responsibly of the library staff while performing these jobs.

- ✓ **Provision Access**

  After placing orders Library should provide range of institute IP addresses to the vendor so that the vendor can activate e-Resources access. Library also prepare various type of list of e-Resources like alphabetical list, publisher wise, etc. to display it on library website so that the users can use it as an access point for e-Resources. Library needs to check the e-Resources frequently for smooth access.

Collection development policy list down the work involved in provision access and role and responsibilities of the library staff involved in it.

✓ **Users and Library Staff Training**

Training of users and library staff is very essential to ensure best utilization of the e-Resources. Collection development policy identify, list down and suggest budget provision for the training, method of training, frequency of the training and place of the training.

✓ **Renewal/Discontinuation**

Collection development policy has to provide basic minimum criteria for renewal of the e-Resources. This acts as a base for taking decision in renewal process of the e-Resources.

✓ **Preservation/Archiving**

Collection development policy give clear guidelines for criteria for selecting resources to be preserve/archive, method of preserve/archive, outsourcing or in-house preserve/archive, budget for preserve/archive, method of providing access to preserve or achieved resources etc.

Collection development policy is blue print of collection development of the library. Proper collection development policy aids to the collection development. Libraries are developing library collection as per user's requirements to fulfill institutes goals and objectives. Any change in users' research activity influence the libraries resources. If any new research field is included in the institute, libraries have to develop collection to support research in the newly added research area. Similarly, many new e-Resources are getting available in the market which may be better than the old ones so library users may demand for these e-Resources. To accommodate all these changes library Collection Development Policy should be flexible. There should be scope to make changes in the Collection development policy as per the requirement. Libraries also need to review Collection development policy time to time to keep it updated as per the libraries requirements.

8.9 Preservation and Management of e-Resources: Practical Guidelines

In digital world libraries are procuring various e-resources. Libraries are digitizing old and valuable print resources to preserve its contents. Libraries also have challenge of preserving and provide access to the knowledge generated in their institutes through publication, research, scholarly discussion etc. The risk of loss of data through e-resources is high due to various factors like machine dependency for access, fragility of the storage media, technological obsolescence, shorter life span of digital media, various formats and styles, copyright and intellectual property right issues etc. Digital preservation is the solution for enhancing access of digital resources. Libraries can refer OAIS model as guideline in preservation of digital contents. Open Archival Information System (OAIS) reference model was established by Consultative Committee for Space Data System (CCSDS) which plays an important role in digital content preservation and its use for long period. It provides conceptual framework for describing functional component, environment, and information associated with system responsible for long term preservation. Preservation is tedious work and successful preservation libraries need to consider following points -

1. **Digital Preservation Policy**:

   All the libraries need to have written digital preservation policy which state guidelines for selection of material for digital preservation, budgetary provision, strategies to be use for digital preservation, archiving of digital contents, management and providing access to the digitally preserved material. Digital preservation policy need review periodically to update regularly as per requirements.

2. **Selection of proper preservation strategy for preservation of digital resources**

   Digital resources provide quick and easy access to required information but risk of data loss in digital form is much greater than any other form. Digital documents may get unreadable or sometimes inacceptable either due to decay and obsolescence of the media on which they are stored or failure of hardware required for software use etc. Hence it is very essential to preserve data stored in digital format. Several strategies are proposed for digital

preservation. All the strategies having some advantages and some limitations. Hence libraries need to select suitable strategy or combination of strategies for preservation of digital content. Some of the strategies are discussed below:

- **Bit-stream copying/Backing up data**: It states making exact duplicate of digital object. This strategy helps to prevent data loss due to media failure or hardware failure.

- **Refreshing:** It refers to copying digital information from one medium to another of the same type like copying data from older CD-RW to new CD-RW. This technique deals with data loss due to decay and obsolescence issues of storage media.

- **Replication:**

  This technique involves creation of duplicate copies of data on more than one system which are located in different location. Replication help to save the data from software or hardware failure, natural or man-made disasters. As data is saved at different locations, it may cause problem to refreshing, migration and access control.

- **Technology preservation:**

  Technology preservation strategy refer to keeping and maintaining technology environment which is used for creation of content i.e. operating system, original application software, media drives etc. This strategy covers access for obsolete media and file format. Technology preservation requires management of wide range of hardware and software along with their licenses and manuals. This technique requires huge investment in necessary equipment and skilled personnel.

- **Migration:** Migration refers to periodical transfer of digital materials from one software/hardware configuration to another or from one generation of computer technology to new generation technology. It treats issues data loss due to obsolescence of physical storage medium, encoding and formats of data.

- **Emulation:**

  The strategy involves creation of new software which can translate instructions from original software to perform on new platform. This

method help preservation by removing the need to retain old hardware working. Emulation bring together all essential software and hardware combinations to create an environment in which computer of different designs, allowing programs designed for a specific environment to operate properly

- **Encapsulation**

  This technique involves grouping of digital object and metadata require for describing it for providing access to that object. Encapsulation plays an important role in Emulation and other preservation strategies.

3. **Implementation of Preservation Strategy Systematically**

   Before implementation of preservation, libraries have -
   i.   Take back up of records identified for preservation
   ii. To select the best strategy available as per requirement and considering cost involved for implementation.
   iii. To test the selected strategy on technical process.
   ii. To identify hardware and software requirements for selected preservation strategy.

   After these procedure's libraries can start implementing preservation strategy on full data selected for preservation. The preserved records need to check deeply to ensure that there is no loss of data, change in format or structure. After completion of preservation programme, system need to set for monitoring the integrity of preserved records, structure, function, content, context, metadata associated with records to ensure the stability of preserved records and to identify whether any changes in successive preservation treatments are required.

4. **Preservation of Metadata:**

   Along with preservation of digital object, it is also necessary to preserve metadata of digital object. In digital preservation metadata provide attributes of digital resources essential for long term preservation and access. Descriptive metadata are used to discover and identification of digital object whereas preservation metadata gives structured ways to describe and record information needed for preservation. Libraries can use OAIS model and

PREMIS (PREservaton Metadata: Implementation Strategies) as in metadata preservation.

5. **Chose correct place for saving digital contents**

   Libraries need to identify safe place for storing digital materials. They can use computer hard disk, CDs/DVDs, institute server or use third party solution (such as cloud). If libraries are storing digital content on server it need to have auto backup facility and data recovery in case of loss of data due to uncontrolled circumstances. Libraries can come together to store digital content at one place by creating necessary infrastructure which can reduce their financial burden for preservation of digital contents to some extent.

6. **Use of digital repository for providing access to digital content**

   Libraries can upload digital content into digital repository along with its descriptive metadata for storing, managing and providing access to the digital content. Libraries can use digital repository to organise knowledge created in their institute like institute's publications, Ph. D. theses of the student, data created while conducting various experiments, annual reports of the institutes etc. It is possible to restrict access of content in digital repository to users according to user's requirements and institutional policy. Many Open Source Softwares like DSpace, EPrints, Fedora, Greenstone etc. can be use for creating digital repository.

7. **Use consortia power in Preservation of online resources –**

   In most of the online resources, ownership of the resources is remaining with publishers and subscribing libraries get only access rights for subscription period. Users access e-resources from publishers' server by IP authentication. Once subscription is over then library users cannot access the resources. Leading publishers like Elsevier, Taylor and Francis, Nature, Springer, Blackwell, Wiley etc. have their archival arrangements. To access back issues of journals, libraries need to subscribe for perpetual access. As outright purchase of e-resources is very costly affair and managing archive of e-resources need huge investment in infrastructure

and manpower. But library consortia need to negotiate with publishers while purchasing outright e-resources. Consortia can develop to set up for archiving e-resources, hosting them on local server for providing access to consortia members. Proper maintenance and migration from old platform to new one is needed periodically. Consortia can ask big publishers to host their contents on local servers. Publishers and libraries can also take help of Electronic Archiving Services like Portico, CLOCKSS, LOCKSS for long term preservation of e-resources.

8. **Use of Electronic Resources Management Systems (ERMS) for managing e-resources.**

Like print resources, e-resources are not physically visible to the users. Libraries are procuring different e-resources packages form different publishers and searching information in different e-resources is not convenient for users. All these resources need to integrated for access with single stroke key. As most of present library software are not capable of handling e-resources, libraries need to have Electronic Resources Management Systems (ERMS). ERMS need to integrate all the e-resources for enabling single platform for all the searching approaches of the user and retrieve information from all available sources. Many commercial vendors are providing Electronic Resources Monument Systems like EBSCO ERM Essentials, ProQuest Serials Solution's 360 Resource Manager Ex Libris Verde etc. Library may use open source softwares like CORAL (developed by University of Notre Dame), CUFTS (developed by the Simon Fraser University Library), ERMes (developed in-house by the University of Wisconsin-La Crosse) for developing Electronic Resources Management Systems etc. Library need to have enough skilled manpower with them to use open-source software for ERMS.

Since libraries are now investing heavily in e-resources and infrastructure hence it is vital that the preservation of e-resources and their management for future use are also given equal importance.

Conclusion:

In science research libraries e-resources are the most important information source for their users. Hence libraries are also spending large share of their budget on the e-resources. Though now libraries are procuring both print and e-resources in near future libraries may procure more e-resources than print due to manifold benefits. Since the nature of the e-resources is different than the print resources, subscription of e-resources made huge impact on both users and libraries. e-Resources help libraries in providing user-oriented services, but libraries are also facing many challenges in managing e-Resources.

The present study is an attempt to present collection management and use of e-resources in science research libraries in the Pune. e-Resources are certainly important in disseminating scientific knowledge among the researchers thereby helps in accelerating research. To understand the collection management and use of the e-Resources in the science research libraries, researcher has collected data from librarians and from the users by using descriptive questionnaires' as research tool. Researcher assessed the library collection, libraries' collection management methods, library services using e-resources, libraries challenges in managing e-resources, collection development policy, etc.

Researcher also analyzed the user's perception, use of e-resources, users' awareness about e-resources, users' preferences, electronic resources searching skills/techniques, users e-resources reading pattern, preferred access point for e-resources, users' awareness about the copyright law, users training, users' difficulties while using e-resources, etc.

It is observed from survey that no library has written collection development policy for the e-resources but every library should have their own collection development policy which guides and provides framework for collection management. In science disciplines hugs number of resources are available. But libraries have limited budget and they are procuring e-resources through consortia. There is a need to develop information network of all the science libraries which facilitate to share resources among the libraries. Libraries also need to educate users about library resources and copyright law by arranging regular orientation and training

programme. Libraries need to acquire and develop ICT skills which help them to provide many user oriented serviced using e-Resources.

This study is very useful to library professionals, science research libraries as well as other libraries too.

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Appendix -I: Science Research Institutes and Libraries in Pune Metropolitan area

Science Research Institutes and Libraries in Pune Metropolitan area

Sr. No	Institute Name	Ministry of Govt.	Core Research Area
1	Agharkar Research Institutes (ARI)	Department of Science and Technology, Government of India.	Life Science
2	Armament Research and Development Establishment (ARDE)	Ministry of Defence, Government of India.	Weapons Technology
3	Automotive Research Association of India (ARAI)	Ministry of Heavy Industries and Public Enterprises, Government of India.	Automotive
4	Botanical Survey of India: Western Regional Centre Pune	Ministry of Environment, Forest and Climate Change, Government of India.	Botany
5	Central Bee Research Centre (CBRC)	Khadi & Village Industries Commission, Ministry of Micro, Small & Medium, Enterprises Government of India.	*Beekeeping*
6	Central Institute of Road Transport. (CIRT)	Ministry of Shipping & Transport, Government of India.	Training, Testing and Consultancy
7	Central Water Power Research Station (CWPRS)	Ministry of Water Resources, River Development and Ganga Rejuvenation Government of India.	Hydraulics, Coastal Engineering, Mathematical Model and Civil Engineering

8	Centre for Development of Advanced Computing (C-DAC)	Ministry of Electronics and Information Technology, Government of India.	High Performance Computing, Super Computing and Linguistic Computing
9	Centre for Materials for Electronics Technology (C-MET)	Ministry of Electronics & Information Technology (MeitY), Government of India.	Electronics
10	Defence Institute of Advance Technology (DIAT)	Ministry of Defence, Government of India.	Defense Related Techniques in navigation systems, wireless sensors, Efficient Propulsion System, Weapons systems
11	High Energy Material Research Laboratory (HEMRL)	Ministry of Defence, Government of India.	Defense Research and Development
12	Hindustan Antibiotics (HA)	Department of Chemicals and Petrochemicals,_Government of India.	Drug Manufacturing
13	Indian Institute of Science Education and Research (IISER)	Ministry of Human Resource Development, Government of India.	Pure Science
14	Indian Institute of Tropical Metrology (IITM)	Ministry of Earth Sciences, Government of India.	Tropical Metrology
15	India Meteorological Department (IMD)	Ministry of Earth Sciences, Government of India.	Meteorology

16	Inter-University Centre for Astronomy and Astrophysics (IUCAA)	University Grants Commission (UGC)	Astronomy and Astrophysics
17	National AIDs Research Institute (NARI)	Indian Council of Medical Research.	HIV
18	National Centre for Cell Science (NCCS)	Department of Biotechnology, Government of India.	Biotechnology
19	National Centre for Radio Astrophysics (NCRA)	Department of Atomic Energy, Government of India.	Astronomy and Astrophysics
20	National Chemical Laboratory (NCL)	Council of Scientific and Industrial Research.	Chemical Sciences
21	National Institute of Naturopathy	Department of Ayush, Government of India.	Naturopathy
22	National Institute of Virology (NIV)	Indian Council of Medical Research.	Virology
23	National Research Centre for Grapes	Indian Council of Agricultural Research.	Grapes
24	Regional Ayurveda Institute for Fundamental Research	Department of Ayush, Government of India.	Ayurveda
25	Research and Development Establishment (R&DE)	Ministry of Defence, Government of India.	Military Engineering

Appendix II Questionnaire for Librarians

Collection Management and Use of E-Resources in Science Research Institute Libraries in Pune Metropolitan Area

Questionnaire (Librarian)

A. Institute Profile

1. Name of the Institute_____
2. Address of the Institute _____
3. Website Address _____
4. Year of Establishment_____
5. Status of Institute: Government/Autonomous/Private
6. FundingAgency_____
7. Core Research Area_____
8. CoursesConducted_____

B. Library Profile

1. Ph No. _____E-Mail _____

2. Working Hours

Days	Opens At	Closes At
Monday to Friday/Saturday		
On Holidays		

3. Name of the Library
   Manager/Head_____
   Designation_____Qualification_____

4. Number of Library Staff
   Professional: _____Technical_____
   Administrative: _____ Supporting Staff _____

5. Number of Users

	Type of Users	Number
b	PG Students	
c	Researchers and scholars	
d	Faculty	

6. **Library Collection**

Type of Collection	Total

Print Books	
Print Journals	
E-Journals	
E-Books	
Databases - Full Text	
Bibliographic	
Ph.D. Theses (Print)	
Ph.D. Theses (Electronic)	
Bound Volumes of Journals	
Digitized Documents	
CD/DVDs	
Any Other	

7. Please mention list of databases subscribed by your Library –

Full-text Databases

Sr. No	Total
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	

15	

Bibliographic databases

Sr. No	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

8. List of publishers of e- books subscribed by your library

9. Do you have an adequate number of library staff to manage electronic resources?
   Yes ☐　　　　No ☐　　　　Can't Say ☐

10. Status of Library Automation: Full ☐　　Partial ☐　　Initiated ☐

11. Which library management software do you have?
   _____

12. Is your library part of campus LAN?
   Yes ☐　　　　　　No ☐

13. Do you have separate Internet Lab for users?
   Yes ☐　　　　　　No ☐

14. Is your library's OPAC available on the web?

Yes ☐   No ☐

C. E-Resources Collection Management

1. Do you have a written Library Collection Development Policy for electronic resources?

Yes ☐   No ☐

I. Budget

1. Do you have a separate budget for subscription of electronic resources?

Yes ☐   No ☐

2. Do you get sufficient budget for subscription of Electronic Resources?

Yes ☐   No ☐

3. Does your library get fixed percentage from total institute's budget?

Yes ☐   No ☐

4. Please provide the details of your library budget for the current year.

Year	Library Budget	Percentage of allocation to E-resources out of the total library budget	Percentage of allocation to print resources out of the total library budget

II. Selection

1. How do you come to know about new electronic resources [Please select more than one option if necessary]?
    i.   Faculty Member's reques ☐   ii. Advertisement by publisher ☐

    iii. Consortia meeting ☐   iv. Conferences ☐
    vi. Any other _____

2. Who plays an important role in developing electronic resources collection for the library   [Please select more than one option if necessary]
    i.   Faculty ☐   ii. Library Staff ☐
    iii. Researcher/Student ☐   iv. Any Other ☐

3. Do you take trial access for reviewing/evaluation for electronic resources before purchasing?
    i. Yes   ☐   ii. No ☐

4. If Yes, who evaluates electronic resources?

    _____

5. Please tick mark, setting the level of importance of the following criteria, while selecting e-resources for your library.

Sr. No.	Criteria	Very Important	Important	Moderately Important	Slightly Important	Not Important
1.	Users Requirements					
2.	Content					
3.	Cost					
4.	Technical Feasibility					
5.	Functionality and Reliability					
6.	Vendor Support					
7.	Supply					
8.	Licensing Terms					
9.	Usage					
10	Any other, please specify _____ _____					

III. Licensing Agreements

1. Do you enter into the licensing agreement with the publisher while subscribing electronic resources?
   Yes ☐   No ☐

2. What is nature of renewal of licensing agreement?
   a. Automatic Renewal ☐
   b. Notice issued for renewal ☐
   c. Early termination ☐

3. Does your licensor provide the following features? Please tick
   [Please select more than one option if necessary]

Scholarly Sharing	
Providing Electronic Links	
Archival/ Back up copy	
Photocopying	
Electronic Reserves	
Access to Database	
Any Other	

4. Which method of access is available for electronic resources in your library?
   i. Stand-alone ☐   ii. Remote access via web ☐
   iii. Campus-wide ☐   iv. Any other _____

5. Which type of subscription do you have in your library?
   i.   Annual subscription with access only model ☐
   ii. Annual subscriptions with perpetual access ☐
   iii. Pay per view ☐
   iv. Subscription with onetime payment ☐
   v.   Any Other (Please specify)_____

6. Which type of authentication is available for most of the electronic resources in your library?
   i. IP-Based ☐   ii. Login and Password ☐
   iii. Both ☐

7. How do you pay subscription amount for electronic resources subscription?
   i. By Cheque ☐   ii. Direct transfer through bank ☐
   iii. Both ☐   iv. Any other ☐

8. What are the major difficulties you face while dealing with the licensor?
   a. Inequality in the bargaining power ☐
   b. Inflexibility on the part of vendor ☐
   c. Fitting license agreement to the need of the library ☐
   d. Jurisdiction ☐
   e. Lack of legal advice ☐
   f. Any other (Please Specify) ☐

9. For electronic resources which type of access does your library have?
   i. Single users with ID and Password ☐   ii. Multiuser with IP based ☐
   iii. Both ☐

10. Who checks the terms and conditions mentioned in the License Agreements?
_____

IV. Acquisition

1. Who gives approval for subscription of electronic resource in your library?
   i. Director of Institute ☐   ii. Library Committee ☐
   iii. Director of institute with recommendation from library Committee ☐
   iv. If any other please specify _____

2. Do you have a separate committee to take decisions on Electronic Resources Subscription?
   i. Yes ☐   ii. No ☐

3. Which mode of subscription do you use in your library?

	Directly from Publishers	Through Consortia	Through Subscription Agency
For E-books			
For E-Journals			
Other E-Resources			

4. Are you a member of any Consortia?
   Yes ☐   No ☐

5. If Yes please mention consortium names
   i. _____
   ii. _____
   iii. _____
   iv. _____
   v. _____

6. Do you feel that consortia play the major role in subscription electronic resources?
   Yes ☐   No ☐

7. If Yes what are the advantages for consortia
   i. Favourable pricing ☐
   ii. Bargaining of number of titles provided by publisher ☐
   iii. Negotiation on terms and condition ☐
   iv. Any other _____

8. Do you feel that consortia purchasing having any disadvantages?
   Yes ☐   No ☐

9. If Yes, what are the disadvantages of consortia?

i. _____

ii. _____

iii. _____

iv. _____

V. Management

1. How do you provide access to e-resources? [Please select more than one option if necessary]

    i. Access in the library ☐   ii. Remote access through campus network ☐

    iii. Internet ☐   iv. Wi-fi ☐

    v. Campus-wide Access ☐   vi. Any other (Please specify) _____

2. What are access points for electronic resources in your library?

    i. Library Website ☐   ii. Library Catalogue ☐

    iii. Both ☐

    iv. Other _____

3. Do you have federated search facility for the users?

    Yes ☐   No ☐

4. Please specify the tools and techniques that help users in finding out the availability of e-resources in the library.

    i. List Display on website ☐   ii. Electronic Resources Management System ☐

    iii. List Display on intranet ☐   iv. OPAC ☐

5. Do you have integrated OPAC for print and e-resources?

    Yes ☐   No ☐

6. How frequently you update electronic resources information on library website?

    i. Every month ☐   ii. Biannually ☐

    iii. Annually ☐   iv. Once in while ☐

7. How do you ensure smooth access of electronic resources?

    i. Random check for access of e-resources ☐   ii. Taking Users Feedback ☐

    iii. Both ☐   iv. Any other _____

8. Is your library doing cataloguing of electronic resources?

    Yes ☐   No ☐

9. If YES which of the following methods you use for cataloguing of electronic resources

    i. AACR2 ☐   ii. MARC ☐

    iii. Dublin Code ☐

    iv. Any other (Please Specify) _____

10. Does your library staff help users for using e-resources if required?

    Yes ☐   No ☐

11. How you manage electronic resources information like ID password, subscription period, publisher, etc.

   i. In Library Management Software. ☐   ii. Content Management Software ☐
   iii. Excel ☐   iv. Any other _____

12. Do you use Electronic Resource Management System?
      Yes ☐   No ☐

13. Does your institute have a digital repository?
      Yes ☐   No ☐

14. If yes which software you are using for the digital repository?
   i. DSPACE ☐   ii. Green Stone ☐
   iii.LS Digital ☐   iv. E-Print ☐
   iv Any other _____

15. Which e-resources available in digital repository?

Theses	
Dissertations	
Institutional Publications	
Seminars	
Institutional News in Media	
Videos	
Any other	

16. From where users can get access to digital repository
   i. Intranet ☐   ii. Web ☐

17. What are the facilities provided by vendors? (Please tick marks whichever is applicable.)

i.	Trial evaluation and product demonstration	
ii.	User training and support	
iii.	Technical/customer support and system notification processes	
iv.	Customization	
v.	Data security and archiving	
vi.	Bibliographic data provision	
vii	Usage Statistics	

viii	Promotional Material	
ix.	Any others _____	

18. Do you insist publisher, to customize e-resources as per the need of your
    library?
    i. Yes ☐   ii. No ☐

19. How do you organize CD/DVD collection in the library?
    i. Disk Stakka   ☐   ii. CD Server   ☐
    iii. In Rack ☐   iv. Any other (Please Specify) _____

20. Do you have CD server in your library?
    Yes ☐   No ☐

VI. Training

Staff Training

1. Are you arranging training programs for the library staff?
   Yes ☐   No ☐
2. If YES how frequently you organize/ sending library staff for training
   i. Regularly ☐   ii. Sometimes ☐
   iii. Rarely ☐
3. Which of the following way you adopt for training library staff?
   i. In House from other trained staff ☐   ii. Training from vendor ☐
   iii. Sending to different institutes ☐
   iv. Any other _____

Users Training

4. Are you arranging training programs for users?
   Yes ☐   No ☐

5. If YES how frequently you organize training sessions for e-resources for users?
   i. Regularly   ☐   ii. Sometimes ☐
   iii. Rarely ☐

6. Which type of user training programs do you conduct?
   i. Library Orientation ☐   ii. Lectures from Vendor/Publisher ☐
   iii. Hands on/Demonstrations ☐   iv. Tutorial on website ☐
   v. Distribution Library Pamphlet vi. ☐ Any other please specify   ☐

VII. Promotions of Electronic Resources

1. Which marketing techniques your library is to promote electronic resources?
   Please ✓

Sr. No	Marketing Techniques	
1	Word-of-mouth	
2	Print brochures and posters	
3	library catalog	
4	Newsletters	
5	Library Website	
6	E-mail announcements	
7	RSS feeds	
8	Advertising	
9	Presentations from Vendor	

2. Do you have a separate budget for advertising or promoting electronic resources?
   Yes ☐   No ☐

3. Do you have any written promotion plan for electronic resources?
   Yes ☐   No ☐

VIII. Renewal

1. Do you check usage statistics of E- Resources before its renewal?
   Yes ☐   No ☐

2. Renewal of any electronic resources depends up on [Please select more than one option if necessary]
   i. Previous year's usage ☐   ii. Vendors/Publishers Promptness ☐
   iii. Users Demand ☐   iv. Availability of budget ☐
   v. Any other ☐

3. Does your library have a set minimum basic criterion for renewal of electronic resource?
   Yes ☐   No. ☐

4. If Yes please mention the criteria
   _____
   _____

5. How you manage subscription renewal of electronic resources?
   i. Preparation of Calendar ☐   ii. Depend on vendor/publisher notice for ☐ renewal
   iii. Reminder from ERM system☐   iv. Any other _____

IX. Preservation:

1. Do you depend fully on publishers for preservation of purchased online E- book and E-Journals
   Yes ☐   No ☐

2. Do you have a digital preservation program?
   i. Yes ☐   ii. No ☐

3. Do you feel that your library needs a digital preservation program?
   i. Yes ☐   ii. No ☐

4. Which Method your library use for long term preservation of digital resources
   i. Refreshing ☐   ii. Migration ☐   iii. Replication ☐
   iv. Emulation ☐   v. Encapsulation ☐
   vii. Any other

   _____

5. Does your library digitize any library resources for preservation?
   i. Yes ☐   ii. No ☐

6. If Yes which type of documents.

   _____

7. How do you provide access to digitized material?
   _____
   _____
   _____
   _____

8. How do you manage digitization?
   i. In House ☐   ii. Outsources ☐

X. Open Access publications

1. Do you provide access to Open Access Publications from your library?
   Yes ☐   No ☐

2. If Yes how you provide access to electronic resources?
   a. Through separate link ☐   b. Federated search ☐
   c. Through OPAC ☐   d. Any other ☐

XI. Technical Issues

1. Which type of internet connection you have in your library?
   i. Leased Line ☐   ii. V-SAT ☐
   iii. Radio Link ☐   iv. DSL ☐
   vi. Any Other: _____

2. Who is internet service provider for your institution?
   i. BSNL ☐   ii. ERNET ☐
   iii. NICNET ☐
   iv. Any other please specify. _____

3. Is your library wi-fi enabled?

    Yes: _____No: _____

4. Are you happy with present internet speed?

    Yes ☐   No ☐

5. Do you have separate library server for the library?

    Yes ☐   No ☐

6. If yes name the server and its location.

    _____
    _____

7. Who is managing library server?

    i. Library staff ☐   ii. IT personnel ☐
    iii. Library staff with the help of IT Personnel ☐

8. Who deals with technical requirements of e-electronic resources?

    i. Library Staff ☐   ii. IT personnel of the Institute ☐
    iiii. Library staff with the help of IT personnel ☐

9. Do you have separate trained staff for managing electronic resource?

    Yes ☐   No ☐

10. Do you get prompt support form IT department?

    Yes ☐   No ☐

11. Do you check and update computer infrastructure required for electronic resources before its subscription of electronic resources?

    i. Yes ☐   ii. No ☐

12. What is your opinion about the efficiency of your library staff regarding the handling of electronic resources?

    i. All are efficient ☐   ii. The Majority are efficient ☐
    iii. The Majority are not efficient ☐   iv. None are efficient ☐

XII. Copyright

1. Does library staff have knowledge about copyright of electronic resources?

    Yes ☐   No ☐

2. What efforts you are taking to educate users regarding copyright issues?

    i. Explaining in users' education programme ☐
    ii. Explaining orally to the users ☐
    ii. Displaying it on website ☐
    iv. Any others_____

3. What measures are applied to control the copyright/ digital rights of e-resources?

    i. Special security measures ☐   ii. Anti-plagiarism software ☐
    iii. Any other (please specify) _____

4. What limitations are imposed by the library for copying portions of licensed materials that has been forbidden?

    i. Stop access for a specific period ☐   ii. Cancel membership ☐

    ii. File a case ☐   iv. Any other_____

XIII. Challenges

Rate the challenges you are facing while managing digital library collation. (where 1 is disagrees and 5 is strongly agrees)

Sr No	Problem	1	2	3	4	5
1	Lack of Funds					
2	Variation in Pricing Model of E-Resources					
3	Lack of trained staff					
4	Lack of Infrastructure					
5	Lack of Demand					
6	Lack of Usage					
7	Lack of awareness about e-resources among users					
8	Lack of technical support					
9	Copyright concerns					
10	Complex licensing agreements					
11	Library staff's resistance in adopting change					
12	Problem in preservation and archiving					
13	Poor Role of Library Consortia					
14	Lack of autonomy in decision-making process					
15	Technological obsolescence					

XIV. Services

Please tick the services your library providing with the help of E-Resources

Sr. No	Services	
1	Reference Service	
2	Current Awareness Service	

3	Selective Demission Service		
4	Document Delivery Service	In-house ☐	To Other Libraries ☐
5	Table of Content Service		
6	Bibliography Services		
7	Translation Service		
8	Reprographic Service		
9	Referral Services		
10	Any other		

7. Please give suggestions to improve management of electronic resources

_____
_____
_____
_____
_____

***

Collection Management and Use of E-Resources in Science Research Institute Libraries in Pune Metropolitan Area

Questionnaire (User)

A. Personal Information

1. Name: _____

2. Gender (Please Tick): Male ☐ Female: ☐

3. Age (Please Tick): 20-30 ☐ 30-40 ☐ 40-50 ☐ Over 60 ☐

4. Name of the Institution: _____

5. Designation: _____

6. Qualification: _____

7. Department: _____

8. Area of Interest: _____

B. Awareness about Electronic Resources

1. Please mention the type of resources you are using for your study and research
   a. Electronic resources ☐. Print resources ☐ c. Both ☐

2. Are you aware if the following electronic resources available in your library?

Sr. No.	Types of Electronic Resources	Yes	No
1.	CD-ROMs		
2.	Subscribed E- Journals/Databases		
3.	E–Books		
4.	E – Theses		
5.	Free Online Resources		
6	Videos/Lectures		

3. How do you get information about the availability of electronic resources in your library? [Can select more than one option also]
   a. Through library website ☐
   b. Through library notices, training ☐
   c. Through colleagues ☐
   d. Through own knowledge & experience ☐
   e. Through conferences/seminars ☐
   f. Referred personally by Librarian/ Library Staff ☐
   g. Library Alert services ☐
   h. Library visit ☐
   i. Any other ☐

C. **P**references

1. Electronic Resources have more advantages over print. Do you
   a. Strongly Agree ☐   b. Agree ☐   c. Disagree ☐
   d. Strongly Disagree ☐

2. Please indicate your degree of preference for each of these electronic resources

	Most Preferred	Preferred	Less Preferred	Not Preferred
E-Books				
E-Databases				
CD-ROM				
Patents/Standards				
Internet/The Web Information				
Open Sources Resources				
Institutional Repository Resources				

D. Searching

1. How do you search for electronic resources? [Can select more than one option also]
   a. General Search Engine ☐   b. Academic Search Engine ☐
   c. Publishers Website ☐   d. Subject Databases ☐
   e. Library Catalogue ☐   f. Federated Search ☐
   g. Any other_____

2. Do you find required information that you are looking for in the electronic resources?
   a. Always ☐   b. Mostly ☐
   c. Rarely ☐   d. Never ☐

3. How do you search electronic resources?
   a. Yourself ☐   b. With the help of library staff ☐
   c. Colleagues/friends guidance ☐   d. Any other ☐

4. How often you take help from others for searching electronic resources?
   a. Always ☐   b. Sometimes ☐
   c. Rarely ☐   d. Never ☐

5. Which search options you use mostly for electronic resources?
   a. General Search ☐   b. Advanced search ☐

c. Federated Search ☐

6. Which approach you prefer while searching information on electronic resources?
   a. Author ☐   b. Keyword ☐   c. Journal Title ☐
   d. Article Title ☐   e. Date of Publication ☐
   e. DOI ☐   g. Subject ☐

7. What advanced search options do you use for online resources (if any)?
   a. Boolean Operators ☐   b. Truncation Search ☐
   c. Field Searching ☐   d. Phrases ☐
   e. Wild Card Searching ☐

8. How do you acquire electronic resources searching skills/techniques?
   a. Self-Study ☐   b. Library Training ☐

   c. Help from friends/colleagues ☐   d. Training Programs ☐

E. Use of electronic resources
1. How long are you using electronic resources?
   a. 1-2 Years ☐   b. 2-5 Years ☐   c. More Than 5 Years ☐

2. Reasons for using electronic journals over print journals [Can select more than one option also]
   a. User-friendliness ☐   b. 24*7 availability ☐   c. Hyperlinking and Multimedia ☐
   d. Easy searching ☐   e. Multiple users access ☐   f. Easy to download ☐
   g. Globally available ☐

3. Which part of electronic/online journals do you use most?
   a. Table of contents ☐   b. Articles abstract ☐
   c. Article References ☐   d. Alerting Services ☐
   e. Full Text ☐

4. What kind of pattern do you use for using e-resources?
   a. Read only abstract ☐   b. Read Full text online ☐
   c. Read online and print if required ☐   d. Download without reading ☐
   e. Download and print without reading ☐   f. Read online, download and print ☐
   g. Any other ☐

5. How do you ensure the authenticity of the electronic resources?
   a. Journal Publisher ☐   b. Author ☐
   c. Database Publisher ☐   d. Ownership of the website ☐
   e. Any other ☐

6. Do you use any similarity checking software?

Yes ☐   No ☐

7. Please list your preferred publishers of electronic resources
    a._____
    b. _____
    c. _____
    d. _____
    e. _____

F. Access

1. How do you get access to e-resources? [Please select more than one option if necessary] ☐
    a. ID/Password based access through Internet
    b. Remote access through campus network ☐
    c. Wi-fi enabled access in the campus ☐
    e. Any other (Please specify) _____

2. Which is your preferred access point for accessing e-resources?
    a. Own Laptop ☐   b. Office Desktop ☐
    c. Computer Lab ☐   d. Library PC ☐

3. Which type e-resources you access [Can select more than one option also]
    a. Free resources available on internet ☐ b. Subscribed e-resources by library ☐
    c. Professional association membership ☐ d. Other Libraries Subscription ☐

4. How do you access resources included in databases? [Can select more than one option also]
    a. List from library website ☐   b. Publishers website ☐
    c. Search engines ☐   d. CD-ROM ☐

5. Does your library provide trial access and review/evaluation for electronic resources before purchasing?
    a. Yes ☐   b. No ☐

6. Which type of internet connection you use to access online resources
    a. Dial – up ☐   b. USB/On-the-go ☐
    c. Broadband ☐   d. Any other _____

7. How you access offline electronic resources (CD/DVD, Offline Database, etc.)
    a. Own Laptop ☐   b. Office Desktop ☐
    c. Computer Lab ☐   d. Library PC ☐

8. How do you rate the quality of information you acquire from the electronic resources?

    a. Very High-Quality ☐   b. High-Quality ☐
    c. Poor Quality ☐   d. Very Poor Quality ☐

9. Do you use CD-ROM for your research?
   a. Yes ☐   No. ☐

10. If YES then how do you access CD-ROM?
    a. CD-ROM network ☐   b. Reading single CD-ROM using computer ☐
    c. Any other ☐

11. Which type of CD-ROM do you use mostly?
    a. CD- ROM which comes along with books. ☐
    b. Indexing and Abstracting CD-ROMs ☐
    c. Full-text Journal CD-ROMs ☐
    d. Electronic Book in CD-ROM ☐
    e. Recreational/Entertainment ☐

G. Frequency
1. How frequently do you access the electronic resources?
    a. Everyday ☐   b. Weekly ☐
    c. Monthly ☐   d. Occasionally ☐

2. How many hours you spend on electronic resources in a week
    a. Less than hour ☐   b. 1to 20 Hours ☐
    c. 20 to 30 hours ☐   d. more than 30 hours ☐

3. How many e-resources do you access in a week?
    a. 5 or less ☐   b. 6 – 10 ☐   c. 10 or more ☐

4. Has this increased or decreased during last two years?
    a. Increased ☐   b. Decreased ☐

5. Are you planning to use more electronic resources in future?
    a. Yes ☐   b. No ☐

H. Purpose

1. What is your primary purpose for using electronic resources? [Can select more than one option also]
   a. Keeping yourself update in the interested subject   ☐
   b. For research purpose ☐
   c. For teaching ☐
   d. For learning ☐
   e. To publish papers in journals/proceedings ☐
   f. To know the recent trends in a particular subject ☐
   g. For leisure reading ☐
   i. Any other _____

2. Do you feel that electronic resources help in exchange of ideas and developing collaborations for research?
   a. Yes ☐   b. No ☐

3. What is your perception of the electronic resources usefulness?

a. Most satisfied ☐   b. Satisfied ☐   c. Least satisfied ☐

I. Download

1. In which format do you download papers/articles?
   a. PDF ☐   b. HTML ☐   c. TXT ☐   d. RTF ☐

   e. JPG ☐   f. SGML ☐   g . Any other ☐

2. While downloading whether you check if the downloaded martial is copyrighted or not?
   a. Yes ☐   b. No ☐

J. Reading

1. How do you read e- journal/e-books?
   a. On the screen ☐   b. Use Kindle/e-readers ☐
   c. Take a print and read ☐   d. Any other ☐

2. Are you aware of the copyright law for using electronic resources?
   a. Yes ☐   b. No ☐

3. If yes, how did you come to know about copyright law?
   a. Own reading ☐   b. Informed by library Staff ☐
   b. Through discussions with colleagues

4. Does your library educate users regarding copyright issues of e-resources?
   e. Yes ☐   b. No ☐

5. How your library educates users regarding copyright issues? [Please select more than one option if necessary]
   a. Explaining in users' education programme ☐ b. explaining orally to the users ☐
   c. Displaying it on website ☐
   d. Any others_____

K. Users Satisfaction

Please tick for your satisfaction level for each option

Sr. No.		Fully Satisfied	Partially Satisfied	Least Satisfied	Not Satisfied
1	Availability of e-resources in the library.				
2	Arrangement of E-resources				
3	Infrastructure available for using electronic resource.				
4	Internet speed				
5	Assistance from library staff				

6	Promotion of e-resources by library				
7	Library services – using electronic resources				

L. User Trainings

1. Do you feel that users' training is necessary for the use of electronic resources?
   a. Yes ☐   b. No ☐

2. Have you personally received any training regarding the use of e-resources?
   a. Yes ☐   b. No ☐

3. The Library provides adequate training on how to use electronic resources.
   a. Strongly Agree ☐   b. Agree ☐

   c. Disagree ☐   d. Strongly Disagree ☐

4. Which type of user training programs does your library conduct? ?[Please select more than one option if necessary]
   a. Library Orientation ☐   b. Lectures from Vendor/Publisher ☐
   c. Hands on/Demonstrations ☐   d. Tutorial on website ☐
   e. Distribution Library Pamphlet ☐ f. Any other please specify ☐

M. Open Access Resources:

1. Do you have a knowledge of search engines available in your field?
   a. Yes ☐   b. No ☐

2. Which search engine you use most to search the information on internet
   _____

3. Are you aware of open access resources available in you field?
   a. Yes ☐   b. No ☐

4. Do you use open access resources for your research?
   a. Yes ☐   b. No ☐

5. If Yes, which of the following [Please select more than one option if necessary]
   a. Open Access Journals ☐   b. Open Sites ☐
   c. Open Access databases ☐
   d. Any other
   _____

6. What is percentage of use of the following resources in your research

a. Open Access Resources	≥ 25 % ☐	25% - 50%	51 % - 75% ☐	75 % ≤ ☐	Don't Know ☐

b. Paid Resources	≥ 25 % ☐	25% - 50%	51 % - 75% ☐	75 % ≤ ☐	Don't Know ☐

N. Difficulties Faced

1. Please tick your option for each row below

	Strongly Agree	Agree	Disagree	Strongly Disagree
Lack of sufficient fund is an important reason for insufficient collection of e-resources.				
No availability of proper Hardware/Software is a hindrance in getting access to electronic resources				
E-resources are less convenient than print resources				

2. What difficulties do you facing while accessing electronic resources?
    a. Limited terminals ☐
    b. Slow internet ☐
    c. Lack of searching skill ☐
    d. Lack of remote access ☐
    e. Lack of skilled staff ☐
    f. Lack of helpful staff ☐
    g. Lack of knowledge regarding availability of electronic resources ☐
    h. No subscription for desired journals
    i. No printing facility ☐
    j. Incomplete access/ Absence of back issues ☐
    k. Printing problems ☐
    l. Failure of library staff to keep users aware of availability of electronic resources ☐

O. Library Services

1. Which of the following electronic resource services offered by your library are used by you?

Sr. No	Services	
a	Reference Service	
b	Current Awareness Service	

c	Selective Demission Service	
d	Document Delivery Service	
e	Table of Content Service	
f	Bibliography Services	
g	Translation Service	
h	Reprographic Service	
i	Referral Services	
j	Any other	

2. Tell us your overall perception about the library services
   a. Most satisfied ☐
   b. Satisfied ☐
   c. Least satisfied ☐
   d. Not satisfied ☐

3. Please give any other suggestions to improve management and use of electronic resources.

   _____
   _____
   _____

Date:

THANK YOU

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