

**RESOURCE SHARING AND NETWORKING BTISNET LIBRARIES  
IN INDIA**

**A thesis submitted to the  
Tilak Maharashtra University, Pune  
For the Degree of Doctor of Philosophy (Ph.D.)**

**In Library and Information Science  
Under the Faculty of Moral and Social Sciences**

**Submitted by  
N. Nageswaran**

**Under the Guidance of  
Dr. P.N. Rath**

**Department of Library and Information Science**

**September 2015**

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### **DECLARATION BY THE CANDIDATE**

I hereby declare that the thesis entitled “**Resource Sharing And Networking BTISNet Libraries in India**” 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 University or examining body.

**Date:19-09-2015**

**N. Nageswaran**

**Place: Pune**

**Research Student**

### **CERTIFICATE**

This is to certify that the thesis entitled “**Resource Sharing And Networking BTISNet Libraries in India**” 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 of Tilak Maharashtra University, Pune is the result of original research work is completed by **N. Nageswaran** 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.

**Date: 19-09-2015**

**Place: Pune**

**Dr. P.N. Rath**

**Research Guide**

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## EXECUTIVE SUMMARY

Networking and Resource sharing have been one of the important areas in library and information services for long time. Dr. S. R. Ranganathan has emphasized much on this concept as library co-operation in his book *Five Laws of Library Science*. Indeed, all five laws guidelines have the practice of networking and resource sharing for better and effective library operations and services. Today, we live in an information era. Every day, a lot of publications are published throughout the world. Therefore, it is impossible for any modern library to procure all the resources to meet the various needs of the users. Several factors such as rapid increase of publications, reduced financial resources, increase of prices and ever increasing expectations of users have made the libraries to look for alternative means of resources. One of the important means is sharing of resources among themselves.

The library and information centre is an important component of any educational institution, which is hub of the teaching and learning activities where students, researchers and teachers can explore the vast resources of information. In the traditional libraries, users have to spend more time for searching a small piece of information and for that, they have to depend mainly on the library professionals or library staff. However, in the age of information communication technology, computers are being used for day-to-day housekeeping activity of the library which saves the time of the end users, and library professionals also and at the same time avoid duplication of work and make the library service smooth and effective. (Sinha, 2008).

The primary objective of a library is to provide right information to right user at right time in right form. To fulfil this objective libraries have to provide maximum access to information irrespective of location. ICT has helped to meet these objectives successfully. Applications of ICT and development of networks, use of internet and WWW have changed the practices in libraries. Due to this change librarians and libraries are facing problems like budget, information explosion, satisfying user needs etc. However, the concept of library cooperation and resource sharing is developed since long in different

nomenclature like ILL, sharing of catalogue data, professional skills, information resources etc. Recently ICT made revolutionary change by developing networks and provide better services to user community.

Libraries from its inception are called as store houses of information having qualitative collection of documents useful to the information society. Libraries are also called as power houses of information and knowledge resources centers which disseminate information and help users in generating new knowledge base on the existing knowledge. However, libraries are not self sufficient and are unable to fulfil all the needs of users due to information explosion and rising cost of publications. Librarians have understood the situation, initiated Inter Library Loan (ILL) facilities, and now reached to library networks in the passage of time with different transformations. The Librarians, UGC, NISSAT made different efforts in achieving resource sharing and provide information resources to the users through developing centers and consortium.

University Grants Commission (UGC) and National Information System for Science and Technology (NISSAT) under Department of Science and Technology (DST) developed many library networks to strengthen the resource collection in particular discipline and also share resources and develop specialised databases. INFLIBNET, CALIBNET, DELNET, MYLIBNET and many more city networks are the outcome of the efforts of UGC and NISSAT.

The study is presented in seven chapters.

**Chapter 1 – Introduction:** This chapter highlights need of library networks, library networks in India, background of study, reason to select topic, scope and limitations, aim and objectives, research methodology, hypothesis, uniqueness of study and structure of the study etc.

**Chapter 2 – Literature Review:** This chapter is a brief analysis of information literature published in different forms and consulted by researcher, relevant to study. The different facets considered while conducting literature are discussed at length with brief summary. The literature survey help in building the concepts developed in the mind of researcher and also used and cited reference in text suitably in different chapters.



**Chapter 3 –: Resource Sharing and Networking** In this chapter highlights about overview and different components of resource sharing and networking applied in libraries.

**Chapter 4 – BTISNet Centres:** This chapter highlights about details about BTISNet Centres under DBT.

**Chapter 5 – Approach to Resource Sharing in BTISNet Centres:** This chapter highlights about approaching towards to resource sharing in BTISNet centre libraries.

**Chapter 6- Library Resources and Services: Data Analysis:** This chapter analysis the data collected from the questionnaire and presented after the evaluation systematically using different statistical methods. This chapter in general helps in narrating the status of BTISNet libraries in India.

**Chapter 7 –Conclusions and Recommendations:** This chapter analysis the data collected from the questionnaire and presented after the evaluation systematically using different statistical methods. This chapter in general helps in narrating the status of management libraries.

In view of foregoing discussions, it is apparent that libraries in present centuries will become the centres of resource sharing with no boundaries, words so ever. Library networks are expected to play major roles as partners in global networking of information centres. In the field of biotechnology in India, SP University of Pune, Bioinformatics centre has made a good beginning by coordinating Pune Library Network (PUNE-NET)<sup>3</sup>. This centre may be given responsibility to coordinate all the resource sharing activities within BTISNet. It is hoped that with right kind of initiatives in this direction will certainly give a boost to research activities in the field of bioinformatics in the country.

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<b>Abbreviations</b>	<b>Full Form</b>
ACRL	Association of College and Research Libraries
ACTREC	ACTREC
ADINET	Ahmedabad Library Network
ADINET	Ahmedabad Library Network
AGRICOLA	Agriculture Online Access
AGRIS	International Systems for Agricultural Science and Technology
AGRISNET	Agricultural Research Information Systems and Networking
AI	Artificial Intelligence
AIIMS	All India Institute of Medical Sciences
ALA	American Library Association
AMU	Aligarh Muslim University
ARPANET	Advanced Research Projects Agency Network
Aslib	Association of Information Management
AU	Anna University
BALNET	Bangalore Library Network
Banasthali	Banasthali University
BDU	Bharathidasan University
BHU	Banaras Hindu University
BI	Bose Institute
BI	Bioinformatics
BIC	Bioinformatics Centre
BINAC	Binary Automatic Computer
BIOSIS	Bioscience Information System
Biotech Park	Biotech Park in Biotechnology City
BISR	Birla Institute of Scientific Research

<b>Abbreviations</b>	<b>Full Form</b>
BITS	Birla Institute of Technology
BLAISE	British Library Automated Information Service
BONET	Bombay Library Network
BT	Biotechnology
BTISNet	Biotechnology Information System Network
BU	Barkatullah University
CAB	Commonwealth Agricultural Bureaux
CALIBER	Convention of Academic Libraries Education and Research
CALIBNET	Calcutta Libraries Network
CALIBNET	Calcutta Library Network
CAS	Current Awareness Service
CAU	Central Agricultural University
CCMB	Centre for Cellular & Molecular Biology
C-DAC	Centre For Development of Advanced Computing
CDFD	Centre for DNA Fingerprinting and Diagnostics
CD-ROM	Compact Disk – Read Only Memory
CD-RW	Compact Disk Rewritable
CeRA	Consortium for electronic Resources in Agriculture
CIARI	Central Agricultural Research Institute
CIFA	Central Institute of Freshwater Aquaculture
CIMAP	Central Institute of Medicinal And Aromatic Plants
COEs	Centre for Excellence
CPCRI	Central Plantation Crops Research Institute
CSIRO	Commonwealth Scientific and Industrial Research Organization
CSK HPKV	CSK Himachal Pradesh Krishi Vishvavidyalaya

<b>Abbreviations</b>	<b>Full Form</b>
CT	Communication Technology
DAV	Devi Ahilya Vishwavidyalaya
DBMS	Database Management System
DBT	Department of Biotechnology
DDBJ	DNA Data Bank of Japan
DDG	Deputy Director General
DeLCON	DBT e-Library Consortium
DELNET	Developing Library Network
DG	Director General
DICs	Distributed Information Centres
DSTSIKKIM	Sikkim State Council of Science & Technology
DU	University of Delhi, South Campus
DUs	Deemed Universities
EDVAC	Electronic Discrete Variable Automatic Computer
EIR	Electronic Information Resource
ENIAC	Electronic Numerical Integrator and Computer
EP	Electronic Publishing
ERNET	Education and Research Network
ESS	Electronic Surveillance System
ETAD	Electronic Thesis Abstracts Database
FAO	Food and Agriculture Organization of United Nations
FID	The International Federation for Information and Documentation
FSTA	Food Science and Technology Abstracts
FTP	File Transfer Protocol
GBPUAT	G.B. Pant University of Agriculture and Technology

<b>Abbreviations</b>	<b>Full Form</b>
GDP	Gross Domestic Product
GIS	Geographic Information System
GNDU	Guru Nanak Dev University
GPRS	General Pocket Radio Service
GPS	Global Positioning System
GSWAN	Gujarat State Wide Area Network
HPUNIV	Himachal Pradesh University
HTTP	Hypertext Transfer Protocol
HW	Hardware
I - NET (VIKRAM)	National Packet Switching Network
IADR	Indian Agricultural Dissertations Repository
IARI	Indian Agricultural Research Institute
IBM	International Business Machines Corp
ICANN	Internet Corporation for Assigned Names and Numbers
ICAR	Indian Council of Agricultural Research
ICRAF	International Centre for Research in Agro Forestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICT	Information and Communication Technology
IFAP	Information for All Programs of United Nations
IFFCO	Indian Farmers Fertilizer Cooperative
IFLA	International Federation of Library Associations and Institutions
IFPRI	International Food Policy Research Institute
IIAR	Indian Institute of Advance Research
IICB	Indian Institute of Chemical Biology
IIIM	Indian Institute of Integrative Medicine

<b>Abbreviations</b>	<b>Full Form</b>
IIM	Indian Institute of Management
IISc	Indian Institute of Science
IISR	Indian Institute of Spices Research
IIT	International Institute of Technology
IITA	International Institute of Tropical Agriculture
IITD	Indian Institute of Technology, Delhi
IITKGP	Indian Institute of Technology, Khargapur
ILS	Institute of Life Sciences
IMTECH	Institute of Microbial Technology
INDONET	INDONET data Network
INDSL	Indian National Dairy Science Library
INFLIBNET	Information and Library Network
INVSL	Indian National Veterinary Science Library
IR	Institutional Repository
ISPs	Internet Service Providers
ISRO	Indian Space Research Organization
IVLP	Institution-Village Linkage Program
IVRI	Indian Veterinary Research Institute
JANNET	Joint Academic Network
JCCC	J-Gate Custom Content for Consortia
JNTBGRI	Jawaharlal Nehru Tropical Botanic Garden and Research Institute
JNU	Jawaharlal Nehru University
KAU	Kerala Agriculture University
KAULIS	Kerala Agricultural University Library and Information Systems
KMS	Knowledge Management System

<b>Abbreviations</b>	<b>Full Form</b>
KU	University of Kashmir
KVAFSU	Karnataka Veterinary, Animal & Fisheries Sciences University
KVK	Krishi Vigyan Kendra
MALIBNET	Madras Library Network
MGIMS	Mahatma Gandhi Institute of Medical Sciences
MKU	Madurai Kamaraj University
MPKV	Mahatma Phule Krishi Vidyapeeth
MSSRF	M.S. Swaminathan Research Foundation
MSU	M. S. Univeristy of Baroda
MYLIBNET	Mysore Library Network
NBRC	National Brain Research Centre
NBRI	National Botanical Research Institute
NCBI	National Centre of Biotechnology Information
NCL	National Chemical Laboratory
NCLIS	National Commission on Libraries and Information Science
NDRI	National Dairy Research Institute
NEHU	North Eastern Hill University
NGO	Non-Government Organization
NIAB	National Institute of Animal Biotechnology
NIC	National Informatics Centre
NII	National Institute of Immunology
NIO	National Institute of Oceanography
NIPGR	National Institute for Plant Genome Research
NIST	National Institute of Standards and Technology
NIT	National Institute of Technology

<b>Abbreviations</b>	<b>Full Form</b>
NKN	National Knowledge Network
OCLC	Online Computer Library Centre
OCR	Optical Character Recognition
OSS	Open Space Software
OWSA	One World South Asia
PAU	Punjab Agricultural University
PU	Pondicherry University
PUNENET	Pune Library Network
PUNENET	Pune Library Network
QRS	Query Redress Service
RFCB	Rajiv Gandhi Centre for Biotechnology
SAUs	State Agricultural Universities
SCFBio	Super Computing Facility
SCI	Science Citation Index
SDI	Selective Dissemination of Information
SIB	Swiss Institute of Bioinformatics
SIRNET	Scientific and Industrial Network
SPPU	S.P. University of Pune
SUBDICs	Distribution Information Centre- Sub Centre
TANUVAS	Tamilnadu Veterinary and Animal Sciences University
TEEAL	The Essential Electronic Agricultural Library
TKDL	Traditional Knowledge Digital Library
TMBU	T. M. Bhagalpur University
TNAU	Tamil Nadu Agricultural University
UC	University of Calcutta



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<b>Abbreviations</b>	<b>Full Form</b>
UHF	Dr. Y. S. Parmar University of Horticulture and Forestry
UNDP	United Nations Development Program
UNISIST	United Nations Information System for Science and Technology
URL	Uniform Resource Locator
USA	United States of America
W3C	World Wide Web Consortium
WWW	World wide web

# Chapter 1

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*Introduction*

## 1.1 Introduction

Networking and Resource sharing have been one of the important areas in library and information services for long time. Dr. S. R. Ranganathan<sup>1</sup> has emphasized much on this concept as library co-operation in his book *Five Laws of Library Science*. Indeed, all five laws guidelines have the practice of networking and resource sharing for better and effective library operations and services. Today, we live in an information era. Every day, a lot of publications are published throughout the world. Therefore, it is impossible for any modern library to procure all the resources to meet the various needs of the users. Several factors such as rapid increase of publications, reduced financial resources, increase of prices and ever increasing expectations of users have made the libraries to look for alternative means of resources. One of the important means is sharing of resources among themselves.

The library and information centre is an important component of any educational institution, which is hub of the teaching and learning activities where students, researchers and teachers can explore the vast resources of information. In the traditional libraries, users have to spend more time for searching a small piece of information and for that they have to depend mainly on the library professionals or library staff. But in the age of information communication technology, computers are being used for day-to-day housekeeping activity of the library which saves the time of the end users, and library professionals also and at the same time avoid duplication of work and make the library service smooth and effective. (Sinha, 2008)<sup>2</sup>.

Information Technology is the combination of telecommunication and computer technology, which facilitates transmission, collection, processing, interpretation and distribution of information. Information technology is considered useful to us in the digital world. The library has been involved in resource sharing initiatives for many years, yet the advent of new technologies such as the World Wide Web (www) have fostered unprecedented growth in the number of institutions impacting the world with rapidly evolving information products and services. Electronic information resources are of increasing importance in modern library services, particularly in specialized libraries that are oriented towards science and technology. (Sridevi & Sonker, 2004)<sup>3</sup>.

## **1.2 Networking in Libraries**

Resource sharing is defined as a mode of operation, whereby a number of participants having the same objectives in mind share information resources. Thus, the user of one library can have his requirements fulfilled by another library if the local library fails to serve his needs.

- Preparation of union catalogues and cataloguing data.
- Provision of bibliographies.
- Optimum utilization of rare collections.
- Cooperative exchange and distribution and storage of documents.
- Saving money as well as manpower in terms of technical work and collections.
- Reduction in the cost of library services in the long run.

Networking systems have been developing fast at local, state, national and international levels all over the world since the 1980s. Thus, libraries have to plan their acquisitions keeping in mind the resources available in other libraries in the area so that they can get the maximum number of books and publications which are not available in their vicinity. In the past few years, considerable progress has taken place in the planning and building of library and information networks. As a result, four <sup>4</sup> major networks - INFLIBNET, DELNET, CALIBNET and BONET- have started functioning in libraries.

## **1.3 Constraints of Networking**

There are several constraints in the networking of BTISNet libraries. This Centre Coordinator still has a dilemma as to whether or not resource sharing is possible through networking.

Following are the major problems faced by the libraries:

- Lack of trained manpower.
- Lack of effective networking and communication technology.
- Less effective implementation of proposed networks.

#### **1.4 Resource sharing**

These activities result from an agreement, formal or informal, among a group of libraries (a consortium or network) to share collections, data, facilities, personnel, etc., for the benefit of their users and reduce the expense of collection development<sup>5</sup>.

- The Resource sharing and networking between libraries has a long history and as old as libraries themselves.
- The Library of Alexandria shared its collection with the Pergamum library in 200 B.C.
- The Library of Congress began lending books to other libraries in 1902.
- In 1919 the American Library Association adopted the first United States Interlibrary Loan Code.

Resource sharing is a method of overcoming these and other limitations of the individual libraries in respect of their resources by way of cooperation and co-ordination among the participating libraries.

Library resources however, have been defined in several ways. To John Fetterman, it indicates "any and all of the materials, functions and services which constitute a modern library system. It is combination of manpower, processes, ideas, materials and budget which form the substance of a library and can be described as its resources." These resources are very expensive and insufficient. It is essential that such resources should be put to optimal use. This is more relevant to the situation obtaining in poor countries which not only face scarcity of resources but also severe competition for allocation of resources. It is in this context that resource sharing among libraries becomes unavoidable.

According to Miller, it is a co-operative system established by libraries and information centres which are brought together by common subject, geographical proximity to share informational resources, human resources and all other elements essential for providing effective information service. In the library world, institutions

form network primarily to achieve better sharing of resources. It is consisting of bibliographic information and of collections and better service to patrons.

Library resource sharing, library co-operation, library consortium and library network are various terms given to the same activity which means that a group of libraries have come together and entered into some kind of formal understanding for the purpose of sharing the resources. It means materials, functions, services and staff sharing to their mutual benefit and realizing that only through resource sharing the greatest amount of the best information can be provided to most of the users at the most reasonable cost.

Raynard C. Swank defined library networks as a "Concept that includes the development of co-operative systems of libraries on geographical, subject, and other lines each with some kind of Centre that not only co-ordinates the internal activities of the system but also serves composed of two or more libraries and/or other organizations engaged in a common pattern of information exchange, through communications for some functional purpose."

The National Commission on Libraries and Information Science (NCLIS)<sup>6</sup> in its National Program Document (1975) defined a network as: "Two or more libraries and/or other organizations engaged in a common pattern of information exchange, through communications, for some functional purpose. A network usually consists of a formal arrangement whereby materials, information and services provided by a variety of libraries and other organizations available to all potential users. Libraries may be under: different jurisdictions but agree to serve one another on the same basis as each serves its own constituents. Computers and telecommunications may be among the tools used for facilitating communication among them." According to United Nations Information System for Science and Technology (UNISIST)<sup>7</sup>, Networking is a set of inter-related information systems associated with communication facilities, which are co-operating through more or less formal agreements and institutional agreements in order to jointly implement information handling operations with a view to pooling their resources and better serving the users. They generally follow identical or compatible rules and procedures.

Most libraries have been duplicating efforts and material. This has led to inadequate utilization of the overall resources of materials and finances. There has been a great increase in the number of users as also their demands. The information being sought has become extremely diverse. In the circumstances, the libraries are left groping for ways and means of providing a wider range of services and collections. Resource sharing offers practical solutions to these problems. An unsystematic and discrete library development often leads to waste, duplication, and the inefficient use of the total knowledge resources.

Resource sharing is considered as an essential pre-requisite for effective library and information services. No library can have all the reading materials which may be in demand by its readers at any point of time. It may not be possible to any library to meet such demands by buying all the material. Resource sharing in every direction of library work will be conducive to provide proper books, serials and to provide the allied service of supplying information. It may not be possible for the librarians to meet the information appetite of all the readers with their own resources only. Hence, resource sharing is the only effective medium through which the primary and fore most objectives of any information system can be achieved.

### **1.5 Need for Resource Sharing**

There is a need for resource sharing among all types of libraries. The immediate factors that enhance the resource sharing activities among the libraries are as follows:

- Due to literature explosion, it is not possible for a library to acquire all the bibliographic materials at one place.
- Individual libraries cannot afford the cost of acquiring the materials, hardware and software and the manpower required to maintain the modern information technologies.
- Gradual decrease in budgetary provisions for the library and information Centre's to provide various information services.

- Availability of access facilities for various types of databases, electronic information and increases in users and their demands for information.
- Inadequacy of infrastructure facilities. No single library can satisfy all the information needs of its users.

### **1.6 Resource Sharing among BTISNet Libraries**

They are 68 Bioinformatics centres are located in different regions of the country established by Department of Biotechnology (DBT). They have mission for development of subjects of Bioinformatics and related areas. They want to promote research and development and information dissemination and retrieval in this field. This objective will be achieved through resource sharing and networking in BTISNet libraries through, cooperating acquisitions, sharing bibliographic data and providing online reference services.

### **1.7 Significance of Study**

There are as many 68 Bioinformatics centres in the country, which are engaged in research in this area. For the efficient result in research, the effective and timely access to relevant information is a basic ingredient. These centres have their own libraries. As the experience shows globally libraries of Bioinformatics centres engaged in education, research, training in bioinformatics and allied fields, can never lead to self-sufficient effectiveness and designed user satisfaction.

- Assessing the resource sharing, facility and services of the libraries of BTISNet Centre's under Apex Bioinformatics Centre, Department of Biotechnology (DBT), GOI and few other autonomous institutions.
- Assessment of present staff working in there BTISNet libraries with a view to analyze the strength, deficiencies and necessary measures to be adopted for cooperative networking among to libraries.
- Evaluate the opinion of the users, authorities and librarians on the need and functional aspects to proposed network for sharing of resources.
- Finding out major problems that may cause the obstacle in the effective implementation of networking in libraries of bioinformatics Centre in India.



- Suggesting effective resource sharing models and networking among the libraries of BTISNet Centres of the country.

## **1.8 Hypothesis**

The following assumptions will form the basis for pursuing this study:

1. The revolution in the field of information and communication technology has opened a new horizon for effective and economical resource sharing in this field of bioinformatics.
2. Resource crunch and inflation make it difficult for the individual libraries under BTISNet.
3. There is increased awareness among library users / researcher and professionals about information dissemination by resource sharing and networking.
4. BTISNet libraries follow uniform standards and practice so far as technical processing and services.
5. The Present structure of BTISNet is not adequate enough to ensure best library services among the institutions under BTISNet.

## **1.9 Scope and Objectives of present study**

The present study mainly confines its scope to the 6 Centres for Excellence (COEs), 11 Distribution Information Centres (DICs), 44 Sub Distribution Information Centres (SubDICs) and 1 Apex Bioinformatics Centre, under Department of Biotechnology (DBT), Government of India (GOI) and universities having significant resource base. It does not cover the libraries and information centres of all other universities and research centres where bioinformatics is not the prime focus. The objectives of the study are:

1. To survey the human resources available in selected BTISNet Centre libraries.
2. To know available infrastructure and networking consortia facilities in them.
3. To survey budget provision available in them.
4. To review information services provided by them.
5. To take a review of resource sharing facilities and services in them.

6. To suggest measures for effective resource sharing and networking among them.
7. To propose a model for resource sharing of these materials which are not covered under the ambit of BTISNet.

### **1.10 Brief Review of Literature**

Since this study relates to Indian biotechnology research, the investigator consulted various sources for getting an understanding of the subject and related problems and developments. The contributions by Enger <sup>8</sup>, Brown, <sup>9</sup>, Ratledge <sup>10</sup>, Bourgaize <sup>11</sup>, Smith <sup>12</sup>, Barnum <sup>13</sup>, Primrose <sup>14</sup>, Baxevanis <sup>15</sup>, Attwood <sup>16</sup>, Chirikjian <sup>17</sup>, were found to be worth consulting and mentioning.

Resource sharing among library and information centres has been acquiring increasing significance. The factors like information explosion, inflation, and resource crunch, variety of forms and channels of multidisciplinary and complex subjects have made all concerned to realize the limitations of individual libraries and information centres in fulfilling the varied information needs of increasing number of users.

The professional organizations like International Federation of Library Associations and Institutions (IFLA), Association of College and Research Libraries (ACRL) in America and Association of Information Management (Aslib) in United Kingdom, etc. The success stories of library network in the developed countries such as the Online Computer Library Centre (OCLC), the Washington Library Network (WLN) in USA and the British Library Automated Information Service (BLAISE) and Joint Academic Network (JANNET) <sup>18</sup> in UK, are some of the important examples. Almost all nations have given due importance and attention to resource sharing and networking among the libraries and are establishing their networks.

Since the present study is related to the group of libraries in the specific subject discipline in the Indian subcontinent, only selected literature concerning countries other than USA and UK has been reviewed. However, the investigator could consult the works of various prominent authors like Allen Kent, Ross Atkinson, M.B. Line, Richard De Gennaro and Bant Harloe, emphasizing resource sharing and distributed collection development in networked environment.

Review of literature by Indian authors on resource sharing and networking indicates that in India also various aspects of resource sharing and networking have got adequate attention. It is revealed that the organized efforts in this direction have started in 1980s.

The working Group of the Planning Commission headed by Dr. N. Seshagiri <sup>19</sup> stressed the need for modernization of library services and informatics during the Seventh Five Year Plan, 1985-90. An overview of the development of library networks in India by S.S.Murthy <sup>20</sup> provides detailed account of the establishment of various metropolitan networks in the country. Description about Calcutta Library Network (CALIBNET)<sup>21</sup>, Delhi Library Network (now Developing Library Network) (DELNET)<sup>22</sup>, Bombay Library Network (BONET)<sup>23</sup>, Ahmedabad Library Network (ADINET)<sup>24</sup> and Madras Library Network (MALIBNET)<sup>25</sup> are available. Brief accounts of Pune Library Network (PUNENET)<sup>26</sup>, etc., are available giving an indication that many such networks will come up at other cities in the country.

The two books by H.K. Kaul <sup>27</sup> i.e. *Library Networks: an Indian Experience* (1992) and *Library resource sharing and networks* (1999) provide detailed account about concept of resource sharing and networks in India. Sufficient literature is available in various sources about Information Library Network (INFLIBNET) <sup>28</sup>: a national network of the University Grants Commission. The sufficient amount of literature about countrywide networks like Education and Research Network (ERNET) <sup>29</sup>, National Knowledge Network (NKN),<sup>30</sup> etc., is available. Literature about similar subject-specific networks is discernible in proceedings of national and regional seminars and conferences.

### **1.11 Biosciences**

Advances in theoretical and applied aspects of biosciences, as well as the new specialized areas such as Biochemistry, Microbiology, Genetics and Molecular Biology have emerged along with an application of engineering and other technologies. All these subjects have developed extremely close and overlapping relationships among themselves. The development of the term biotechnology (BT) can be explained as the link between the biological and technological advances. Biotechnology, which is the

application of technology in biosciences, seems to be leading to a sudden new biological revolution. It has brought us to the brink of the world of "engineered" products that are based in the natural world rather than on chemical and industrial processes.

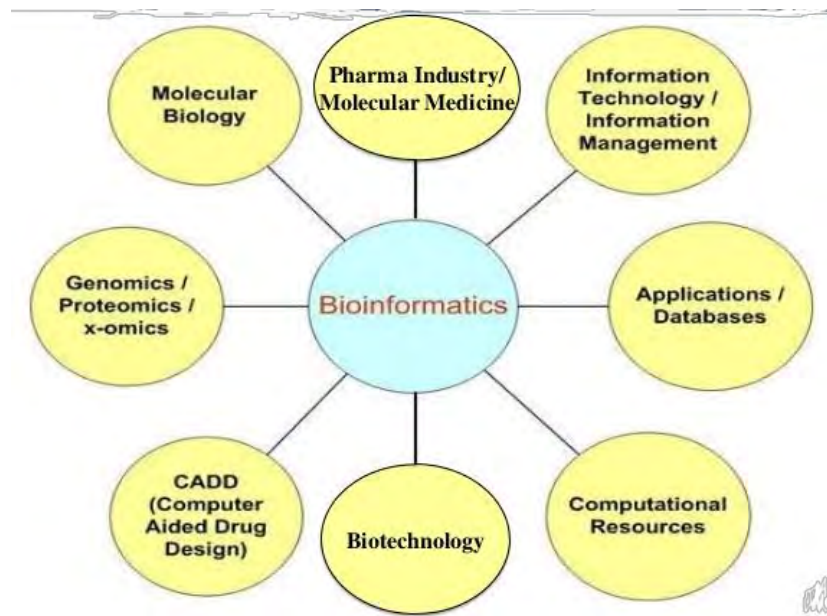
Bioinformatics is a combination of molecular biology and computer sciences. It is that technology in which computers are used to gather, store, analyze and integrate biological and genetic information. The need for Bioinformatics arose when a project to determine the sequence of the entire human genome was initiated. This project was called the Human Genome Project. Bioinformatics is very important for the use of genomic information to understand human diseases and to identify new ways for gene-based drug discovery and development. Therefore, many universities, government institutions and pharmaceutical companies have come forward to form bioinformatics groups to do research related to computational biology so that better ways are used to make processes more efficient and less time consuming.

### **1.12 Application of Bioinformatics**

Proteomics is a branch of biotechnology that deals with the techniques of molecular biology, biochemistry, and genetics to analyze the structure, function, and interactions of the proteins produced by the genes of a particular cell, tissue, or organism. This technology is being improved continuously and new tactics are being introduced. In the current day and age, it is possible to acquire the proteome data. Bioinformatics makes it easier to come up with new algorithms to handle large and heterogeneous data sets to improve the processes.

Genomics is the study of complex sets of genes, their expression and the most vital role they play in biology. The most important application of bioinformatics in genomics is the Human Genome Project through which more than 30,000 genes have been identified and secured through the sequencing of chemical base pairs which make up the DNA. It has thus enabled us to obtain necessary knowledge as to how these genes inter-relate and what functions they perform. Cures for many diseases are being discovered through this inter-relation where bioinformatics, no doubt, plays a pivotal role.

**Figure 1.1. Bioinformatics and Its Applications**



Parallel to the above mentioned fields, Bioinformatics is also being used in Molecular medicine, Personalized medicine, Preventative medicine, Gene therapy, Drug development, Microbial genome applications, Waste cleanup, Climate change Studies, Alternative energy sources, Biotechnology, Antibiotic resistance, Forensic analysis of microbes, Bio-weapon creation, Evolutionary studies, Crop improvement, Insect resistance, Improve nutritional quality, Development of Drought resistance varieties, Veterinary Science, etc., which are all quite debatable in their own capacity and will be discussed in further detail.

The focus during these two years has been on basic and application oriented new biology and biotechnology covering agriculture and plants, genomics, molecular medicine, big instrumentation, bioinformatics, biofuels, bio fertilizers, bio pesticides, human resource development and environment and biodiversity

Today's biotechnology has its roots in chemistry, physics and biology. The explosion in techniques has resulted in three major branches of biotechnology: genetic engineering, diagnostic techniques and cell/tissue techniques.

### **1.13 Bioinformatics Research and Development – International Scenario**

- National Centre for Biotechnology Information (NCBI)<sup>31</sup> was established by National Library of Medicine in 1988.
- DNA Data Bank of Japan (DDBJ)<sup>32</sup> began DNA data bank activities in earnest in 1986 at the National Institute of Genetics (NIG) with the endorsement of the Ministry of Education, Science, Sport and Culture.
- EBI lie in the EMBL<sup>33</sup> Nucleotide Sequence Data Library, which was established in 1980 at the EMBL laboratories in Heidelberg, Germany and was the world's first nucleotide sequence database. The Expert Protein Analysis System (ExPASy)<sup>34</sup> proteomics server established by Swiss Institute of Bioinformatics (SIB) is dedicated to the analysis of protein sequences and structures.
- The Research collaborators for Structural Bioinformatics (RCSB)<sup>35</sup> is a non-profit consortium dedicated to improving our understanding of the function of biological systems through the study of the 3-D structure of biological macromolecules. Establish group of members are Department of Chemistry and Chemical Biology and the Centre for Molecular Biophysics and Biophysical Chemistry at Rutgers.
- The State University of New Jersey, San Diego Supercomputer Centre (SDSC) at the University of California, San Diego (UCSD), and leading-edge site of the National Partnership for Advanced Computational Infrastructure (NPACI). The Centre for Advanced Research in Biotechnology, part of a joint venture between the University of Maryland Biotechnology Institute (UMBI) and the National Institute of Standards and Technology (NIST)., The Department of Biochemistry at the University of Wisconsin-Madison.

### **1.14 Bioinformatics Research and Development - Indian Scenario**

Bioinformatics is the branch of science which uses the applications of information technology and computer science into the field of molecular biology. It was Paulien Hogeweg who invented the term Bioinformatics in 1979 to study the processes of information technology into biological systems. The science of bioinformatics actually develops algorithms and biological software of a computer to analyze and record the data related to biology, for example, the data of genes, proteins, drug

ingredients and metabolic pathways. As biological data is always in raw form and there is a need of certain storage house in which the data can be stored, organized and manipulated. Biological software and databases provide the scientists this opportunity so that the data can be extracted from this database easily and can be used by the scientists.

Bioinformatics joins mathematics, statistics, and computer science and information technology to solve complex biological problems. These problems are usually the molecular level which cannot be solved by other means. This interesting field of science has many applications and research areas where it can be applied.

The application of sequence analysis determines those genes which encode regulatory sequences or peptides by using the information of sequencing. For sequence analysis, there are many powerful tools and computers which perform the duty of analyzing the genome of various organisms. These computers and tools also see the DNA mutations in an organism and also detect and identify those sequences which are related. Shotgun sequence techniques are also used for sequence analysis of numerous fragments of DNA. Special software is used to see the overlapping of fragments and their assembly.

It is easy to determine the primary structure of proteins in the form of amino acids which are present on the DNA molecule, but it is difficult to determine the secondary, tertiary or quaternary structures of proteins. For this purpose either the method of crystallography is used or tools of bioinformatics can also be used to determine the complex protein structures.

The tools of bioinformatics are also helpful in drug discovery, diagnosis and disease management. Complete sequencing of human genes has enabled the scientists to make medicines and drugs which can target more than 500 genes. Different computational tools and drug targets have made the drug delivery easy and specific because now only those cells can be targeted which are diseased or mutated. It is also easy to know the molecular basis of a disease.

Bioinformatics is a scientific field that is used to store, organize, analyze and retrieve large extensive data for various experiments. Bioinformatics is a combination of two scientific branches, i.e. computer science and biology. It involves the application of statistics, mathematics and engineering. It implies a use of various tools and software for data management and analysis.

Journal of Applied Bioinformatics & Computational Biology because of its multidisciplinary approach is very much useful for librarian also journals procured through consortia goes in a long way to overcome financial constraint face by libraries in procuring bioinformatics journals become of high cost holds a strong position under Bioinformatics Research Journals or Librarians. Under this, authors can readily submit their valuable contribution as research, review, case report, commentary or editorial on various research topics under the subscription mode of publication. Subscription journals are those which involves paid readership but free publication.

This overcomes the financial constrains faced by the young scholars or researchers from a middle and lower income economy. The process prevents them to pay the exorbitant prices for the publications thus boost the scientific community and accelerate the discovery and researches Journal of Applied Bioinformatics & Computational Biology is readily available for the students of various institutes and universities. Academic libraries can buy the subscription of the journal on the yearly basis under which the institution will be allowed to freely access the published content of the journal without repetitive payments.

### **1.15 Bioinformatics in India**

India is one of the first countries in the world to initiate a Bioinformatics programme. A National Bioinformatics Network has been evolved for sustainable utilization of the biological data resources. The 68 BTISNet Centre's, six interactive computer graphics facilities and four post graduate diploma courses in Bioinformatics are being supported. Internationally recognized databases such as European Molecular Biology network (EMBnet), Protein Data Bank (PDB), Genome Database Bank (GDB),



European Bioinformatics Institute (EBI) and Plant Genome database have been established in the form of Mirror sites under the National Jai Vigyan S&T mission. These databases are being utilized for genomic and proteomic R&D activities through high speed and high bandwidth network services.

### **1.16 Human Resource Development**

Sixty-two biotechnology teaching programmes in various Indian universities and institutions about 1600 students have been trained in two years. These include a special programme in Neurosciences. National and overseas associate ships awarded annually to about 45 scientists have resulted in very good expertise. National Bioscience Awards for Career Development and National Women Bioscience Awards are conferred annually to recognize the outstanding contributions of biotechnologists in various fields. The number of biotechnology scholarships given to school leaving students to encourage them to pursue a career in biology-related areas has been raised from 10 to 25 per year.

### **1.17 Autonomous Institutions under Department of Biotechnology (DBT)**

The Department has set up following autonomous institutions for achieving excellence in specialized areas, which have been further strengthened:

1. National Institute of Immunology
2. National Centre for Cell Science
3. National Brain Research Centre
4. Centre for DNA Fingerprinting and Diagnostics (CDFD)
5. National Institute of Plant Genome Research
6. Institute of Life Sciences
7. Institute of Bio resources and sustainable development (IBSD)
8. Rajiv Gandhi Centre for Biotechnology
9. Institute for stem cell science and regenerative medicine
10. Translational Health Science and Technology Institute
11. National Institute of Biomedical Genomics
12. Regional Centre for Biotechnology

13. National Agri-Food Biotechnology Institution
14. National Institute of Animal Biotechnology (NIAB)
15. CIAB (formerly Bio-Processing Unit)

These institutes are working in the frontier areas of New Biology and Biotechnology, have a high degree of excellent publications to their credit and many research leads have been converted into products and processes and transferred to industry. Recently the institute for Bio resources and Sustainable Development has been established at Imphal under the auspices of the National Bio-Resource Development Board<sup>36</sup>

Biotechnology in different states is used for developing initiatives, especially to deal with location specific problems.

International Collaboration: Under the Integrated Long Term Programme of Indo-Russian collaboration in biotechnology an Indo-Russian Centre for Biotechnology is being established. A new phase of Indo-Swiss collaboration in biotechnology implementation was he added during 1999-2004 with the focus on biotechnology applications in agriculture and environment with special reference to the improvement of wheat and pulses. Vaccine and contraception, brain research and genomics are the areas for joint programs with USA. Thus, biotechnology research and application are moving in a new direction for the creation of a strong knowledge base and for the conversion of this knowledge into economic and societal benefit. However, the existence of following international information systems in the area of biotechnology (BT) and bioinformatics (BI) are notable.

Bioinformatics is a “scientific discipline that compasses all aspects of biological information acquisition, processing, storage, distribution, analysis and interpretation”. It is a multi-disciplinary subject which combines the tools of Biology, Chemistry, Mathematics, Statistics and Computer Science to understand Life & its processes.

The establishment of Biotechnology Information System Network (BTISNet)<sup>37</sup> in India in 1986 in the DBT having 68 centres in the country is notable.

### **1.18 Research Methodology**

For such a topic especially aimed at making comparative study and assessment of resources, facilities and services of the selected libraries for three years from 2010 to 2013, the survey research method was selected. Considering the distant location of bioinformatics institutions in the country, it was decided to use structured questionnaire for data collection from the libraries. The questionnaire for librarians (Appendix-I) was framed for collecting primary data about the BTISNet libraries through the library professional handling the responsibility. This questionnaire was specially designed for knowing their sharing resources, cooperative library activities like acquisition, cataloguing, seeking suggestion towards bringing improvement in resources sharing and networking services of the BTISNet libraries. The questionnaire for users (Appendix-II) was framed for collecting library services data and user needs about the BTISNet libraries.

For users only a representative group has been selected because it was not possible for the researcher to make a comprehensive study of users across the centres.

The pilot study was conducted at SP Pune University, Department of Biotechnology and Bioinformatics Centre, Pune to test the questionnaires. According to feed back of library staff, suitable modifications were made in both the questionnaires to avoid vagueness.

The investigator visited Apex Bioinformatics Centre, New Delhi and few of the institutions personally for the purpose of gathering desired data and information. Attempts were made to meet the Coordinators of centres, librarians and users for personal interview and discussion for gathering necessary information.

This was found quite useful in getting an insight with the first-hand information about facilities, services and problems.

While visiting the libraries, it was found that many librarians desired to send the completed questionnaire for libraries later by post, as all information was not readily available. Regarding questionnaire for librarians, Owing to the limited time frame for study and other practical problems, it was decided to collect 7 COEs, 11 DICs, 44 SUB-

DICs and dully filled in questionnaires for Librarians from each such institution through personal efforts as per ‘stratified sampling’<sup>38</sup>. However, the responses from BTISNet Librarians of BU, JNU, MKU, TNAU, IARI, NDRI and SP Pune University were encouraging. The pattern of response to BTISNet Librarian questionnaire from different institutions was different.

It is found that out of 68 distributed questionnaires, 62 have been responded, giving a response level of more than 80 per cent. Some basic data or information in questionnaire for librarians, which could not be made available by the librarians, were supplemented from sources like annual reports, exports, expenditure and budget statements, etc., of the concerned Centre. Despite repeated reminders and follow up, no information could be received from Indian Institute of Chemical Biology, Kolkata, M.S. Swaminathan Research Foundation, Chennai, Engineering College, Raipur, Institute of Bio resources & Sustainable Development, Manipur and Biotech Consortium of India Limited, New Delhi.

The JNU is mainly engaged in education and research. Also its response was quite late. Instead of analyzing data separately, the findings, the processed data and relevant information have been used in respective chapters to avoid repetition and bulk. But they represent their perception about the resources, facilities and services of these libraries.

### **1.19 Total Number of Print Resources in BTISNet Libraries**

This table 1 and figure 1 gives us overview of total number of print resources available in BTISNet libraries

**Table: 1.1 - Total No. of Print Resources in BTISNet Libraries**

<b>Sl.No.</b>	<b>Type of Centres</b>	<b>Total No. of Print Resources</b>
1	COEs	42905 (21%)
2	DICs	60089(29%)
3	SUBDICs	104330(50%)
	Total	207324

**Figure: 1.2 - Print Resources in BTISNet Libraries**

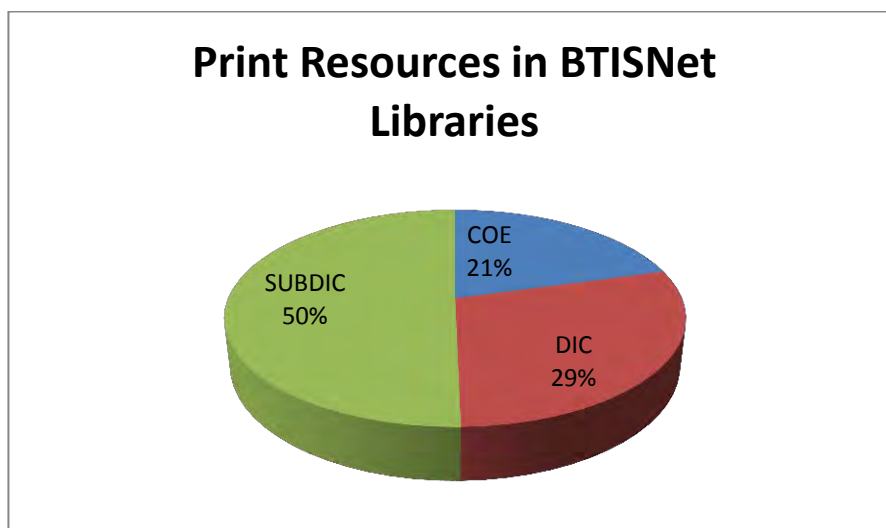


Table 1.1 and Figure 1.2 show the total print resources available in different types of BTISNet Libraries India. COE is having 42905 print resources in which are 21% print resources. DICs is having 60089 print resources in which 29% print resources. Collection of SubDICs has 1,04,530 print resources in which is 50% has print collection.

### 1.20 Categorization BTISNet Libraries on basis of Print Resources

This table 1.2 gives an idea about print resources which are categorized with different ranges. These data are represented here.

**Table: 1.2 – Categorization BTISNet Libraries on basis of Print Resources**

Sl.No	No. of Print Resources	Types of Centres		
		COEs	DICs	SUB-DICs
1.	≤ 500	1(14%)		2(4%)
2.	501-2500			23(52%)
3.	2501-4500		3(28%)	15(34%)
4.	4501-6500	1(14%)	4(36%)	4(10%)
5.	6501-8000	5(72%)	4(36%)	
6.	>8000			
	Total	7	11	44

Table 1.2 shows the categorization of BTISNet Libraries on the basis of Print Resources. Collection range between 6501–8000 comes under 5COEs which is total of 72% print collection and 4DICs which is total of 36% print collection. Collection range between 4501– 6500 is under 1COE which is total of 14% print collection and 4DICs which is total of 36% print collection. Collection range between 2501-4500 is under 3DICs which is total of 28% print collection and 15 SubDICs which is total of 34% print collection.

### 1.21 Consortia’s membership in BTISNET Libraries

Figure 1.3 gives an idea about BTISNet libraries holding various library consortia membership.

**Figure 1.3: Consortia’s membership in BTISNET Libraries**

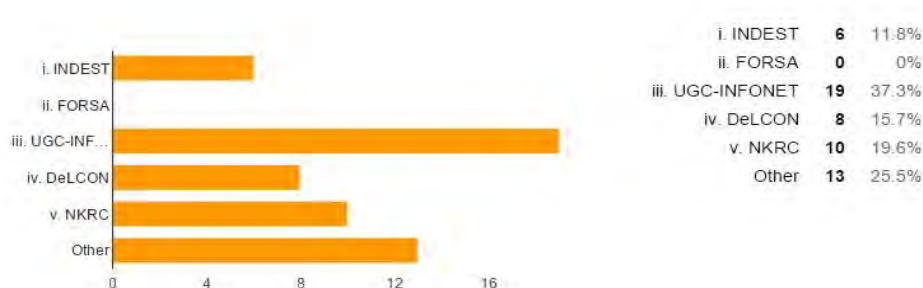


Figure 1.3 indicate that BTISNet libraries have membership with UGC-INFONET which is total of 37.3% BTISNet Libraries, 10 BTISNet libraries are membership with NKRC which is total of 19.6% BTISNet libraries. 8 BTISNet libraries are membership in Delcon Consortia. These libraries are DBT autonomous institutes. DelCon Consortia cover few DICs, few SubDICs, and one Bioinformatics Apex Centre. Majority BTISNet Libraries are covered with host institution Consortia access. 13 other BTISNet libraries are members with CeRA Consortia, UGC-DAE Consortium, and NKRC which is total of 25.5% Consortia membership.

### 1.22 Resource available through Network in BTISNet libraries

This figure 1.3 gives an idea about how resources are shared among BTISNet libraries

**Figure1.4: Resources available through network in BTISNet Libraries**

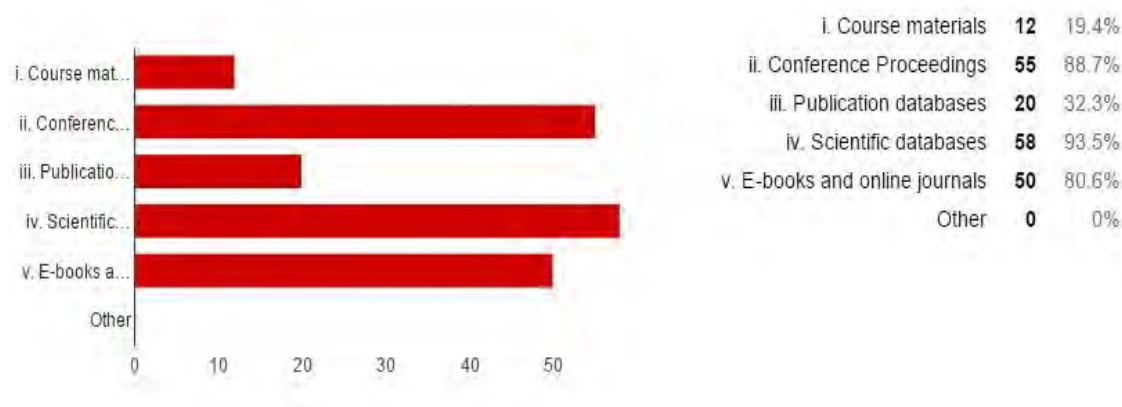


Figure1.4 indicates that scientific databases and conference proceedings and E-books and journals resources are shared in this BTISNet. 58 BTISNet libraries scientific databases are shared among BTISNet network. Which is total of 93.5% shared among BTISNet. 50 BTISNet libraries E-books and online journals are shared among BTISNet network which is total of 80.64% shared among BTISNet.

Most of the centres are considering with Bioinformatics Research. 58 (93.5%) scientific databases are Mirror with IMTECH & NBRC Bioinformatics centres are shared among BTISNet network. This Service mainly used for Project students and Research scholar in Bioinformatics. 55(88.7%) BTISNet Annual Conference Proceedings, Bioinformatics national, and International Conference Proceedings are shared among BTISNet centre through website. 20(32.3%) bioinformatics publications are shared through Bioinformatics Library Publication portal which is presently maintained by JNTBGRI. 50 (80.6%) E-books and E-journals are shared with this network. Due to Copyright and Licenses policy are restricted to access these resources all BTISNet Centre. Our suggestion is that Apex Bioinformatics negotiate to publisher all bioinformatics and allied subjects resources made available in this BTISNet Network.

### 1.23 Type of Services avail through BTISNet Libraries

This figure 1. 4 gives an idea about Type of Services avail through BTISNet Libraries

**Figure1. 5: Type of Services avail through BTISNet Libraries**

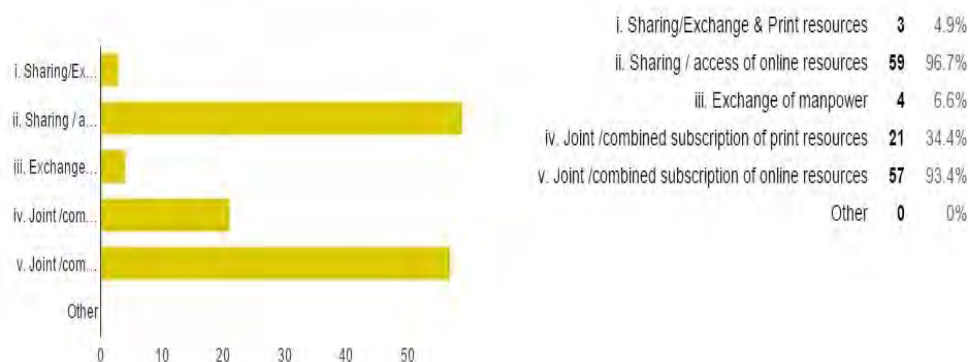


Figure1.5 indicates that 59 (96.7%) sharing /access of online resources 57 (93.4%) combined subscription of online resources. 21 (34.4%) Joint subscription of print resources only. They have to develop combined acquisition policy within BTISNet. This will help particularly SUBDICs libraries should develop print resources in their libraries. 4(6.6%) exchanging of manpower. This area need urgent attention BTISNet – COEs are having trained manpower they should come forward to develop exchanging manpower programme. It will help Other BTISNet SubDICs can start Diploma courses in Bioinformatics.

#### 1.24 BTISNet Network

The importance of information technology for pursuing advanced research in modern biology and biotechnology, a bioinformatics programme, envisaged as a distributed database and network organization, was launched during 1986-87.

The computer communication network, linking all the bioinformatics centres, is playing a dynamic role in the success of the bioinformatics programme. Database development, R&D in bioinformatics, man power and an Information services and dissemination in support of biotechnology R&D projects.



### **1.25 Centres of Excellence (COEs)**

7 Centres of Excellence (COEs) have been established with the task of providing discipline-oriented information to all institutions belonging to the host institution subject branch as well as other institutions

### **1.26 Distributed Information Centres (DICs)**

11 DICs have been established with the task of providing discipline-oriented information to all institutions belonging to the branch as well as other institutions and individual users interested in particular subject related to Biotechnology.

### **1.27 Distributed Information Sub Centres (SubDICs)**

A large number of R&D institutions and universities now form the chain of 50 distributed Sub-Centres set up in geographic locations affiliated to each Distributed Information Centres in their respective area. List of BTISNet Centres present study carried out (Annexure III).

### **1.28 Bioinformatics Infrastructure Facility (BIFs)**

Department of Biotechnology (DBT) has launched a new scheme under its BTISNet in the year 2006-07, namely Development of Bioinformatics Infrastructure Facilities (BIF) to promote innovation in Biology Teaching through Bioinformatics (BTBI). Through this scheme so far 89 educational institutions were extended Bioinformatics Infrastructure Facility supports which include computer and communication infrastructure, software, databases and training resources. The goal of this scheme is to expose teachers and students to real-world of science and the use of bioinformatics in solving hard core biological problems. Tutorials are available online to help students and teachers, learn how to navigate those resources through online and gather data that can be applied to original questions. Several sites provide free and unhindered access to biological information resources which include lecture materials, video clippings, and demonstration and so on. These resources would promote understating of advanced biology and develop interest to the students, teachers and promote quality human resource to undertake challenging research in the field of modern biology. Presently around 90 BIFs centres throughout the country

## Summary

It was recognized that besides 68 BTISNet centres funded by DBT (GOI), various biotechnological research institutions and centres under state governments and universities imparting biotechnology education have well-established resourceful libraries. Considering that BTISNet libraries in the study will enhance the service efficiency and effectiveness of information system. In total, the study of 62 BTISNet libraries has been included.

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# Chapter 2

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## *Review of Literature*

## 2.1 Introduction

The reviewed literature is an important component of any research study, which gives necessary input to the investigator to structure the research study on the chosen topic. Review of related studies further avoids the duplication work that has already been done in that area. It also helps the researcher to study the different aspects of the problem. It enables the researcher to identify the unknown areas, in order to create a new pathway for research. It sets a study in the right direction, which would keep abreast of the latest developments of the subject. The review of the related literature has been collected from various forms such as books, journals articles, thesis, reports, and websites.

The present chapter provides the comprehensive review of literature of survey-based research on “Resource Sharing and Networking: BTISNet Libraries in India” which enumerate the utility, usage and its perception, satisfaction, feeling and general opinion about the Resource sharing and Networking. Therefore, the literature is reviewed by studies on networking based library services, library networks, cooperative library services, and Consortia approach, as well as Bioinformatics research within BTISNet.

Traditionally the library resources are shared using the inter-library service and accessibility of resources necessarily required a physical visit of the user to the library. The concept of networking of libraries using the ICT has diminished the geographical boundaries and the resources are made accessible through the on-line databases. The traditional concept of resource sharing has reshaped in the form of consortia where the on-line resources are shared among the libraries for providing greater accessibility to the users. Therefore, the literature has been reviewed by focusing all these aspects.

Review of literature is a study of literature available on the problem selected by the researcher and to review the relevant literature that has been reported earlier in any form of literature. Review of the literature suggests new planning approach for the investigations. In the words of Busha & Harter, (1980)<sup>1</sup> ‘Literature review is a critical summary of different facets of research problem as reported in existing sources’. Further, they state that literature search on literature review is an attempt to

identify, locate and synthesize completed research reports, articles, books and other materials about the specific problems of a research topic.

## **2.2 Library Resource Sharing and Networking**

Juneja, (1986) in “Networking and Libraries” describes the development of networking in India with special emphasis on project INDONET. It also deals with an email system to be provided on INDONET. All these efforts will lead to flexible and reliable modern computer network offering users many services.

Kaul, (1999)<sup>2</sup> in his document “Library Resource Sharing and Networking” highlights the growth of library automation since its start to the late nineties; the various components used in each developmental phase and also state the importance of networking in resource sharing.

Vyas, (1998)<sup>3</sup> Library Automation and Networking in India: Problems and Prospects Abstract: Library Automation and Networking in India during the last decade. Automation and the networking of academic libraries are still in their formative stages. The reasons for, prerequisites of, and benefits of networking are given. Networking systems at the national and local levels are described, as are the salient features of INFLIBNET, which has been functioning since 1998.

Satyanarayana, (2003) “A Manual of Library Automation and Networking” Librarians and Information professionals are confronted today by the rapidly changing environment. The major aspects to this change are new technologies and the potential for new service which they bring. At the same time, library users and their demands are also changing. They are now coming with new expectations and insist on high-quality service. On the other

Potdar, & Joshi, (1997)<sup>4</sup> in “Library Networking: a Proposal for Amravati University Region” explains the concept, need and objectives of networking, enumerates components of library networks proposes a library network for this university region for sharing resources and improving services.

Rao, Abhiram & Muralidhar, (1997)<sup>5</sup> in their paper “Networking Solution for Academic Libraries: Experience of Andhra University Library” defines concepts of

local area network and wide area network and networking options. It desires to share the database of Andhra University Library with databases of other libraries.

Francis, (1997)<sup>6</sup> in his paper “Regional Information Networks: necessary thrust area for INFLIBNET to establish integrated information system in India.” Evaluates INFLIBNET program based on activities and achievements and suggests necessary deviation in future plan of action. It stresses the need for integrated and 36 total development of libraries and information sector in the country by concentrating on the establishment of regional networks for resource sharing.

Existing literature i.e. from the research works (Ph. D theses), the research papers presented in the Seminars/Conferences and the research articles published in the journals. Besides these research contributions as reviewed above, the researcher further has also attempted to take a review of existing literature published in some of the basic books pertaining to the components related the present research.

The review of the literature it can be interpreted that no attempts have been made by the researchers so far to contribute on the present research topic undertaken by the researcher. So, the investigation presents the first attempt and it would be an original and significant contribution to the literature on the concerned subject. It is revealed through review literature that the area of present study is unexplored and no study related to this topic has been done.

### **2.3 Resource Sharing in Libraries**

Charlotte (2001)<sup>7</sup> studied the background and values of resource sharing in engineering libraries and also provides an understanding of the collections, e-resources access, user requirements, and resource sharing essential to meet the information needs of library Users.

Robert (2003)<sup>8</sup> revealed the use of global interlibrary loan to meet the needs of today's academic and scholar through library networking and resource sharing program.

Volmer (2005)<sup>9</sup> describes the library consortia are significant tools to information resource sharing and can add to increase the quality of academic education.

Peter (2006)<sup>10</sup> explained the collaborative, user-initiated, and interlibrary loan service for all eight universities in Hong Kong and described detail the introduction of a service that will be of interest and impact to many other libraries facing shrinking budgets and the need to share resources in an efficient way.

Gail (2007)<sup>11</sup> highlighted the innovations in resource sharing in the US library community with an international perception. Tom (2007)<sup>12</sup> discovered that Ohio LINK contributes to its users' educational activities through access to and use of the documents and information resources which it deliveries. It provides a set of priorities and initiatives for consideration.

Roxanne (2007)<sup>13</sup> describes the developments in Australian libraries and the national interlibrary loan and document delivery systems, in particular, the outcomes of the Local Inter-lending and Document Delivery Administration Systems (LIDDAS) project.

Sirous (2008)<sup>14</sup> presented the success factors of resource sharing (RS) and cooperation in Iranian Academic Libraries (IAL). Anne (2008)<sup>15</sup> describes the need for rethinking resource sharing to offer both library users and non-library users options to obtain the material they seek from both libraries and commercial sources.

Kingsley (2010)<sup>16</sup> studied the challenges facing Nigerian University Libraries with respect to information and communication technology application and utilization for resource sharing, as well as to areas of library operations to which information and communication technology can be applied and utilized for resource sharing. It concludes by volunteering solutions for viable information and communication technologies based cooperation among university libraries in Nigeria.

Sangeeta (2010)<sup>17</sup> highlighted that DELNET fulfils a vital role in enabling resource sharing in India and is expanding its role rapidly. Rekha (2011)<sup>18</sup> reported the development of the Indian National Union Catalogue for Scientific Serials (NUCSSI). It was found that NUCSSI database is enhanced with the online access and enables easy and improved access to locate a particular journal and its availability in various libraries free of cost.



## 2.4 Resource Sharing at International level

Woodward, Hazel and Cliff, McKnight (1995)<sup>19</sup> after summary of the electronic journals, discussed the issues relating to access to and bibliographical control of e-journals from a local and national perspective. The added purpose of the paper was to assist the librarians in implementing and enhancing the access mechanisms of e-journals. They identified 3 types of e-journals as online, CD-ROM and networked journals. They further argued that for facilitating access to e-journals there are three levels of access need to be considered by library and information services. The first was access to information about what titles are available and other bibliographic details. The second level suggested an access to information about the articles within individual journal issues: what is being published by whom? The third level was about access to the actual text of the journal: how can access be made quick and easy for the end user?

Vishwanathan, Rama, Walter, Wilkins, and Jevic, Thomas (1997)<sup>20</sup> developed a computer-assisted instructional program for giving special assistance in finding and using electronic information sources for the users at University of Illinois at Chicago(UIC). The program was designed mainly for the remote users of the libraries providing more network access to resources. During the study, the sixteen-lesson course was distributed to the faculty, staff and students of the sample size 450. During the study, the pre and post-tests were conducted to access the participant's prior knowledge and subsequent knowledge gain. The survey results showed that participants built on their familiarity with an e-mail to broaden their internet expertise. The well-developed instructional material serves as an ongoing resource for new users and past participants also. Instead of typical classroom instruction of one hour, the online medium allowed the library to reach a large number of users. The pre-course survey revealed that 60% users intended to use the internet for research and work while the post-course survey showed an increase in personal use as the course increases the comfort and familiarity level of the participants.

Alexei, Oulanov, and Pajarillo, Edmund (2001)<sup>21</sup> conducted a survey on evaluating the usability of CUNY + a wide area network database (City University of New York). The survey used questionnaire technique five-point Likert scale. The

survey results found that 70% users denote positive opinion in using the database while only 10% disagreed.60% interested in using the system again and 10% were not. General satisfaction about the database was denoted by 60% users. The paper emphasizes the relevance of the user and user participation in any system planning design.

Gorman, G E and Cullen, Rowena (2002)<sup>22</sup>provided a new approach to the modelling of networks where the libraries enter through the network library model, moved forward through the cooperative library model and ends in an advanced knowledge environment model. The research paper traced out three stages of development of networks as “Initial stage” which is equivalent to the Network Library Model where the libraries are self-sufficient and provide full services to users without relying on other libraries. Here the printed documents, CD-ROMs, and dial-up connections are the main resources and the resources are discovered through the OPAC mainly describing bibliographic data about the printed resources and the library staffs gives the face to face service. Further, the next stage is explained as “Intermediately”, equivalent to Cooperative Library Model where the library provides access to more off-line e-resources. Further, the locale and networked resources are included in OPAC.

The catalogue can be accessed remotely and use of e-mail delivery can be traced. Library provides e-guide which is used by the users for accessing the system. The next stage described is “Advanced”, equivalent to Knowledge Environment Model, where the libraries provide full remote access to resources, most of the material is in e-format, dedicated internet links are used. The metadata is used comprehensively for the bibliographic description of resources. The access is provided full on-line and remotely. On-site access not necessarily human and full computer-assisted support for information discovery is provided. In these models, the library is viewed as one player in the information transfer process along with the internet, community information services.

The research paper indicated that no network in the Asian region has achieved the advanced stage of Knowledge Environment Model. Further, the paper mentioned that The China Academic Library and Information System (CALIS) are

moving towards the advanced stage. CALIS is a nationwide academic library consortium that links the services across 27 provinces and cities in China.

Nfila, Reason Baathuli and Darko-amoem, Kwasi (2002)<sup>23</sup> traced out the development of Library Consortia by conducting a literature review from the period 1960-2000. After tracing the historical review, the paper highlighted the scenario in 2000. The paper discussed the new purchasing environment created due to electronic publishing, types of consortia as well. The researchers mentioned that the consortia have increased the levels of library services and convenience for the patrons of large libraries. The library consortia cause the shifting from peripheral and limited sharing of resources to an integrated system-wide and formalized resource sharing. Further, the researchers added that this has been possible due to the developments in electronic access.

Vanbuskirk, Mary and Krym, Naomi (2003)<sup>24</sup> mentioned that access to electronic media is the way of future in the paper, where the efforts were done for tracing out the history of Canada Institute of Scientific and Technical Information in resource sharing. Further the paper included present scenario faced by the libraries such as declining in the budget and ever-increasing budgetary pressures faced by the information consumer. The paper has discussed the accessibility to the resources in Canadian Universities offered through the consortia approach. The activities of the major cooperative venture in Canada “scholar portal project at OCUL” which is funded by Ontario Innovation Infrastructure and Ontario Universities to expand the access to electronic and printed resources were also highlighted. The DSP (Depository service Program of Communications in Canada) provides access to federal government information. It provides this information through a network of more than 790 libraries in Canada and 147 institutions around the world. The program is administered by Communication Canada.

White, Pam and Twomey, Cherly (2006)<sup>25</sup>, studied the interlibrary network and document supply service of National Health Service (NHS) in the UK. The study did a comparative analysis of the same with the service models in five countries as USA, Italy, Australia, Iceland and Canada. They identified the issues related with the interlibrary network and document supply. The study shows interesting findings where the researchers mentioned that automation of library system should improve

the user experience, but does not necessarily replace the need for involvement of the library services and the staff. Complementary collections are necessary for widest and most effective access to information. Access to electronic resources does not alleviate for remote document supply.

Korobili, Stella, Tilikidou, Irene and Delistavrou, Antonia (2006)<sup>26</sup> examine the use of library resources, focusing on e-resources by the members of the faculty of the higher educational institute in Thessaloniki, Greece. The study conducted a census survey using a structured questionnaire. The frequency of use of resources mainly e-resources examine the impact of demographic or situational characteristics are examined. The researcher found that the majority of faculty members use printed resources, but they also use e-resources frequently. They found that use of e-resources is higher in the school of Business Administration and Economics, among those who hold Ph.D. degree and younger faculty members. Further, they added that the use of e-resources is positively indicated by the researchers as the convenience of access. The study also examined the computer anxiety rating scale which indicated that the less anxious the faculty feels about PC's, the frequent users they become.

Hammond, Ellen (2009)<sup>27</sup> discussed how the new thinking is required about the access services provided by the large academic libraries in the United States in the scenario of Internationalization of higher education. It provided an overview of the agreements (MOU) concluded by East Asia library staff at Yale University, USA to secure access, for Yale affiliates to the University of Tokyo and Waseda University Libraries, Tokyo, Japan. The researchers argued that due to an increasing trend of going abroad for research among the faculty and students, the need for the services that support their users globally provided by the library professional has also increased. Further, they added that "global access", should refer not just to retrieve information on-line but also to the myriad institutions beyond national borders that provide access to information sources and services. To provide worldwide accessibility/entry in other libraries is another role of the library science professionals in today's scenario of internationalization of education.

## 2.5 Library Network – International

Since this study relates to Indian bioinformatics research, the investigator consulted various sources for getting an understanding of the subject and related problems and developments in the field in India. The contributions by, Enger,<sup>28</sup>, Brown,<sup>29</sup>, Ratledge<sup>30</sup>, Bourgaize<sup>31</sup>, Smith<sup>32</sup>, Barnum<sup>33</sup>, Primrose<sup>34</sup>, Baxevanis<sup>35</sup>, Attwood,<sup>36</sup>, Chirikjian,<sup>37</sup>, were found to be worth consulting and mentioning.

Resource sharing among library and information centers has been acquiring increasing significance. The factors like information explosion, inflation, and resource crunch, variety of forms and channels of multidisciplinary and complex subjects have made all concerned to realize the limitations of individual libraries and information centers in fulfilling the varied information needs of increasing number of users.

The professional organizations like International Federation of Library Associations and Institutions (IFLA), Association of College and Research Libraries (ACRL) in America and Association of Information Management (Aslib) in United Kingdom etc. The success stories of library network in the developed countries such as the Online Computer Library Centre (OCLC) the Washington Library Network (WLN) in USA and the British Library Automated Information Service (BLAISE) and Joint Academic Network (JANNET)<sup>38</sup> in UK, are some of the important examples. Almost all nations have given due importance and attention to resource sharing and networking among the libraries and are establishing their networks.

Since the present study is related to the group of libraries in the specific subject discipline in the Indian subcontinent, only selected literature concerning countries other than the USA and the UK has been reviewed. However, the investigator could consult the works of various prominent authors like Allen Kent, Ross Atkinson, M.B. Line, Richard De Gennaro, Bant Harlow, emphasizing for resource sharing and distributed collection development in networked environment.

## 2.6 Library Network - India

Review of literature by Indian authors on resource sharing and networking indicates that, in India also, various aspects of resource sharing and networking have got adequate attention. It is revealed that the organized efforts in this direction have started in the 1980s. The working Group of the Planning Commission headed by Dr. N. Seshagiri<sup>39</sup> recommended for the need for modernization of library services and informatics during the Seventh Five Year Plan, 1985-90. An overview of the development of library networks in India by S.S.Murthy<sup>40</sup> provides detailed account of the establishment of various metropolitan networks in the country. Description about Calcutta Library Network (CALIBNET)<sup>41</sup>, Delhi Library Network (now Developing Library Network) (DELNET)<sup>42</sup>, Bombay Library Network (BONET)<sup>43</sup>, Ahmedabad Library Network (ADNET)<sup>44</sup> and Madras Library Network (MALIBNET)<sup>45</sup>, are available. Brief account of Pune Library Network (PUNENET)<sup>46</sup>, Bangalore Library Network (BALNET), Mysore Library Network (MYLIBNET), etc. are available giving an indication that many such networks will come up at other cities in the country.

The two books by H.K. Kaul<sup>47</sup> i.e. "Library Networks: an Indian Experience" (1992) and "Library resource sharing and networks" (1999) provide detailed account about concept of resource sharing and networks in India. Sufficient literature is available in various sources about Information Library Network (INFLIBNET)<sup>48</sup>: a national network of the University Grants Commission. The sufficient amount of literature about countrywide networks like Education and Research Network (ERNET)<sup>49</sup>, National Knowledge Network (NKN)<sup>50</sup> etc is available. Literature about similar subject-specific networks is discernible in proceedings of national and regional seminars and conferences.

Raina, Roshan Lal(1997)<sup>51</sup>, proposed a model for establishing a network among the IIM libraries for sharing the resources through his thesis titled "Library Resource sharing and Networking: an approach to management schools in India." The research work is a comparative study of IIM's in India.

Rao, Siriginidi (2001)<sup>52</sup> illustrated the challenges for the networking of libraries and information centers in India. The paper mentioned the changes that libraries and information centers need to undergo and also highlighted the role of

ICT in transforming traditional libraries and information center into a digital mode. The paper also discussed the government policies that led to the development of national information infrastructure. The paper mentioned that the working group of the planning commission recommended the need for networking and modernization of library and information centers in India during the seventh five-year plan (1985-90).

The paper further mentioned that the libraries and information centers should set the objectives which include the availability of computerized services to users, promotion of resource sharing among member libraries, the development of a network of libraries and the coordination of efforts for suitable collection development for reducing unnecessary duplication.

Mishra, Sanjay (2001)<sup>53</sup>, conducted a survey of local library networks in India for studying the factors affecting local library networks. A survey of participating libraries of four local networks (ADINET, CALIBNET, DELNET and PUNENET) in India was conducted using a survey method. The study revealed that organizational factors such as planning, governance, funding, communication and administration are related to each other. The study surveyed 131 libraries. The questionnaire included items related to computerization and networking, organizational factors, and general data. The study considered six organizational factors as planning, governance; funding, communication administration and success and they were measured using a Likert 5 point scale. The response for these factors indicating moderate level. Researchers indicated that raising the levels of these factors will assist in developing local area networks. The researcher concluded that the local area networks in India are in an elementary stage, further he added only DELNET is functioning in the true sense as a network. The researcher suggested few active steps for the development of local area networks in India as follows:

Proper long-term, strategic and short-term planning with specific agenda of action, the network service center should be located in one of the member libraries, constant up gradation of hardware and software for successful delivery of information within the network, nominal fees from the member institutions and training for professionals.

Pandian, Paul, Jambhekar Ashok and Karisiddappa, C R (2002)<sup>54</sup> mentioned that there have been many cooperative efforts up to 2002 among the Indian Libraries for resource sharing, but it is hard to find one successful program that could use as a benchmark to replicate in other libraries. Further, they added that main factors affect such efforts are more human and attitudinal than technological or economical. Researchers designed a framework for the internet model based on a consortia approach for facilitating information access and use by providing a single web-enabled window to the information users for the participating institutions (IIM's) in the consortia program not only to their resources but the other institutions resources also. The purpose of the model was to bridge the gap between information resource rich and information deficient libraries and enhance the information use shared access and optimum utilization of information resources at an affordable cost. Thus the paper proposed a model for IIM consortia for sharing the on-line resources among IIM libraries and concluded with the fact that with the advent of the internet World Wide Web, it has been possible to provide instantaneous access to the resources available not only within the organizations but other institutions that participating in the consortia program.

Cholin, V S, and Karsiddappa C R argued (2002)<sup>55</sup> that for meeting the genuine needs of users, libraries need to take an active part and provide access to on-line resources. The paper has discussed the role of OCLC (Online Computer Library Centre) and the services offered by OCLC in different packages.

Chikkamallaiah, Neela and Usha(2002)<sup>56</sup>discussed the efforts for accessing the on-line resources through the formation of IIM consortium and Raina Roshan Lal (2005) illustrated sharing of online resources among the IIM's at the INDEST Consortium of the MHRD. The IIM's are sharing 7 on-line databases at a consortium price.

Sridhar, M S (2002)<sup>57</sup> discussed the case study of sharing of on-line resources among the ISRO libraries where the effort has been made by using the consortia approach. Efforts were also put in to implement uniform library management software to enable remote networked access of holdings of about a dozen libraries within the organization. The online resources such as Ulrich+, Aerospace,



Compendex and BIP databases are shared. Additional shared resources through the consortia were the 22 on-line journals related to aerospace, IEEE journals.

Singh, Ibohal, Singh, Khomdon and Singh, Joteen (2004)<sup>58</sup>, in a study assessed the attitude of the users towards UGC-INFLIBNET services at Manipur University Library, India under INFLIBNET program. The researcher used survey research method for collecting the primary data using stratified sampling technique. The purpose of the study was to ascertain the requirements of the users and access their attitude towards INFLIBNET services of Manipur University Library.

The study received 68% response. The researcher found that there are fewer users (51.96%) who are aware of the INFLIBNET services of the Manipur University Library. Further among the various INFLIBNET services, Internet access, and E-mail are mostly used by the users. Use of OPAC was negligible due to lack of awareness among the users. Whereas “downloading of e-resources” is used remarkably by the researchers (82.61%). The users had the attitude towards the internet that its speed was felt poor. The teacher community carried the attitude towards the INFLIBNET services that it enables library automation and allows greater access to information sources.

Sinha, Manoj Kumar (2004)<sup>59</sup>, studied the scenario of automation and networking of Libraries of North Eastern region of India. The researcher has evaluated the automation and networking services in 12 libraries that had financial assistance under INFLIBNET program. The researcher used survey research method including the questionnaire technique. The survey findings mainly cover various aspects of library automation and networking, multimedia application and use of CDROM databases, OPAC and internet services like in-house operations such as acquisition, circulation, retro-conversion, serial control, information retrieval and dissemination, bibliographical services, on-line search of databases, OPAC, web OPAC.

Survey result shows that out of 15 libraries only 26.7% libraries are fully computerized whereas 33.3% libraries are partially computerized and in 33.3% libraries computerization was initiated. Only 6.7% libraries were willing to start computerization. Further, out of 15 libraries, 40% libraries have started computerized acquisition of reading materials and serial control started in 60% and

library administration has started in 66%, whereas computerized cataloguing started in 80% libraries. The OPAC service was available in 60% libraries, interlibrary loan in 33.3% libraries. Results of the survey showed that out of 15 libraries, the users of 40% libraries are assessing all services being offered by the INFLIBNET center.

Ramesha, Kumar B D and Kanamadi Satish (2004)<sup>60</sup>, evaluated IT-based services on the basis of user requirements and satisfaction. The study was conducted in the University Libraries in the Karnataka state. In this study, the researcher used the survey research method followed by two different sets of questionnaires one for users and another for the providers of service- for the Librarians. In the findings of the study, researchers noted that out of 7 universities, only 3 have full-time librarians and further the existing staff strength, both professional and others, is highly inadequate compared to magnitude of the work.

These libraries have traditional and modern infrastructure and IT facilities and network facilities are available in most of the university libraries. Most of them were participating in the one/another network system for sharing the resources. The researchers also traced out the awareness level of the users regarding the computerization activities of the library. The results of the study showed that the lack of manpower is the basic cause of declining of the quality of library and information services. Further the study indicated that the university libraries are lacking in the programs of users awareness and publicity. The researcher revealed the need for the library professionals to update new skills by considering the changing environment in the respondent libraries.

Cholin, Veernna s (2004)<sup>61</sup>, in another paper took an outline of the implementation of information technology in different university libraries in India. The paper has discussed the role of INFLIBNET Centre and overall development of University libraries across the country with special emphasis on efforts through UGC-Infonet E-journals Consortium. The paper has also related the availability of e-journals in western universities with Indian Universities. The paper found out the problem faced by the University Libraries in meeting the user requirements even after spending more than 75-80% library budget on journal subscription. The paper concluded that the libraries could increase buying power and access to resources

through qualitative resource sharing for effective document delivery service among the universities.

Singh, Anil and Gautam, J N (2004)<sup>62</sup>, presented a summary of the electronic databases developed in India or on Indian topics. The paper emphasised various electronic databases in India as Indian databases on science and technology established by NISSAT (National Information System on Science and technology, SAARC social sciences and humanities database, National Institute of Science and Information Resources (NISCAIR) databases, National Union Catalogue of scientific serials in India (NUCSSI) database, DELNET databases, INFLIBNET databases, other databases such as Library and information science databases, statistical databases. Researchers claimed that the role of information science professional is to tap the unique items of useful information, the nuggets of knowledge and to extract the search pattern in the raw data. Further, it was concluded that the intermediary role of library science professionals in accessing, structuring, evaluating and refining has improved.

Srivastva, Mehandra and Kanauja, Laleta (2004)<sup>63</sup>, conducted a study for investigating the present situation of library automation, CD-ROM database services, internet and on-line facilities, reprographic services in Agricultural University libraries in India. The survey also highlighted the conventional documentation and information services namely bibliographic service, current awareness service, abstracting and indexing and newspaper clipping services in agricultural Universities in India. The study used questionnaire technique for data collection and data collected from 30 agricultural University Libraries in India. Findings showed that 100%

Researchers recommended that all the libraries should provide agricultural newspaper clippings service. The further suggestion given for implementing OPAC in the library for better access to information and CD-ROM database service should be provided by all the respondent libraries and automate their library functions and services. The researchers finished that in the new millennium, each library in India must go on the electronic internet for better information services for meeting the future challenges.

Patel, Yatrik, Vijaykumar J K and Murthy T A V (2005)<sup>64</sup> provided an overview of INFLIBNET's institutional repository and archive-India which is developed for Indian academic and research community to archive their scholarly work by using D-space digital library system and accessibility is provided through the internet.

Madhusudhan, Margam (2007)<sup>65</sup> evaluated the use of the internet as an information source by the researchers in the field of science and technology in University of Delhi, India. The study was conducted on the sample of 51 research scholars in the Central Science Library in the University of Delhi. The study used questionnaire observation and interview technique. The researcher used the stratified random sampling method for data collection. The study received 81% response. The findings of the research revealed that 66% respondents were using e-journals and databases and handsome figure of 70% use the internet. During the paper, the researcher stated a need for creating awareness among the research scholars about using the internet services more efficiently.

Manthas Rajiv and Kaur, Amritpal (2008)<sup>66</sup> studied the use of internet services and resources in the engineering colleges of Punjab and Haryana (India). The study used survey research method and data was collected using the questionnaire technique with 80.8% response rate. A total sample of 625 teachers and 903 undergraduate was focused. Random sampling method was used for the data collection (least 5, 3 teachers, and 2 students) from the respondent colleges.

Results showed that all the respondents make frequent use of the Internet because they have access either at the college or at home. The survey revealed that the majority of the respondents, i.e. 65.6%, access the Internet from college or their workplace. More than 75% of the respondent's use the Internet services mainly for educational and research purposes. Google and Yahoo search engines are found to be more widely used than other search engines. More than 70% of the respondents impression that the Internet is useful, informative, easy to use, inexpensive and time-saving.

Sinha, Manoj Kumar (2008)<sup>67</sup> identified various issues relating to access and bibliographic control of e-journals, access management problems, policy issues and development of e-journals consortium approach to subscribing scholarly peer reviewed journals for their library users in network environment. The paper has set a brief account of various consortium efforts in India. The paper has concluded that in India and South Asia or developing countries, a number of e-journals are less and printed version of e-journals is available. Further they added that e-journals are very much costly and also the shortage of the funds provided by UGC to the institutions, therefore the national institutions like IIM's, IIT's and universities are involved in consortia approach for providing access to number of e-journals and databases to the user community.

Aher, D W, Matsagar, M B and Wagh V G (2009)<sup>68</sup>, studied the impact of electronic resources on the libraries and their users in Nashik City. The study has targeted total 480 sample population using stratified random sampling method using questionnaire technique for data collection. The respondents included were teachers, librarians and students from various colleges in Nashik city. The study found that percentage of students visiting the library for electronic resources such as CD's, e-books and e-journals is  $\frac{1}{4}$  of the population who visit for reading books and journals. Further, the researchers mentioned that the overall opinion of the user population is that the electronic media's help them in understanding their subjects collecting relevant information with a faster access as compared to the information in print form.

Desale, Sanjay, Londhe, N L and Patil S K (2009)<sup>69</sup>, evaluated JCCC@UGCINFONET and the document supply service at the University of Pune. The paper had taken a brief review of JCCC@UGC INFONET and the document supply service provided by the University library; problems come across while using the JCCC@UGC INFONET interface and the administrative interface in providing ILL service. The researchers discussed the new service initiated by INFLIBNET and evaluate the JCCC software from both the user's and administrative point-of-view.

Kaul, Sangeeta (2009)<sup>70</sup>, conducted a survey of DELNET libraries for assessing the usage of DELNET services. The study results show that there were total 90% respondents indicating the dedicated internet facility in their libraries and

in 97% organizations, faculty have direct access to the internet from their own desk. Awareness of DELNET services was indicated by 92% of member libraries. Photocopying of journal articles and supply is the most popular service of DELNET. The study has found that 86% member libraries are benefited from the union catalog and above 90% libraries are satisfied with the ILL/DD service of the DELNET.

Ghosh, Maitraiee(2009),<sup>71</sup> studied the digital setup and attitudes towards access and sharing of selected engineering libraries in Maharashtra, India. The researcher surveyed the forty-nine libraries and studied the current status of the libraries. The paper focused financial, technical and structural factors of the libraries. The focus is on librarians' perceptions on the formation of state-level consortia; ICT infrastructure; users' needs; collection development policies and the services provided by engineering libraries to the community. The purpose is to explore the possibilities of forming regional consortia for enhancing the access to information and knowledge through cooperation for the benefit of the engineering communities.

The engineering libraries from diverse backgrounds such as central government-funded, autonomous deemed universities, fully state government funded colleges, partially state-funded colleges with autonomous status and unaided colleges. The study examined the data using various heads as library collection, information sharing infrastructure, use of on-line resources, and librarian's observation on the current levels of cooperation, consortia relationships and obstacles towards cooperation.

Research conclusions showed that 66.5% libraries have online journals and bibliographic databases through INDEST. 10.5% libraries are subscribing to online resources independently. 16.5% libraries have only offline A.V. resources. Above 50% of the libraries have memberships to INDEST and are receiving e-journals and bibliographic databases at discounted price. 56% of libraries have started some digital library initiatives. Out of 49 respondents, 13 indicated that they had engaged in at least one cooperative activity with other libraries.

In a nutshell, the networking related services created multiple choices of accessibility to the users. The way of improvement is the successful application of it in the libraries. Automated library functions, on-line access to full-text databases, Web OPAC, Digital Library, remote access are few major highlights of it, whereas

benchmarking is mapping out the milestones of future development. It is an ongoing process of improvement. It is the process of understanding the user requirements and application of it for the future improvement.

### **Summary**

The review of the literature reveals that most of the studies mentioned above are based on “library survey: -Primary data collected from the BTISNet librarians in India, user feedback etc. These studies are based on relatively large sets of data collected from a BTISNet Centres attached with libraries such as Research institute and agricultural, veterinary universities in a particular state. The focus of these studies is related to the use Resource sharing, networking, and impact of IT including the study of the network-based services in these libraries. The present study is one of the series of such study discussed above.

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# Chapter 3

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*Resource Sharing and Networking*

### **3.1 Introduction**

We are in an age of information explosion. There has been an exponential growth of documents in recent past in a variety of forms and media and through different channels. Increasing price, high inflation rate and worldwide resource crunch further aggravate the situation. As a result, it is virtually impossible for any library to be self-sufficient to fulfil the information needs of its users. Cargill and Graves<sup>1</sup> state "No library can afford to acquire even half of the published material, both in terms of cost, and the investment in space and personnel time required to process and provide access to a burgeoning quality of information. An average size library at a college or university may subscribe to 3,000 to 10,000 journal titles, a fraction of nearly 2, 60, 000 possible acquisitions".

Multiple reasons such as limited resources, price rise, lack of proper distribution channels, a variety of non-profit publishing agencies etc. coupled with inter-disciplinary subjects and scattering of literature in uncommon sources further compound the problems. All these factors in the due course of time have led to the recognition of the concept of cooperation and resource sharing among libraries.

### **3.2 Library Cooperation**

Cooperation in libraries is considered a concept developed in the late 19th Century and the beginning of 20th Century. In fact books themselves represent a kind of cooperation for communicating individual experiences to society and this in turn, led to creation of more knowledge and thereby creation of libraries to systematically organise and retrieve the knowledge, when needed. Library cooperation consists of borrowing and lending the reading materials. Cooperating library is "a library that joins with another library or group of libraries in some common plan, such as coordinated development of collections and services or contribution of to a union catalogue."<sup>2</sup> observes that in modern times the cooperation is found helpful in following main activities in libraries:

1. Acquiring books - selection, ordering, and purchase, etc.
2. Recording books - cataloguing and classification

3. Making them available - their own books by consultation and lending books not held by them by borrowing from elsewhere.
4. Storing books - for present and future use.

He also states that the main argument for cooperation is surely not financial at all. It is simply that no library can be self-sufficient. Access to the collection of resources is the basic theme around which the library cooperation revolves. Lot more efforts have been made throughout the world in the area of library cooperation, viz., cooperative acquisition, cataloguing, storage and so on. The psychological, geographic, organisational and historical barriers coupled with application of computer technology gave rise to the concept of resource sharing which, in fact, is an improved version of library cooperation having formal agreement between libraries for mutual benefits.

### **3.3 Resource Sharing**

The term 'resource' usually means human, finance, and materials. It applies to anything, person or action to which one turns for aid in time of need. The word 'sharing' connotes apportioning, allotting or contributing something that is owned to benefit others. In case of libraries, it signifies sharing of library materials and functions in common by a number of libraries for benefit of each other.<sup>3</sup>

Resource sharing in libraries is a mode of operation, whereby functions are shared in common by a number of libraries. "Resource sharing, in its most positive aspect entails reciprocity, implying a partnership in which each member has something useful to contribute to others and in which each is willing and able to make available, when needed."

According to Khanna,<sup>4</sup> "resource sharing signifies a symbol of good will, intent to share resources, knowledge, bibliographical data, facilities and other fruits of modern technology, man's ingenuity, and the results of accumulated wealth of knowledge. It implies:

1. A degree of democratisation of information, in which all information is made as uniformly available as feasible;
  1. A steady increase in the ability to serve at all points of service;
  2. A cooperatively sharing the resources of many libraries;



3. A division of function based upon efficient utilisation of the cooperation network;
4. An increasing degree of specialisation in the collections and interest of individual libraries, so that intellectual and financial resources are not dissipated in duplication of broadly available material;
5. A sense of responsibility by the individual library to serve others and to support the costs of operating collections on which it may draw;
6. Willingness on the part of libraries to cooperate in a voluntary, but responsible manner, including a willingness to accept certain common standards of cataloguing collection and methods of operation;
7. The creation of new view of library, on the part of librarians and users - as the place to go for information service of all kinds;
8. That the potential pain is worth the risk of some loss of individual achievement;
9. That effective cooperation depends upon adequate resources, administrative ability, and efficient communication;
10. That all libraries must maintain an attitude of flexibility and experimentation."

### **3.4 Objectives of Resource Sharing**

The objective of resource sharing activity is to create an environment in which the librarian can offer better services and more materials without any extra financial involvement. Four objectives of resource sharing have been identified, viz., conceptual, operational, behavioural and research. Some of the important objectives of resource sharing are enlisted below:

1. Assisting member libraries in selection, procurement and processing of materials;
2. Coordinating acquisitions, inter-library loan and reproduction of materials for the member libraries;
3. Promoting expanded use of library resources;
4. Improving library facilities and services;
5. Cooperating in the training and development of personnel;
6. Achieving economy in the use of human and material resources; and

7. Facilitating sharing of materials among participating libraries, which are beyond the reach of individual libraries.

Due to the shift of emphasis from the collection of documents to access of desired information and that too in most effective and efficient manner, there have been consistent efforts to achieve the objectives in best possible ways. Improved approach to these objectives discernible in recent literature may be summarised as under:

- a. Improvement of bibliographic access, i.e., the information needed to identify documents, their existence and location; and
- b. Improvement of physical access, i.e., the delivery of the published item in textual or copied form.

Currently, the emphasis has been shifted from collection development and acquisition to access of information and from information access to delivery.

### **3.5 Need for Resource Sharing**

Information is an essential ingredient of all human activities. It acts as a medium for communication of ideas, a resource for research and development necessary for the sustenance and progress of socio-economic well-being. The need for a variety of information along with many complexities in its dissemination and access has necessitated resorting to this phenomenon. The various factors, which have influenced and increased the current pace of resource sharing activities, are:

- i. Ever increasing inflationary trends;
- ii. Spiralling prices of reading materials;
- iii. Decreasing budgets size and buying capacity;
- iv. Exponential growth of publication and relative scarcity;
- v. Growth of inter-disciplinary subjects and obsolescence of knowledge;
- vi. Increase in variety and degree of user demands and growing awareness for access to information;
- vii. Change in emphasis from ownership to collective access, holding to document delivery, materials to client centred approach and document delivery to information delivery;
- viii. The advent of increasingly effective information technology; and above all,

- ix. Growing willingness to share resources.

### **3.6 Growth of Publications**

The libraries are confronted with the unchecked growth of publications with an ever-increasing rate. These publications are being published and distributed through non-trade channels. The institutional publications under grey literature with fewer profit avenues pose a complex problem. In this situation, it is not possible for any library to procure everything even in a minute subject area and claim for self-sufficiency. He maintains that the rate doubles every eight to ten years and by the end of the century, 15,620 million documents will be produced annually. Chowdhury<sup>5</sup> states "Knowledge is being created currently at rates never before imagined and thus is because of the multiplier effect, of the influence of ideas triggering new ideas and these leading to inventions and discoveries." He further quotes that the number of scientific papers has increased from 10 million in 1970 to 40 million in 1996 and Chemical Abstracts has added 3,40,000 items in 1970 which increased up to 15,00,000 items in 1995.

### **3.7 Library Collection**

The efficiency of its services and the satisfaction level of the users gauge the importance of a library, which in turn is dependent on quality and strength of library collection. It is the collection of reading materials, which is shareable. Without rich and up-to-date collection, resource sharing cannot be imagined. To be effective, a library must be able to provide appropriate information or document to meet the user needs. The appropriateness implies that the collection shall be planned and developed in accordance with well-defined objectives, policies and procedures.

A library collection is the sum total of the library materials which includes library books, manuscripts, journals, reports, microforms, films, databases and so on. Collection development is a term which has replaced the term book selection and acquisition. In fact, collection development is a broad term and book selection is an activity of this process. The collection development programmes are guided by users point of view and hence the collection should be adequate, up-to-date and capable of meeting the present as well as future needs of the clientele.

The A.L.A.<sup>6</sup> Glossary of Library and Information Science defines collection development as "a term which encompasses a number of activities related to the development of the library collection, including the determination and coordination of selection policy, assessment of needs of users and potential users, collection use studies, collection evaluation, identification of collection needs, selection of materials, planning for resource sharing, collection maintenance and weeding."

"Collection development is the process of planning a stock acquisition programme not simply to cater for immediate needs, but to build a coherent and a reliable collection over a number of years to meet the objective of the service." The process of collection development may be summarised as embracing the following activities:

- i. Acquire/collect and provide all relevant materials to its clientele. Building comprehensive and specialised collection in specific areas to support research programmes and developing collection in borderline subjects of general interest along with areas of immediate concern;
- ii. Evaluation of existing materials and add only those which serve maximum number of clientele;
- iii. Continuous study and surveying the use of collection; and filling up gaps;
- iv. The replacement of worn out or mutilated materials and, thus, reduce maintenance cost;
- v. Preservation and conservation of materials;
- vi. Removal of less used and out-dated materials.

The exponential growth of knowledge and number of scientists are increasing consistently. The yearly increase in the cost of scientific and technical literature by about 10 per cent coupled with budget restriction make it virtually impossible for any individual library, however, resourceful it may be, to claim self-sufficiency. The libraries like other organisations face various social, economic, cultural, political and technological changes. Singh<sup>7</sup> states "Experiences show that there has been continuous economic recession throughout the world and there seems to be no hope of any improvement of this trend in near future. He further enlists following reasons for financial pressure and increased spending in academic and university libraries:

- i. "Increased number of information seekers;

- ii. Varying demand for current, more specific and depth information and services;
- iii. Multiplicity of information sources through various channels in many forms and languages;
- iv. High inflationary rates and rising cost of documents and staff;
- v. Opening of new fields of scholarly interest and information scattering; and
- vi. Need for specialised manpower for the adoption of technological developments."

The libraries, therefore, have no option but resort to cooperative agreements and resource sharing. The librarians wishing to play an active role in chain must consider:

- i. Assisting the readers in receiving the necessary document/information and referring to a library where it is available;
- ii. Developing resource sharing methods that are inexpensive to the end user and are convenient and easy to approach.

With the advancement in information technology and its increased application in libraries, the communication process has become very fast. Application of electronic mail and use of Internet has significantly changed the scenario. The non-formal channels of publications have emerged. A great deal of nascent information among researchers is passed on from information generator to user by phone, e-mail and so on and this scholarly communication is termed as invisible college, where user and creator are in direct touch without any intermediary.

### **3.8 Information Technology**

The availability of library records in machine-readable form is the basic requirement for efficient resource sharing. We find the extensive application of information technology (IT) has revolutionised the conceptual framework of library services and has led to the process of resource sharing and networking among libraries a reality. It may be seen that out of five important technologies namely, information technology, biotechnology, space technology, nuclear technology and materials technology, which have influenced our life at work tremendously, the IT is

the one having potential to influence all other. There is no area, which has escaped the impact of this versatile technology. It holds true with the world of library and information dissemination.

IT is not a single identify. It is considered as an amalgamation of three technologies (i) Computer Technology, (ii) Data Communication Technology, and (iii) Document Reproduction Technology.

Prem Singh<sup>8</sup> lists out following problems posed by the process of information explosion in managing libraries with traditional methods:

- i. Problem of acquiring information;
- ii. Problems of organising information;
- iii. Problem of disseminating information;

a. Problems of providing reference services

i. Problems of information analysis and consolidation i.e. bibliographic services, document reproduction services etc., and Space problems"

He further elaborates "Libraries found the solution of the above problems in the application of the following technologies and techniques:

- i. Use of computing technology;
- ii. Use of data communication technology;
- iii. Use of document reproduction technology;
- iv. Use of compact discs; and
- v. Use of compact shelving."

It is discernible from the literature that the new ITs provide libraries with a new and fast set of alternatives for gathering, organising and using information. The advantages of using IT in libraries have been summarised below:

- i. Redundancy of dept. classification
- ii. Enhanced productivity
- iii. Enhanced efficiency
- iv. Provision of quality information services
- v. Provision of exhaustive information
- vi. Use of national and international databases through network

- vii. Use of compact disc - read only memory (CD-ROM/DVD-ROM) for faster access to information and saving of space."

### **3.9 Problems in modernisation and Adoption of IT**

It is seen that introduction of IT in libraries is not that simple. Numerous problems are encountered in the process. However, the application and adoption of information technologies help libraries to improve overall performance of library services with greater accuracy, speed and effectiveness, the modernisation of library and information services in India have not been attempted vigorously. Some of the problems in IT application are listed below:

- i. Lack of planning
- ii. Financial constraints
- iii. Choice of hardware and software
- iv. Special barriers
- v. Resistance to change
- vi. Retrospective conversion of records into machine-readable form
- vii. Lack of suitably trained manpower
- viii. Lack of resources and infrastructural facilities

In the changed environment with an onslaught of ever improving IT, the libraries are left with no option but to go in for these technologies. Emphasizing the need for adoption of IT, it is stated that "Failing to keep abreast of rapidly changing technology in products and processes is an obvious, excessive and potentially lethal cost: an equivalent of the cost of man conformance, which is the hidden burden bending the backs of libraries without modern quality management."

### **3.10 Resource Sharing Tools**

Resource sharing tools are the building blocks containing machine-readable records of various resources or documents available in the library. These tools facilitate information about the resources of libraries. Effective resource sharing can only be done if; appropriate resource sharing tools are available. The beginning of the creation of such tools may be traced with the preparation of catalogues of

libraries, subject bibliographies, the union list of periodical holdings etc. These records have changed from time to time from card catalogue and printed catalogue to the database, CD and online database forms, which are in machine-readable forms. The essential tools for effective resource sharing are briefly discussed herewith.

### **3.11 Databases**

According to Convey<sup>9</sup>, "databases are collections of records in the machine-readable form that are made available for searching from remote computer terminals. Exchange of information through electronic mail, online facility or a terminal is possible if a machine-readable database exists. In bibliographic databases, the bibliographic details of a document facilitating its identification, storage and retrieval are contained. The databases created by libraries or information centres of their holding are termed as an internal database. Online databases or CD-databases about one or more libraries are known as external databases. Machine-readable databases are essential for resource sharing. It means that the participating library must strive to develop a database of their collection in machine readable or electronic form.

### **3.12 Cooperative Collection Development**

Appropriate collection development is an essential step for developing efficient resource sharing tools. Creation of collection development policy and its implementation in the libraries of institutions having similar subject interests may be easier to practices. Lander<sup>10</sup> notes "the libraries are looking at the networks for help in order to reduce expenditure on material cost." Nevertheless, at the same time the participating libraries must strive to build up the core collection of documents, which are frequently used. The libraries should not depend on others for everything. Keeping in view the specialised needs of the researchers, it is essential to specialise collection of materials and technical reports. Kaul<sup>11</sup> observes, "It does not help to entirely depend upon electronic databases for resource sharing purposes" Also in order to avoid duplication, it is one of the important functions of a library network to help the participating libraries to check their lists of books to be ordered with the union catalogue of the network.



The experiences reveal that for effective pre-order verification the willingness and commitment of participating libraries to strictly follow provisions of collection development policy is an essential requirement. However, in the larger network, it may not be a feasible practice. It is observed "Developing Library Network (DELNET) libraries do not use union catalogue before ordering because resource sharing among libraries is limited to inter-library lending (ILL) facility only. In smaller and subject specific networks, it is advisable to have a collection development policy to be followed by participating libraries for developing rich and update a specialised collection.

### **3.13 Union Lists and Catalogues**

Union lists of the holding of periodicals and union catalogues of documents available in the participating libraries are important resource sharing tools. These can facilitate actual location and faster delivery of documents. The union catalogue of books created by DELNET is the example where participating library's data is merged in the existing database after checking the duplication.

The union catalogue may not be effective if the retrospective conversion of records of participating libraries is not completed using standard norms. Retrospective conversion of records becomes essential as a resource sharing tool. In fact, it is the backbone of the resource sharing tools. Conversion of old records into machine-readable form is of great concern, especially in developing countries. It involves handling of the tremendous amount of data and the problem becomes more complex in want of resources and suitably trained manpower. It is observed that most of the libraries in India are facing the problem of retrospective conversion of records due to resource and staff problem.

### **3.14 Online Public Access Catalogue (OPAC)**

The online public access catalogue (OPAC) of the individual participating libraries available through the internet is another important source indicating a location of documents from remote locations and non-participating libraries. This

also facilitates getting information about latest arrivals etc., which are usually not available through union catalogue.

The CD-ROM database provides a faster and more efficient means of end-user searching and works as an important resource sharing aid. A CD-ROM union catalogue can offer an offline access to the resources of a library network, which is convenient as well as inexpensive. It is going to further enhance and revolutionise the resources sharing process.

Digital libraries are now growing as the important tools for resource sharing. The establishment of digital libraries comprises of following major steps:

- i. Digitization of existing library materials
- ii. Their connectivity to the users worldwide
- iii. Integration with the networks
- iv. The availability on the World Wide Web (WWW)

The information transfer in digital form is very fast and less costly. This plays a significant role in reducing the time gap from access about information to delivery of information.

World Wide Web (WWW) is also a major tool for resource sharing. Huge information base is available through the internet. However, one has to evaluate and identify the right type of resources to make efficient use of the facility. It has been indicated through literature that owing to the enormous growth of WWW the virtual libraries will become a major source of information. They will have no physical presence and will be accessed from any location.

### **3.15 Resource Sharing Barriers**

Based on the experiences and problems faced in the implementation of resource sharing process, the idea of sharing has not been favoured by few to the desired extent. Several experts have identified these problems/barriers in a different context. It is said that the document delivery and availability of the information from libraries take considerable time whereas their library could have procured the same, but for resource sharing process. The reasons levelled for this dissatisfaction are goal

displacement, improper discretionary behaviour, insufficient education of library managers and conflicting views on the mission of libraries.

According to Woods<sup>12</sup> et al., there are four sources of resistance to resource sharing:

- i. Economic resources
- ii. Political decisions and neglect
- iii. Personal and professional concerns
- iv. Social and cultural pressures.

They are also of the opinion that in developing countries the basic structures for the library may not be available for many years. Bramin<sup>13</sup> lists out following obstacles to resource sharing efforts:

1. A desire for everything here and now
2. Changing priorities for collection development
3. Control of collection policies and priorities
4. Staff and faculty attitudes
5. Document delivery time
6. Lack of awareness among users about cooperation
7. Lack of needed support services
8. Lack of required administrative structure and support
9. Non-conducive political environment
10. Reluctance to yield autonomy
11. Lack of common language for analysis and description.

The resource sharing in libraries has been sufficiently attempted in the United States. Many a time's users are not satisfied. The major obstacles confronted by the user community may be summarised as under:

1. All academic libraries have the common materials for undergraduates and sharing of common materials is unintelligible
2. Documents dealing with the latest branch of knowledge are not reflected as subject catalogue does not provide entry under that subject term

3. Due to the backlog at the cataloguing stage the union catalogue of libraries do not include the information about the availability of documents even if the documents are in the holding of libraries.
4. The libraries do not address to the scholar's needs. The measures adopted for strengthening the subject collection disallow procurement of materials of interdisciplinary nature, which are found useful for research.
5. Since no library can collect all retrospective material on any given subject, the research needs of such scholars are not met within the specialised library and user may get the same in some other library.
6. The old and rare printed materials are never available through resource sharing.
7. The stringent rules of the libraries pertaining to admission and number of pages to be xeroxed are discouraging factors.
8. For the sake of preservation, the original materials are not made available, which results in rendering the material useless. Original documents are considered more significant in some instances.
9. The concept of the library without wall becomes meaningless because access to materials delayed or restricted is equivalent to access denied.

Out of several barriers hampering the resource share activities, some can be overcome and the impact of some other can be minimised. In practice, it is found that most of the barriers are just perceived and psychological. It is necessary to overcome the susceptibility of users and the librarians for the sake of improved information accessibility and other related benefits. However, the advancements in IT have been able to subjugate most of the perceived barriers and most of them have no meaningful impact. R.G. Prasher<sup>14</sup> lists the following barriers that hamper resource sharing:

1. Attitude of some of the librarians is conservative and are unwilling to part with the material for resource sharing or do not take up additional responsibilities
2. Restrictions, mainly local in lending the library materials to others

3. Due to limited resources, libraries may not participate in ILL
4. Lack of adequate funds can hamper resource sharing programme
5. Shortage of staff for handling ILL requests
6. Lack of reprographic facilities
7. Distances between the libraries and lack of proper communication system
8. Lack of awareness about the usefulness of resource sharing.

In addition, some of the other barriers that come up in the way leave resource sharing a concept at times. Prasher further refers to the following regulations that are important and need to be introduced for smooth resource sharing among participating libraries:

(a) Interlibrary Loan

1. Borrowing library will bear the expenditure
2. Books taken on loan are to be returned within the stipulated time
3. The books on loan should not be issued out by the borrowing library
4. The reader for whom the book has been borrowed should use it within the library
5. If necessary, the reproduction of any part of the document may be made permissible
6. Lending libraries may not loan rare materials
7. Request for a book which costs less than five rupees and is easily available for purchase should not be made
8. Borrowing library will be solely responsible for the safety of the document.

(b) Cooperative procurement of books and other documents, which could be economically desirable, does not happen.

(c) Cooperation for the centralised system for classification and cataloguing which would reduce duplication does not happen.

(d) Preparation of union catalogues could be done cooperatively for resource sharing.

(e) Cooperative storage could also be achieved if the institutions retained the weeded out books and journals at one place both for storage and reference.

(f) Non-cooperation in documentation work results in duplication in documentation work by the institutions specialising in the same subjects.

(g) The exchange of surplus/duplicate copies of journals and books can fill vital gaps in the libraries. Cooperation in this regard is very scanty and it can be promoted only if the management has liberal policies and the librarians make an extra effort to inform intended libraries about their surplus stocks.

(h) The exchange of experts in the library and information science field is becoming increasingly important as information technology is changing very fast.

All these aspects need to be examined thoroughly and corrective measures must be contemplated before embarking on the system. The concept of resource sharing has many benefits for the users and library managers as well. The judicious handling of its implementation pre-supposes consideration of the user's satisfaction and ease of working to the highest level and procedural and policy readjustments at various levels. Dougherty<sup>15</sup> rightly states "library resource sharing systems will have to conform to the spirit of the age if they are to be useful to the majority of information seekers."

### **3.16 Library Networks**

Library networks can be termed as the centres of resource sharing. The concept of resource sharing among libraries is not new. Taking clue from the experiences of the society and compulsions of interdependence in all spheres of man's journey of development, the libraries also resorted to networking and resource sharing for maximising the use of their resources and satisfying the growing users demand. There has been the tremendous growth of information and it becomes extremely difficult to acquire all published materials by a library even in its specialised subject field. The unchecked information generation, escalating the cost of materials, increasing the cost of processing of documents and database creation, decreasing budgets and advances in IT have stressed the need of network based cooperation.

There is a slight difference, that too of approaches, in resource sharing and networking. In a true sense, these are two sides of a coin attempting to strive for the same objective i.e. dissemination of right information to the right user with utmost

accuracy and speed. "As long as we operate with print on paper collections we need to share those collections. As we move increasingly into electronic based information, we can see technology and networks working together to reduce the physical movement of materials," clarifies Molholt <sup>16</sup>.

Networking enables to have access to the resources available even at distant places. When two or more than two libraries and their data get connected through communication links, the online exchange of data from one another starts and this is known as networking.

The meaning and scope of networks has been changing since its application in the 1970s. According to Markuson <sup>17</sup> "library network is a specialised type of library cooperation for centralised development of cooperative programmes and services, including use of computers and telecommunications and requiring the establishment of a central office and a staff to accomplish network programmes rather than merely to coordinate them. Programmes require significant funding and usually formal contracts are required between users and the network, which is, in most cases, a legally established corporate entity."

Raynard C. Swank defines library networks as a "Concept that includes the development of cooperative systems of libraries on geographical, subject, or other lines each with some kind of centre that not only coordinates the internal activities of the system but also serves as system's outlook to, and inlet from, the centres of other systems. The concept is also hierarchical..."

### **3.17 Objectives of the Library Networks**

The objectives of the library and information network are enumerated as under:

- To share the resources among libraries
- To share the cost
- To share efforts, expertise and technology
- To standardise input, output and processing of resources
- To undertake scientific research in information science and technology

- To offer technical guidance to member libraries on collecting, storing, sharing and dissemination of information
- To coordinate efforts for suitable collection development and to reduce unnecessary duplication
- To maintain bibliographic database of books and non-books material
- To process and maintain electronic and mechanical equipment for speedy communication of information and delivery of electronic mail
- To coordinate with other regional, national and international networks and libraries for the exchange of documents and information through online, email and Internet.

Shared cataloguing, online reference, shared circulation and online transmission of information are some of the services provided by networks."

### **3.18 Types of Library Networks**

The main objective of library networks is to facilitate efficient and effective use of resources, to avoid unnecessary wastage of scarce resources. Different types/ models of networks came into being to achieve higher user satisfaction without involving extra costs on materials. The following are some of the models

#### **(i) Collection centred Cooperative Networks**

These networks mainly concentrate on collection development process based on the present and anticipated future needs of the users. The sharing of collection could be done through a memorandum of understanding between the participating libraries providing better access to resources to the users. The Triangle Research Library Network in North Carolina (USA) is an important example of this type.

#### **(ii) Client centred Cooperative Networks**

In this case, one library is used as a centre resource and other libraries participate in the network.

#### **(iii) Resource sharing Network**

In this type, participating libraries pay attention to developing core collections. Other materials are not duplicated.



#### **(iv) Multi-type Library Network**

This is a consortium of all the libraries in a geographical area, which is generally small. According to McClarren<sup>18</sup>, multi-type is an inter-library activity involving two or more types of libraries (i.e. academic, public, school and special); ..." Hamilton and Earnst<sup>19</sup> mention it as "a means of mobilising total library resources to meet the needs of the users without regard to the type of library involved and without classifying user as a public, school, academic or special library patron. The goal is to help all library users make more effective use of all library resources and services to education, work and recreational needs." DELNET (India) is the upcoming example under this type.

### **3.19 Evolution of Library and Information Networks**

The Online Computer Library centre (OCLC) became de facto national network in the 1970s and international network in 1990s. It has grown from 54 libraries in 1971 to 26540 libraries in March 1998. It is stated "It has 30 million bibliographic records with 520 million holding locations in its union catalogue. The database increases at the rate of 400,000 records every month. The other important library networks include Research Libraries Information Network (RLIN) established in 1978 and Panhandle Library Access Network Inc. (PLAN) established in 1992 as multi-type library consortium. PLAN provides retrospective service, Internet access and creates databases of monographs and serials to mount on a CD-ROM tower.

Joint Academic Network (JANET, UK is a single national network of United Kingdom linking its universities and government research laboratories. JANET came into being in 1984 with merging of Science and Engineering Research Council Network and another research network. JANET-2 was started offering linkage to over 100 sites and connection to over half a million potential users. Smith<sup>20</sup> states "the basic approach of JANET has been a 'breadth first' approach with a usable service to as many as possible and then enhance with additional services." In addition to JANET-2, a new broadband network as Super JANET was proposed in 1989. The Super JANET pilot project was conducted in 1993 for providing electronic document delivery to the libraries. It has a major programme known as eLib consisting of Electronic document delivery; Electronic journals; on demand

publishing; Training and awareness; Access to network resources; and Digitisation project.

### **3.20 Development of Library Networks in India**

The process of automation and modernization of libraries and establishment of library networks has been very slow up to 1980s. However, Sinha Committee Report (1959), Ranganathan Committee Report to UGC (1965), Kothari Commission of Education (1964-66) etc. have emphasised the important role of libraries and advocated for cooperation among libraries. The creation of National Union Catalogue of serials by the Indian National Scientific Documentation Centre under the guidance of Dr. S.R. Ranganathan in the 1960s can be termed as the trendsetter of resource sharing activities in India, as it solved a major hurdle of the lack of location tools of resources to be shared.

The organised efforts in the direction of development of library networks have been started in the mid-1980s. In July 1984, the working group of the Planning Commission recommended to the Government about the need for modernisation of library services and informatics during the Seventh Five Year Plan of 1985-1990<sup>21</sup>.

The Committee for the National Policy on University Libraries, while mentioning the objectives for university library, recommends "Networking and resource sharing among university libraries should be practised by each institution towards utilisation of all resources and to introduce, if necessary, technological innovations like computer/word processing etc. to facilitate users getting prompt services..."

Serge has been noticed in the development of library networks in India from the year 1986. A number of metropolitan library networks were initiated mostly with the motivation and support provided by the National Information System for Science and Technology (NISSAT). The University Grants Commission (UGC) also established a nationwide library network - the Information and Library Network (INFLIBNET). A brief account about some of the important Indian networks is given herewith.

### **3.21 Developing Library Network (DELNET)**

The erstwhile Delhi Library Network has been renamed as Developing Library Network during the year 2000 with the same acronym. DELNET is the first operational library network in India. It was started as a project in January 1988 and registered as a society in 1992. NISSAT arranged the feasibility study of DELNET and provided technical financial assistance for the network up to 1992. Presently the National Informatics Centre and India International Centre are promoting it.

DELNET<sup>23</sup> has a membership of 200 libraries in 20 states in India and five countries outside India. Recently the All India Council for Technical Education (AICTE) has signed MOU with DELNET with an aim to modernisation and networking of libraries of AICTE approved technical institutions/University Department running technical courses. With this agreement, the membership will increase further. DELNET offers its services now to more than 255 institutions in 23 states in India and five countries outside India. These services include access to following databases

1. An online union catalogue of books available in its member libraries in Common Communication Format (CCF). It has 1,00,000 records with locations.
2. DELNET is now promoting database creation of books with its member libraries in MARC format. It has about 75,000 records with locations.
3. It has developed union list of current periodicals having details of 17,000 periodicals of all subjects with locations.
4. Has developed union catalogue of periodicals with full holding data and has 16,000 records.
5. Contains database of more than 2, 00,000 periodical articles on a variety of subjects.
6. Union list of CD-ROM database has 1200 records with locations.
7. The database of the union list of video recording has 2300 records with locations.
8. Union list of sound recordings contain records of about 700 audiocassettes with locations.

9. A database of Urdu manuscripts has a list of 210 manuscripts available in Delhi Libraries with locations.
10. The database of theses and dissertations contains about 15,587 records with locations.
11. A database of Indian specialist is available online to member libraries with profiles of 2000 scholars.
12. The development Information Network for South Asia (DEVINSA) database has 20,000 records of periodical articles, books and unpublished material with abstracts.
13. 75,000 MARC records with locations are available in the database in English, Tamil and Telugu.
14. DELNET offers the link to Oxford English Dictionary online, GISTNIC databases, U.S. Patents, Index to Hindu, MEDLARS and other databases of National Library of Medicine, Washington and Library of Congress catalogues.
15. Document delivery service is provided to the member libraries on request.
16. DELNET provides soft wares to the member libraries for database creation either free or at reduced price.

It is to note, "DELNET has emerged as the first operational cooperative network incorporating all the disciplines - Science and technology, social sciences and humanities in its ambit." In view of this, it may be termed as first multi-type library network in Asian sub-continent.

### **3.22 Information and Library Network (INFLIBNET)**

INFLIBNET was established as a network of university and college libraries in 1988. It began its operation in 1989 and has provided financial assistance to a large number of university libraries in India. "INFLIBNET will include participants from colleges, universities, research and development institutes, institutes of higher learning, information centres, institutes of national importance and document resource centres. All the disciplines such as science, technology and medicine, agriculture, fine arts, humanities, social sciences etc. are to be covered under INFLIBNET.<sup>24</sup>"

### 3.23 Objectives of INFLIBNET

The objectives of INFLIBNET are summarised as follows

- To evolve a national network, interconnecting various libraries and information centres in universities, deemed to be universities, colleges, UGC information centres, institutions of national importance and R and D institutions, etc. in the country for efficient sharing of information resources available with them and to improve capability of information handling and services.
- To provide reliable access to document collection of libraries by creating online union catalogue of monographs, serials and non-book materials (manuscripts, audiovisuals, computer media, etc.) in various libraries in India.
- To provide better access to worldwide bibliographic information sources with citations and abstracts, such as periodical articles, conference papers, preprints, technical reports, standards and specifications, patents, monographs, etc. through indigenously created databases and by establishing gateways for online accessing of international databases held by international information networks and centres.
- To provide document delivery service by establishing resource centres on libraries having the rich collection of documents.
- To optimise information resource utilisation through shared cataloguing, interlibrary loan service, catalogue production, collection development and avoiding duplication in acquisition to the extent possible.
- To implement computerisation of operations and services in the libraries and information centres of the country, following a uniform standard.
- To facilitate academic communication amongst scientists, engineers, researchers, social scientists, faculties and students, through electronic mail, Internet, bulletin board, file transfer, audio/video conferencing, etc.
- To enable the users dispersed, all over the country, irrespective of location and distance, to have access to information regarding books, monographs,

serials and non-book materials by locating the sources where from available and to obtain it through the facilities of new communication technologies.

- To create the database of projects, institutions and specialists for providing online information service.
- To encourage cooperation among libraries, documentation centres and information centres in the country, so that the resources can be pooled for the benefit of helping the weaker resource centres by stronger ones.
- To train and develop human resources in the field of computerised library operations and networking to successfully participate in the establishment and regular operation of INFLIBNET.
- To evolve standards and uniform guidelines in techniques, methods, procedures, and hardware and software services and so on and to promote adoption in actual practice by all the libraries, in order to facilitate pooling, sharing and exchanging resources and facilities towards optimization.

### **3.24 Achievements of INFLIBNET**

- Creation of the union catalogue of serials database consisting of 30,000 records from more than 60 universities. It consists of more than 8000 unique serial titles.
- The development of the database of doctoral theses and dissertations submitted to various universities. More than 1.6 lakhs records are currently added to this database.
- As of now, over 7 lakhs records are available. More than 10 lakhs records received from the participating universities are under process.
- The creation of current serial database was started in 1998. It has now 10,000 unique titles having more than 26,000 holdings.
- A database of research projects undertaken by organisations and departments has over 3000 records. About 1000 records are under process.
- Creation of new database giving details of secondary (abstracting/indexing/serials and bibliographical databases in CD-ROM subscribed by more than 110 universities, has been taken up.
- The database of experts in different areas has over 6500 records and is growing steadily.

- It has developed a software - namely SOUL - Software for University Libraries for providing to participating libraries for database creation.
- Organising training to professional staff of participating libraries under manpower development programme.
- Provided financial support of Rs.6.5 lakhs each to 123 university libraries for infrastructure, automation and networking. Another Rs.1.0 lakh has been made available to each of these libraries to develop core facilities.
- Subscribing to OCLC's first search service providing support to member libraries through more than 80 bibliographic databases and a large number of full-text journals available at OCLC.

In addition to the aforesaid databases, the INFLIBNET has launched providing Bibliographic Information Service from the databases namely - Dissertation abstracts - humanities and social sciences, Econo-lift - economic literature, EMBASE Drugs and Pharmacology, ERIC - Education and research centre, Inside information, CD, LISA - Library & Information Science Abstracts, NUCSSI - National Union Catalogue of Scientific Serials, Psyclit - Psychological literature, SSCI - Social Science Citation Index and Ulrich's on disc - Abstracts. It has also started Contents of Periodicals in Science and Technology (COAST) service and document delivery service against subscription and payment basis respectively.

INFLIBNET Review Committee Report mentions that "the quality of database prepared at some of the university libraries is very poor and, therefore, needs improvement."

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# Chapter 4

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*BTISNet Centres*

#### **4.1 Biotechnology Information System Network (BTISNet)**

Recognising the importance of information technology for pursuing advanced research in modern biotechnology, a bioinformatics programme, envisaged as a distributed database and network organisation launched during 1986-87.

The programme has become a very popular vehicle for transfer and exchange of information, scientific knowledge and technology packages in the country involving 10-12 thousand scientific personnel. 6 Centres of Excellence, 11 Distributed Information Centres and an Apex Centre at the Department of Biotechnology, 51 Sub-Distributed Information Centres and 98 Bioinformatics Infrastructure Facilities located in Universities and Research Institutes of national importance, are fully engaged in this task. Six national facilities have been set up for interactive graphics based molecular modelling and other bio-computational needs. Five long term courses at the level of post-M.Sc. Diploma in Bioinformatics, at S.P. Pune University (SP.PU), Jawaharlal Nehru University (JNU), Calcutta University (CU), Pondicherry University (PU) and Madurai Kamaraj University (MKU), are fulfilling the long unresolved need for trained human resources in this interdisciplinary area.

The computer communication network, linking all the bioinformatics centres, is playing a crucial role in the success of the bioinformatics programme. Database development, R&D activities in bioinformatics, human resource development and a variety of services in support of biotechnology R&D programmes and projects, has made this programme very popular and useful to the scientific community. With an excellent cooperation received from various agencies of the Government of India, in particular, the National Informatics Centre (NIC), who provided the communication support, initially for E-mail and subsequently for full Internet access.

The contributions made by the scientists and academicians at the University departments of the UGC, and national laboratories and institutions of the CSIR and ICAR, in which our bioinformatics centres are located, have resulted in excellent capacity building for use of a variety of information resources on the Internet. More than 100 databases dealing with different aspects and of relevance to R&D efforts in biotechnology are now available on the network. A national node of EMBnet has

been established at the Centre of DNA Fingerprinting and Diagnostics (CDFD), Hyderabad.

Four mirror sites for mirroring important biological databases have established at IISc, JNU, Pune University, and IMTECH to promote and support R&D activities in Genomics and Proteomics, the two emerging fields of biotechnology requiring critical support of genomic databases. With these resources now available on the BTISNet, it has now become a single largest information resource for all references to biotechnology-related literature, scientific data, patent information, policy matters and related issues. Several Home Pages have hosted on the Internet to give details of the services are provided to the scientific community.

#### **4.2 Human Resource Development**

Bioinformatics is an emerging interdisciplinary area of science and technology encompassing systematic development and application of IT solutions to handle biological research problems. The area requires the highly trained human resource to deal molecular biology issues with the application of computer and software tools. The present crisis is non-availability of sufficient manpower for teaching as well as for perusing R&D activities in bioinformatics in combination with Experimental Biology. The department had realised this problem and, therefore, had introduced several long-term and short-term educational activities to address this gap. The details are as follows.

#### **4.3 M.Sc. and M. Tech. Course in Bioinformatics**

Five Universities namely 1) JNU, 2) S.P. Pune University, 3) Calcutta University, 4) Pondicherry University, and 5) MKU were running a one-year advanced post graduate diploma courses in Bioinformatics. 100 candidates are produced per annum through these courses. The first two universities mentioned above namely JNU and the University of Pune have upgraded their diploma courses as Postgraduate courses namely M.Tech. Computational and systematic biology and M.Sc. in Bioinformatics respectively, during the year. The MKU and Pondicherry University along with Anna University have also proposed to start M.Sc in Bioinformatics on consortium basis to share the faculties and resources through video Conferencing and virtual classroom approaches from this academic session.

#### **4.4 Ph.D. Programmes in Bioinformatics**

The COEs of BTISNet including the supercomputing facility at IIT, Delhi are running Ph.D. programmes in Bioinformatics as the demand is very high for the high-end human resource in Bioinformatics & Computational Biology.

#### **4.5 Short Term Training Programmes**

In order to provide exposure and hands-on experience for the researchers, faculties, and students about Bioinformatics tools and resources and to encourage them to use these for speeding up of their R&D activities, the BTISNet centres have organized 130 short-term training programs and over 2000 researchers have trained during this year.

#### **4.6 Bioinformatics National Certification (BINC) Examinations**

India has made major steps in Biotechnology and Bioinformatics. The industry growth in these areas is remarkable. The growth can be better if India is able to create high-quality human resources and provide industry relevant training. Last few years several private institutions and universities have started Bioinformatics courses and training programmes at various levels.

Therefore, DBT has decided to conduct national level Bioinformatics Certificate Exam (BINC) to identify quality bioinformaticians. The task is assigned to Bioinformatics Centre, S.P. Pune University. A National Coordination Committee under the Chairmanship of Prof. Ashok Kolaskar was formed with the experts from Jawaharlal Nehru University(JNU), Madurai Kamaraj University(MKU), Anna University(AU), Pondicherry University(PU), Indian Institute of Science(IISC), Bose Institute, and Department of Biotechnology, University of Pune, etc.

The Examination designed in three parts. The first part of the exam was fundamentals through objective type question paper, a second part was to test the knowledge of Bioinformatics through short answers and a third part was practical on the computers. The syllabus was designed by the experts and kept on the web at least four months advance with a model question paper. These examinations have conducted at Pune, Delhi, Bangalore, Chennai and Kolkata. Department of

Biotechnology (DBT) provided Ph.D. fellowships to all eligible BINC qualified students.

#### **4.7 Centres of Excellence (COEs)**

BTISNet comprises of Seven Centres of Excellence (COEs) in Bioinformatics.

#### **4.8 Apex Bioinformatics Centre, DBT, New Delhi**

The Biotechnology Information Centre (BTIC), the Apex Centre, established at the Department of Biotechnology(DBT), is coordinating the entire network activities, including hosting of a Home Page on the activities of the Department of Biotechnology and its major programmes, as well as maintaining several directories and databases on the research projects funded by this department. A Biotechnology Patent facilitating Cell has recently been established which uses the facilities of the BTIC to provide full-scale patent search services.

#### **4.9 SavitribaiPhule Pune University, Pune**

The Bioinformatics centre (DIC) at the SavitribaiPhule Pune University, Pune provides an up-to-date information in the area of Biotechnology with emphasis on Virology, protein and nucleic acid sequences, structures, Microbial strain data and also an access to the other related areas through networks. Apart from answering the bibliographic queries and supplying the sequence data, the centre also offers unique facilities for data analysis. The hardware, software and the expertise available at this centre. The centre is equipped with state-of-art services and facilitates in computing facilities as well as the separate library.

#### **4.10 Madurai Kamaraj University (MKU), Madurai**

Bioinformatics Centre at the SavitribaiPhule Pune University has designed, coordinated and conducted BINC examinations on behalf of Department of Biotechnology (DBT), Govt of India during 2005-2010. The centre also served as a nodal agency to manage BINC fellowship programme.

The centre have established as a Distributed Information Centre (DIC) in 1986. The National High-Resolution Graphics Facility started to cater the need of structural biologist and molecular modellers from 1993. Since 1996, the centre started its extensive manpower development activities with the initiation of the one-year Advanced Diploma Course in Bioinformatics. MSc Computational Biology has started as an up gradation of the Advanced Diploma Course and as a network programme with Anna University and Pondicherry University. The Centre has been focusing its attention mainly on development of research and manpower as well as providing services in the areas of structural Bioinformatics, proteomics, database development, data mining and molecular modelling, dynamics and computer aided drug designing. The Centre has an acclaimed reputation for service, teaching and research in the area of Bioinformatics.

Structural Bioinformatics of membrane proteins, Structural Genomics of prophage proteins; and Structural Genomics of Mycobacterium tuberculosis. Structural biology of microbial stress response pathways, Large-scale Sequence Analysis, Molecular Modelling, Molecular Docking, Molecular Dynamics, and In silico Drug designing.

#### **4.11 Indian Institute of Science, Bangalore**

The Centre has recognised as a Centre of Excellence in structural Biology and Biocomputing by the Department of Biotechnology, Government of India. The Centre created in 1985 was one of the earliest in the country to establish information dissemination and formal teaching in bioinformatics. In tune with the evolving nature of this discipline, there has been a paradigm shift in the focus of the Centre's activities, directing the activities towards research and development from that of information dissemination as a primary objective. At present, the centre hosts several important research programmes in the broad areas of structural biology and bioinformatics, genome analysis and systems biology.

Modelling and dynamics of protein-ligand interactions, protein folding by graph theoretical methods, Protein Function Prediction, Drug-DNA interactions, Creation of Value-added databases and Software Engineering.

#### **4.12 Bose Institute, Kolkatta**

The Bioinformatics Centre of Bose Institute established in 1988 as one of the ten nodal centres under the programme, BTIS of the Department of Biotechnology. It has recognized in 2004 as a “Centre of Excellence” in Bioinformatics to undertake research in the following areas: modelling of proteins structures; molecular interaction and docking; drug design; chromosomal dynamics; stress biology of plants; functional genomics and host-pathogen interactions. The computational infrastructure developed at the Centre has provided the impetus for thriving research activities in bioinformatics and computational biology, as can be seen from a large number of publications made over the years and its recognition as the Centre of Excellence in Bioinformatics by DBT in 2004 and various national awards received by the staff and students working at the Centre.

#### **4.13 Super Computing Facility (SCFBio) IIT, New Delhi**

To develop new scientific methods and highly efficient algorithms, using combining principles of Chemistry, and Biology with Information Technology for Genome analysis, and Protein structure prediction. Target-directed Drug Design pursuing the dream of delivering GENOME to DRUG to the society. The facility is committed to provide free access of its bioinformatics and computational biology tools to the global user community. SCFBio provides free supercomputing access to scientific community and students across the globe.

The Supercomputing Facility at IIT Delhi is committed towards the scientific community in providing state of the art high-performance computing environment along with necessary tools to explore the new frontiers in Bioinformatics and Computational biology. The resources and facilities provided by SCFBio geared to cater for specific scientific research work in life science area.

Research student can create an account in our Supercomputer and run computationally intensive programmes in our Supercomputer. To get an account on the SCFBio Supercomputer the user has to fill a form abiding with the terms and conditions mentioned therein.



#### **4.14 Jawharlal Nehru University (JNU) New Delhi**

School of Computational and Integrative Sciences (SC&IS) presently consists of three centers, namely, Centre for Computational Biology and Bioinformatics (CCBB), High Performance Computing Center (HPCF) and Centre for Complex Systems Study. At present ten faculty members are working in our school. Taking note of this trend BIC-JNU was renamed its centre as Centre for Computational Biology and Bioinformatics (CCBB).

Our main objective of human resource development activities and research in emergent areas of computational biology has taken an outline and recognition within the country. We are also making concrete effort in inter-institutional collaboration in research projects. To keep pace with the development in the field, motivation is given to set up the necessary infrastructure and resources for the academic community.

We have Ph.D. in Bioinformatics successfully as well running specialised project in Bioinformatics. In our centre so many universities students are doing postgraduate projects with help of faculty members.

#### **4.15 Distributed Information Centres (DICs)**

DICs established with the task of providing discipline-oriented information to all institutions belonging to the branch as well as other institutions and individual users interested in the particular subject related to Biotechnology.

#### **4.16 Anna University, Chennai**

The Distributed Information Centre, Centre for Biotechnology, Anna University has good infrastructure facility with Dell Power Edge R610 Cluster an Apple cluster for parallel computing, Dell, HCL and IBM PCs. Three Credit courses in Bioinformatics and Computational Biology are an offer to the Undergraduate and Postgraduate students of the University. In the past five years, published several papers in good impact international journals. We have also developed online tools and servers. Currently, we have 7 Ph.D. students and 3 M.S. by research students working in Computational Biology.

Major research areas of the centre include Molecular dynamics; Cluster computing, Enzyme structure-function studies, Protein-Protein interactions, Comparative Genomics and Systems Biology.

The centre is one of the sub-distributed information centres (Sub-DICs) set up by the Department of Biotechnology, Government of India. The Sub-DICs has Pentium Servers with nodes. This is meant for providing information service to users in the city as well as to train students in Bioinformatics. The centre has software on Bioprocess modelling, Symbolic Manipulation, Molecular modelling, MATLAB. It also provides Internet facility to students. It is connected via fibre optic cable to the Campus network.

Centre for Biotechnology, Anna University has started Technology Business Incubator with the support of Department of Science and Technology (DST).

#### **4.17 Centre for Cellular and Molecular Biology (CCMB), Hyderabad**

The Bioinformatics Centre at CCMB started in 1986. The principal objective is to serve as a part of a national network providing biological information with a stress on Oncogenes, epigenetics, DNA and protein sequence and structure analyses. The Centre has attempted to achieve its objectives in a variety of ways. The Centre is equipped with a high-performance computing server, a good internet connection and several PCs. Silicon graphics workstation with Insight software provides high-speed high-resolution graphics facility to the scientists. CCMB is one of the Centres under the National Facility for High-Resolution Graphics and Molecular Modelling.

Major research activities will include following areas Genome organisation and epigenetic regulation and Theoretical studies of biological systems.

#### **4.18 Indian Agricultural Research Institute, New Delhi**

Bioinformatics Centre at IARI, New Delhi was established in 1989 under Biotechnology Information System (BTISNet) Network to function as a computerized information base in fields related to Agricultural Biotechnology in particular and fields allied to agriculture in general. Since its inception, the Centre has provided various services, such as online and offline bibliographic search through network and CDROM server, email, internet, creation and updating of

database, statistical analysis of research data, protein sequence analysis, training programmes, workshops on bioinformatics and current awareness services etc., to the researchers, students and farmers.

A number of Bioinformatics tools developed at the centre as well as a number of databases along with information retrieval system are functional at the centre. While initiating the work on e-agro-advisory in 2007, the Centre has released the quarterly News Letter entitled “Agro-Bioinformatics” that was widely circulated to various Institutes as well as Universities and all visiting dignitaries since 2008. During the year under report, the academic council of this institute approves M.Sc programme in Bioinformatics.

The web-based application ‘Wheat Informatics’ has been developed which enables the target user to retrieve general, scientific, bioinformatics and other information (such as R & D institutes, landmark publications) about wheat. This application is user’s friendly and will help the students, researchers and even the farmers to know complete detail related to wheat.

CeRA (Consortium for e-Resources in Agriculture) established under the NAIP for providing online access to e-journals and resources in over 120 ICAR institutes. We provide various journals related to Biotechnology and Bioinformatics to DICs /Sub DICs under ICAR.

#### **4.19 Kerala Agricultural University, Thrissur**

The Centre which started as a Sub-DIC in 1995 upgraded to DIC during 2004 with the objective to support Plant Biotechnology research. It provides services to promote biotechnological research and development in the specialised areas of Agriculture. The Centre is involved in research across a wide range of Bioinformatics disciplines, including gene & protein sequence analysis, protein structure prediction and interaction studies, plant-pathogen interaction studies and exploitation of active compounds of medicinal plants.

The Centre offer courses in Bioinformatics to post graduate Plant Biotechnology students conduct training programmes in Bioinformatics and

maintain various databases relevant to agriculture. Resources available at the centre are efficiently utilised by students, researchers and teachers of the University.

Antidiabetic and Anticancer Medicinal Plants Database (DIACAN) developed at this centre are unique in providing a comprehensive platform for antidiabetic/anticancer medicinal plants, taxonomical hierarchy, phytoconstituents, and medicinal properties obtained through literature mining.

#### **4.20 M.S. University of Baroda, Baroda**

The Department of Microbiology and Biotechnology Centre offers a two-year Post Graduate programme leading to the Master of Science (M.Sc.) in Biotechnology. Admission to this course is through an All India level Common Entrance Test conducted by JNU, New Delhi. Graduate students in this programme begin with fundamental courses in Biochemistry, Genetics, and Molecular Biology and then proceed to a thorough study of their selected area of specialisation.

The centre has strong base in Microbial Technology and the main features of the programme are Genetics, Molecular Biology, Industrial Microbiology, Biophysics, Bioinformatics, and Immunology

Major achievement - CastorDB - is a comprehensive resource providing vital information about the genome of Castor bean plant.

#### **4.21 National Brain Research Centre (NBRC), Manesar**

National Brain Research Centre is the only institute in India dedicated to neuroscience research and education. Scientists and students of NBRC come from diverse academic backgrounds, including biological, computational, mathematical, physical, engineering and medical sciences and use multidisciplinary approaches to understand the brain. Located in the foothills of the Aravali range in Manesar, Haryana, NBRC is an autonomous institute funded by the Department of Biotechnology, Government of India and is a Deemed University.

Neural Information Processing is the research focus at NBRC. It involves analysis and modelling of neural data acquired during electrophysiological recordings, speech recordings, MRI scans functional neuroimaging paradigms.

NBRC carries out research and training in this area in a focused and dedicated manner.

New techniques of image acquisition and image analysis for more efficient application of diagnostic and therapeutic neuroimaging methodology is developed by Prof. Prasun Roy's laboratory. The Speech and Language Laboratory (SALLY) uses behaviour and functional imaging paradigms to study how different areas of the brain network together to read different scripts like Devanagari and English.

#### **4.22 National Institute of Immunology (NII), New Delhi**

Bioinformatics Centre (BIC) at NII is engaged in advanced research in the area of computational and structural biology. The utility of the facilities provided by the centre reflected in usage of bioinformatics resources in the large number of publications from various research groups at NII.

The research interests of the various research groups at NII coalesce in six major areas; Chemical Biology, Genetics & Cell Signalling, Immunity & Infection, Molecular & Cell Biology, Reproduction & Development, and Structural & Computational Biology.

#### **4.23 North-Eastern Hill University, Nehru Campus, Shillong**

The DIC at North-Eastern Hill University started functioning from November 1999. In the past seven years, more than ten thousand users of the region have used the Centre's facilities and services. National training, refresher courses and regular in-house training for researchers.

The Centre also gives access to subscribed Biotechnology Abstracts and Reference Update to users and to email on request. The Internet access, recently upgraded to Leased Line, scanning, and printing has greatly benefitted the researchers and students who otherwise have very limited access to such services and facilities.

The Centre has compiled data in HTML format on CD for the "Helminth Parasite Spectrum in Northeast India" submitted to DBT for copyright and

publishing, "Traditional Fermented Foods and Beverages of the Sikkim Himalayas"; "Medicinal Plants of Meghalaya" and "Mosquito Fauna of Northeast India with Special Reference to Medically Important Vectors". Another focal point of the activity is a development of software on Visual basic for information on classification and taxonomy of plants.

The Centre is part of the National Bioinformatics Network and functions as an information base in various areas of Biosciences and Biodiversity for the entire north-east ever since its inception.

The Nodal centre of North East Bioinformatics Network (NEBInet). The BIC at NEHU serves as a nodal centre for the newly constituted NEBInet by DBT, GOI comprising 3 Sub-DIC's and 26 Bioinformatics Facilities through Biology teaching (BIF-BTBI) Centre's since 2008 spanning 8 states of North-East.

Nodal centre for operating DBT-sponsored Online Access Facility of Library Resources (OAFLR) for 36 Secondary and Senior Secondary Schools in the North Eastern States of India through 8 BIF-BTBI Coordinators. Identified as one of the 18 nodal Centres in North-East Region to operate and monitor the DBT e-Library Consortium (DeLCON) facility (that comprises a total of 917 selective Journals and a Database (SCOPUS) for NEHU).

Bioinformatics National Certification Examination Exam Centre (BINC) BIC, NEHU as one of the seven Examination Centres for conducting BINC Exam Identified for the first phase of Bio-Resource Information Centre (BRICs) and portal development under Indian Biodiversity Information Network (IBIN), DBT, Govt. of India. Dissertation Training Students pursuing post-graduation in any branch of biosciences are trained in Bioinformatics for a period of 3-6 months towards their dissertation work as a partial fulfilment of their M.Sc. degree.

#### **4.24 Pondicherry University, Pondicherry**

The Centre for Bioinformatics in Pondicherry University was started as Sub Distributed Information Centre of the Department of Biotechnology, Govt. of India (DBT) in 1991. The mandate of the Centre is to train manpower and conduct research in various areas of Bioinformatics and Computational Biology. Recognising

the progress made by the Centre, DBT upgraded the Centre to a full Centre level in 2002, several new positions were sanctioned, and additional funding was allocated.

The Centre has identified as a Centre of Excellence for Research and Training in the field of Bioinformatics by the Department of Information Technology, Govt. of India, New Delhi from 2007 to 2013. The Centre has taken up several research projects and offered modular courses in Bioinformatics under this Grant.

The Centre has started an innovative M.Sc. Programme in Computational Biology fully funded by DBT in a network mode with Madurai Kamaraj University, Madurai and Anna University, Chennai in 2010. This programme is first of its kind in the country and upgraded to M.Tech programme in Computational Biology from 2014 in collaboration with Anna University, Chennai. The Centre has also signed a MoU with Institute of Bioinformatics (IOB), Bangalore and University of Sienna, Italy for collaborative research and Ph.D. guidance.

#### **4.25 University of Calcutta, Calcutta**

The Bioinformatics Centre of the University of Calcutta was established in 1993 as one of the Sub-DICs under the BTIS programme of the Department of Biotechnology, Government of India. It was recognised as full DIC in 2003. The Center started One Year advanced Diploma Course in Bioinformatics since 1999-2000. The Centre with the Department of Biophysics, Molecular Biology & Bioinformatics currently runs One-year diploma course and two years M.Sc. Course in Bioinformatics and Biophysics. The major thrust of the centre is Human resource generation through the courses. It offers and to do research in the area of structural bioinformatics and systems biology.

Study conformational consequences of post-transcriptional modifications of RNA bases and their role in t-RNA structure and function. To apply string-variable grammar and push-down automata to identify important features imprinted in the biological sequences

#### **4.26 Distributed Information Sub-Centres (SubDICs)**

A large number of R&D institutions and universities now form the chain of distributed Sub-Centres set up in geographic locations affiliated to each Distributed Information Centre in their respective area. While the Distributed Information Centres act as the repository of information in their respective specialised disciplines, the Distributed Information Sub-Centres provide an access mechanism for the information to be available at the universities, R&D and manufacturing institutions. Thus, the distributed Sub-Centres provide an added dimension of access and diffusion of information across the network.

#### **4.27 Aligarh Muslim University, Aligarh**

The Distributed Information Sub-Centre was established by the DBT, New Delhi at Aligarh Muslim University, Aligarh in the academic session 1988- 89. The main function of the Centre is to act as a member of Bioinformatics Network System for providing information to the interested users on topics pertaining to the relevant areas of Biotechnology specially protein folding and design, protein structure and protein engineering. Centre is contributing significantly for the manpower development by organising workshops and courses in the field of bioinformatics. Since its inception, the Centre has organised 17 national level bioinformatics workshops and trained more than 400 participants from different universities and institutions. Centre is regularly organising seminar lecture for the benefit of students, researchers and scientists working the area of biotechnology or in the areas related to biotechnology. Recently a dedicated 512 kbps BSNL leased line and a 2 Mbps broadband connection is functioning satisfactorily in providing online literature search etc.

Centre has been concentrating on research in various aspects of protein biotechnology and efforts continue in this direction, in addition to those in immunology and molecular biology.



#### **4.28 All India Institute of Medical Sciences, New Delhi**

Biotechnology has emerged as a major force not only in industrial terms but also as a discipline wherein frontier areas of biology integrated to enhance the quality of human life. The developments of immunology and molecular biology have been integrated with modern virology, microbiology and fermentation technology to yield rich dividends in the form of medical products such as insulin. In addition, the newer therapeutics visualised to be genetically engineered cytokines such as interferons and interleukins.

These global developments need to be understood and harnessed by the medical personnel in India at all the levels viz. undergraduate, postgraduate students, teachers and clinicians. With these objectives, Department of Biotechnology the first department of Medical Biotechnology in the country established at the All India Institute of Medical Sciences in 1986 for teaching and research in the areas of Medical Biotechnology.

BTISNet provided support for three major activities of our department namely (i) Teaching: The bioinformatics module for M.Tech in Biotechnology students was restructured as a 5.5 credit point Theory and 4.0 credit point Practical course (ii) Research: Active research was carried out in the field of infectious diseases including malaria & tuberculosis, cancer and cardiac diseases culminating in (iii) Publications, diagnostics and patents.

#### **4.29 Advanced Centre for Treatment Research and Education In Cancer, (ACTREC), Mumbai**

The Department of Biotechnology (DBT), Government of India, funded to establish the Biotechnology Information Service (BTISNet)/Bioinformatics Centre at the Cancer Research Institute in 1989. TMC-ACTREC has also provided necessary inputs as and when required for gradual maturation of the facility. In addition to the expansion of the institutional infrastructure, increasing the number of users for full use of a facility.

Apart from the institute sponsored VSNL provided internet leased line, DBT continued funding of a wireless leased line from 'Tulip' for 250 Kbps port and this has resulted in almost zero downtime internet availability at the ACTREC.

BTISNet Sub-DIC at ACTREC organises every year a two-day workshop targeting faculties, Ph.D. students from various colleges and universities to provide them basic knowledge to modern approaches/tools and applications of bioinformatics. This helps them in teaching bioinformatics related subjects in their parent institute. The major focus of the institute is basic and translational research in cancer biology.

#### **4.30 BanasthaliVidyapith, Banasthali**

In view of rapidly growing importance of Information Technology in Biotechnology teaching and research., Centre for Bioinformatics (a sub-DIC under BTISNet) at Banasthali University was sanctioned by Department of Biotechnology, Govt. of India in November, 1998. Over the last fifteen years, this centre has acquired many databases and software's and has round the clock Internet connectivity. All computers are connected to the internet through 2 MBPS leased line under campus networking. Centre is providing services to the PG students in Biotechnology through searching literature/databases of their own research interest and their Computational work.

#### **4.31 Barkatullah University, Bhopal**

Bioinformatics Center (Sub-DIC) sanctioned in the year 1999 and started during the year 2002-03 in the Department of Biotechnology aiming to provide the Computational facility and bioinformatics training to the Students, Research scholars and Teaching staff of life sciences of Barkatullah University. Centre is involved in research work related to Microbial genomics and diversity analysis and also providing the computational support and training in biodiversity analysis. It has organised 13 workshops, 3 training, and 2 seminars. 4 Ph.D. and 6 dissertations done by students with the help of Bioinformatics centre staff.

Centre has published 3 papers and 15 abstracts in bioinformatics. One Ph.D. in Bioinformatics area of Biotechnology has been submitted to Barkatullah University. It has developed software BIOCUM for the study of microbial genomics and developed a database of codon usage patterns in Firmicutes. Rhizobacterial diversity, Field evaluation of PGPR in association with the indigenous AMF in soybean and wheat cropping system.

#### **4.32 Banaras Hindu University, Varanasi**

The Bioinformatics Centre at the School of Biotechnology, Banaras Hindu University (BHU), Varanasi, set up in 1989 as one of the distributed Information Sub-Centres (DISCs) under Biotechnology Information System (BTIS) programme of Department of Biotechnology, Government of India. The centre established with an objective to work as a resource institution in the area of biotechnology. The Centre is equipped with state-of-the-art hardware and software. Internet facilities are available at the centre for the use by the scientific community.

The centre has emphasised the use of databanks in the area of its specialisation. Important among these databanks are those on protein and DNA sequences and so on. The centre provides training to the users by conducting seminars and workshops. The contribution of the centre to the activities of the university is in terms of teaching the M.Sc. Biotechnology Students a regular course on "Computer Applications".

#### **4.33 Bharathidasan University, Tiruchirapalli**

The Bioinformatics Centre at Bharathidasan University is an offshoot of National Facility for Marine Cyanobacteria (NFMC) sponsored by DBT Govt of India exclusively started as a Sub-Centre -Distributed Information Centre (Sub-DIC) to work on the primordial organism the cyanobacteria. This photosynthetic ancestor bridges the gap between prokaryotes and eukaryotes, which inhabits all illuminated environments from Tundra to hot springs and freshwater to marine ecosystems.

The Centre has the good infrastructure facility, which supports NFMC and Department of Marine Biotechnology and other life science students of University in Bioinformatics. The centre conducts National level workshop annually, which adds

up the knowledge and manpower to the field of cyanobacterial Bioinformatics. NFMC and sub DIC together had done a pioneering work in marine cyanobacteria and cyanobacterial Bioinformatics.

#### **4.34 Biotech Park, Lucknow**

The Bioinformatics Centre is actively involved in human resource development and R&D activities in the area of Bioinformatics and serves as a nodal point for industry-academia-public institution interaction. The park extending support to researchers for computational data analysis and provides hands-on training in bioinformatics applicable to the field of agri-biotechnology and pharma biotechnology. The Centre continued to host the website [www.dbtjatropa.gov.in](http://www.dbtjatropa.gov.in) for DBT funded project 'National Database on Jatropha'.

During the current year, it strengthened its capabilities by procuring SYBLE-X software with drug designing modules, developed four databases relevant to the need of industries & the researchers, and conducted three workshops. one student has been awarded Research Associateship of ICMR to work on "A study of Dengue hemorrhagic fever using bioinformatics tools."

#### **4.35 Birla Institute of Scientific Research, Jaipur**

Birla Institute of Scientific Research, Jaipur is a leading centre for Biotechnology research in Rajasthan. The institute undertakes goal-oriented applied research in the frontier areas of industrial biotechnology sponsored by government and industries as well as in-house research. The BTIS-SubDIC at BISR established in 1999. This is one of the core facility used by the scientist for the analysis of data using various Bioinformatics software application for their research work.

Recently BISR has initiated research in the area of Proteomics, Genomics and Structural Bioinformatics. Besides, efforts made to develop various quality information resources in the form of databases and software for professionals in the area of biotechnology and Bioinformatics.

Birla Institute of Scientific Research (BISR) is involved in fostering and promoting various aspects of science and technology and has multi-functional

activities. The research programmes of the BISR are concerned primarily with Biotechnology and Natural Resource Management.

#### **4.36 Birla Institute of Technology, Ranchi**

The Distributed Information Sub-Center (Sub-DIC) established by the Department of Biotechnology, Government of India at Department of Biotechnology, Birla Institute of Technology, Mesra, Ranchi in the year of 2005. Organization of training programmes, workshops and scientific meetings besides M.Sc. Bioinformatics programme, in order to create awareness of bioinformatics in the local community, is among its regular activities.

Molecular Modelling and Drug design, Medicinal and Aromatic Plants, Database development, Functional Genomics and Computational Bioinformatics.

#### **4.37 Central Agricultural Research Institute, Port Blair**

The Distributed Information Sub-Centre (Sub-DIC) established at Central Agricultural Research Institute, Port Blair, in the year 2005. This Bioinformatics centre is to develop databases on Biodiversity of Andaman & Nicobar Islands, which would provide information to taxonomists, ecologists, biodiversity management specialists, policy makers, planners & related entrepreneurs to store, manage, and exchange electronically published scientific information in standard format.

This centre can serve as an active site for bioinformatics research and development in the remote union territory of Andaman and Nicobar Islands. It provides computational support and training to students and scientist and offers traineeships and studentships to deserving bioinformatics students.

#### **4.38 Central Institute of Freshwater Aquaculture, Bhubaneswar**

The Bioinformatics centre of CIFA which is a Sub-DIC under BTIS network is one of the oldest centres in India, 1949. The centre is doing an outstanding work with a view to cater to the needs of the scientific community as well as students from eastern as well as other parts of the country. The excellent quality of infrastructure facility set up over the year is regularly updated both in terms of hardware and software.

The centre till date has published 43 research papers, 11 training manuals and 6 books. 14 national level workshop-cum-training on bio-informatics has been done till date. 3 standalone databases related to aquaculture developed. The centre till date has trained more than 600 researchers, officials and students. The centre has also acquired 10 databases and has 11 electronic publications to its credit.

#### **4.39 Central Institute of Medicinal and Aromatic Plants (CIMAP)**

Bioinformatics Centre, 1998 is the backbone of bioinformatics/computational analysis in R&D activities of CIMAP. The major research activities undertaken include database/tool development and computational research analysis in the areas of Genomics, Proteomics, Cheminformatics, and Pharmaco-Informatics. Centre is also providing quality Human Resource Development through its various training programmes.

Bioprospecting novel bioactive from plant sources for infectious diseases, metabolic disorders and safety evaluation of MAPs using modern tools. Computational research analysis in the areas of genomics, and proteomics. We are developing a database in this field.

#### **4.40 Central Plantation Crops Research Institute, Kasaragod**

The Distributed Information Sub-Centre (Sub-DIC) under the Biotechnology Information System Network (BTISNet) programme of the Department of Biotechnology, Government of India, New Delhi, established at CPCRI in December 2000. The Bioinformatics Centre, CPCRI has taken up a creation of databases on biotechnological aspects of coconut, cocoa and areca nut provide information

retrieval services in Biotechnology area. The main objectives of the centre include the development of bibliographical databases related to plantation crops, providing training in the computer application of Bioinformatics and providing up to date information in the field of Biotechnology to plantation crops research workers

Current research focuses on the development of bioinformatics applications in plantation crops focusing on coconut, areca nut and cocoa.

Online access to databases through [www.bioinfpcpri.org](http://www.bioinfpcpri.org) (IP restricted) Web access for coconut tissue culture and molecular markers protocols. Limited access to full-text literature databases at intranet and shared resources among bioinformatics centres of CPCRI and IISR. The Centre is subscribing to various biology and bioinformatics journals. The centres also have a good reference collection on bioinformatics.

#### **4.41 CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur**

Distributed Information Sub-Centre (DISC) at Department of Agricultural Biotechnology, CSK HPKV, Palampur (HP) in October 2002. The Centre has developed good infrastructure in the form of 32 Computers/laptops, two servers, Communication equipment's and Printers, one Photocopier, Fax machine, one interactive classroom etc. All the computers connected through Local Area Network (LAN) and internet with 256 kbps lease line.

The Centre has procured software's like Linux, Oracle, Windows Net Server, Bio-Systematic, DNA Star, Images, Genchektm, SQL Server, and VStudio.Net for normal bioinformatics work including analysis, software development, database creation and management. The Centre has created 5 databases and one software. The Department of Agricultural Biotechnology is engaged in research and training in bioinformatics programme.

#### **4.42 Devi Ahilya Vishwavidyalaya, Indore**

The Distributed Information Sub-Centre established in 1993. This centre has BSNL 512 Kbps lease line connection internet. The centre also setup a web server (<http://www.davvbiotech.res.in>) having all the software & database developed and procured by the centre.

The development of a server for the identification and characterization of Genomic and Pathogenicity Islands - PredictBias is available on The internet. An independent Java based tool named GGRP has developed to parse the Genbank Genome record with flexibility and GenBank record defragmentation facilities. Sequence analysis, Biological software, Structure Prediction & database development related to medical bioinformatics and human resource development.

#### **4.43 Dr Y. S. Parmar University of Horticulture And Forestry, Solan**

Dr. Yashwant Singh Parmar University of Horticulture and Forestry has earned a unique distinction not only in the country. Also in the whole of Asia to impart teaching, research and extension education in horticulture, forestry and allied disciplines with Himalayan perspective.

Its milestones in teaching, research and extension education have strengthened the path of sustainable development of horticulture and forestry in Himachal Pradesh and have further presented a model of prosperity for eco-conscious development before Indian Himalayan states and entire region of Hindu Kush-Himalayas.

#### **4.44 G. B. Pant University of Agriculture & Technology, Pantnagar**

Bioinformatics Sub-DIC established in November 1998 in the College of Basic Sciences & Humanities, G.B. Pant University of agriculture & Technology, Pantnagar. This is one of the first Sub-DIC in Uttarakhand. Centre is actively involved in teaching and conducting research in bioinformatics. The bioinformatics



education to the students disseminated through theoretical and practical courses in Bioinformatics.

The centre is offering the Bioinformatics courses “Elements of Bioinformatics” and “Use of computers in molecular modelling” to the PG students of various disciplines including Biotechnology, Biochemistry, Biophysics, Plant Physiology, Plant Breeding and Genetics.

The centre has initiated electronic in centivization of plant biodiversity of Uttarakhand. A small database “Uttaranchal Plant Resource DB” of 50 plants, “Nutritional Plant Resource Database of Uttaranchal”, enumerating nutritional and information about nearly 60 genotypes of small grains has developed. Database “Cry gene transgenic database” providing comprehensive information about transformed Cry genes in various crops has developed. The centre is also actively involved in hands-on skill training of Bioinformatics skills by conducting workshops. So far, twelve training workshops have conducted with active funding support from DBT and our university.

The centre also imparts short duration training to students of other universities who applied for their project/thesis dissertations every year. Three students from BanasthaliVidyapeeth successfully completed their dissertations and presented their finding in the form of poster presentation in the ‘International conference on Bioinformatics’ held at Bhubaneshwar. Their work in the form research papers has also been communicated/under preparation for publication in reputed international journals for publication.

#### **4.45 Guru Nanak Dev University, Amritsar**

The Distributed Information Sub-Centre (DISC) at Department of Biotechnology, Guru Nanak Dev University established in the year 1995 with the financial assistance from DBT, Govt. of India, New Delhi. The Centre is providing practical training in computer-based applications, computer languages, software analysis, computational methods, sequence analysis tools, etc. Training workshops

organised at regular intervals to apprise the faculty and students about the latest developments in Bioinformatics.

The Department is offering a two-year degree programme leading to M.Sc. in Biotechnology. The Department admits the students to a Postgraduate Biotechnology Programme through an All India Combined Entrance Test (AICET) conducted by Jawaharlal Nehru University, New Delhi and on the basis of University test. The students selected through AICET in Biotechnology are awarded a scholarship of Rs.3000.00 P.M. throughout the two years of their study.

The Department has well-equipped teaching, research and computer laboratories for imparting training to the students and for carrying out basic/applied research in the areas of Biotechnology and Bioinformatics. The department is recognised by the university to carry out research for the Ph.D. degree in these areas.

#### **4.46 Himachal Pradesh University, Shimla**

The Bioinformatics Centre of Himachal Pradesh University established in 1999 with the financial support of Government of India, Department of Biotechnology (DBT), New Delhi. The Centre is housed in the Netaji Subhash Chandra Bose Bhawan of Himachal Pradesh University. The Centre has successfully organised sixteen training and workshops covering various aspects of the Bioinformatics and has trained around 242 participants.

The Centre is highlighting on genome-wide studies which includes the development of tools and techniques for the search of novel sources of nitrile metabolising enzymes. Besides this, the Centre provides various facilities for M.Sc. and B.Tech students belonging to a different institute of northern India for completing their research project i.e. In-silico studies of different industrially important microbial and plant enzymes. The Centre has recently installed sequence & molecular modelling software for detailed In-silico analysis of various bioinformatics problems.

The research activities of the University in the area of Biotechnology have a major focus on microbial diversity, microbial enzymes, and traditional fermented food and stem cell.

#### **4.47 Indian Institute of Advanced Research, Gandhinagar**

The objectives of the centre are a compilation of information on plants and their pathogens and tropical pathogens in a user-friendly manner. Tritryp portal having detailed information on proteome of trips has been developed and hosted on IAR website and other databases and tools like on AdhesinProfile, a database on adhesins, ProtAnno for predicting adhesion like proteins, Glud for finding distance between sugar rings in carbohydrates and a database on plant pathogens have been developed for free use by the community. Regular training programmes have undertaken at the centre.

Various research groups in the Institute are working in the areas of Plant biotechnology for gene prospecting and enhanced functionalities, understanding the factors responsible for virulence in pathogens like *Vibrio* spp. in the human health, understanding the role of various factors in apoptosis in cell biology and genome analysis in bioinformatics

#### **4.48 Indian Institute of Integrative Medicine, Jammu**

Department of Biotechnology, Govt. of India, New Delhi sanctioned distributed Informatics Sub-Centre at Indian Institute of Integrative Medicine (IIIM), Jammu in the year 1998-99. The centre made functional in Aug 1999. The centre has an established molecular modelling facility and the staff is actively engaged in the in silico research activities pertaining to the mandate of the Institute.

The Sub-DIC at IIIM, Jammu has been instrumental in spreading the buzz of Bioinformatics, particularly within the state. It has established the state-of-the-art infrastructure for carrying out several Bioinformatics activities including Molecular Modelling. The centre has an established in-silico facility encompassing activities like Molecular Docking, QSAR studies and 3-D structure prediction using Homology Modelling and Threading techniques. The software used to carry out the sophisticated experiments includes Accelrys Discovery Studio, Schrodinger suite, and Hyperchem software.

The centre is actively engaged in research activities of the Institute related to drug designing for cancer and infection. The in silico group closely interacts with the

Medicinal Chemistry and Pharmacology groups of the Institute for developing theoretical models and providing Chem-bioinformatics support for the current research activities of the Institute.

#### **4.49 Institute of Life Sciences, Bhubaneswar**

The Institute of Life Sciences (ILS), an autonomous institute has brought under the fold of the Department of Biotechnology, Government of India in August 2002. The institute earlier established on February 11, 1989, and was under the administrative and financial control of Department of Science and Technology, Government of Orissa. The mandate of ILS is to undertake basic and translational research in frontier areas of life sciences. The research interests of the faculty are in three major areas Infectious Disease Biology, Gene Function and Regulation and Translation Research and Technology Development. In addition, new collaborations with industry have established to tap commercial potential of laboratory science.

Bioinformatics is an interdisciplinary research area that relies on computational and statistical methods to solve biological problems. With the advancement of high throughput technologies, biological experiments now generate a huge amount of data, ranging from genomic sequences to gene expression profiles and to protein structures.

#### **4.50 Indian Institute of Spices Research, Calicut**

The Indian Institute of Spices Research (IISR), Kozhikode a constituent body of Indian Council of Agricultural Research (ICAR) is a major Institute devoted to research on spices. In 1976, it started as a Regional Station of the Central Plantation Crops Research Institute (CPCRI), Kasaragod engaged in research on spices. A National Research Centre for Spices established in 1986 with its headquarters at Calicut, Kerala by merging the erstwhile Regional Station of CPCRI at Calicut and Cardamom Research Centre at Appangala, Karnataka.

The Bioinformatics Centre established at the Institute as a sub- centre under the BTIS network. The Centre has a dedicated 1 Mbps Internet connectivity, required

hardware and software resources to initiate and support the Spice Bioinformatics/Biotechnology programmes. A Bioinformatics Library with more than 100 reference books, journals, databases also set up. Round the clock browsing facility, SpicE-Lab, is made available for the benefit of students and research fellows.

Active collaboration exists with nearby BTISNet centres, especially with the centre at CPCRI, Kasaragod in organising Bioinformatics training and sharing of resources. The Centre also collaborates with NIT, Kozhikode for conducting a Bioinformatics course for M.Tech. Students. Bioinformatics students doing their M.Sc. in other institutions allowed carrying out their project work in the institute. The Centre collaborated with DOEACC Centre, Kozhikode in conducting an 'O' level course in Bioinformatics. The Centre has also initiated action on coordinating Agri-bioinformatics efforts in the country by organising workshops and by developing an Agri-Informatics portal.

#### **4.51 Indian Institute of Technology, Kharagpur**

The history of the IIT system dates back to 1946 when a committee was set up by Hon'ble Sir Jogendra Singh, Member of the Viceroy's Executive Council, Department of Education, Health and Agriculture to consider the setting up of Higher Technical Institutions for post-war industrial development in India.

The centre provides facilities to the B.Tech, M. Tech and Ph. D students to carry out their day to day work, project work and training in the field of Bioinformatics. The Institute offers a separate 3 - credit course in Bioinformatics for the students. A number of thesis, publications, and oral and posters presentations are made in national and international conferences on the relevant areas of Biotechnology. A laboratory credit course on Bioinformatics has also been conducted for the B.Tech and Dual degree students.

Scale up of recombinant proteins, therapeutic and diagnostic proteins, immunodiagnosics studies, and bio-hydrogen production in different bioreactors, development of microbial fuel cell, bioremediation of metals, radionuclides and

organic pollutants; enzyme and biofuel technology, macromolecular interactions involving proteins and nucleic acids, and their folding; Indian non-mulberry taser silk proteins and other polymers as biomaterials for tissue engineering applications.

#### **4.52 Indian Institute of Technology, New Delhi**

The Department of Biochemical Engineering and Biotechnology at IIT Delhi established in 1974 by the then first-time vision that progress in biotechnology could be dramatically faster by marrying Biology with Chemical Engineering. Over the last 37 years, this vision has borne rich bonuses; Biotechnology departments in virtually all Indian engineering schools are populated.

The research publications of our Faculty are very significant both qualitatively and quantitatively. The department has pioneered the development of a 5-year dual-degree undergraduate programme culminating in an M.Tech. Degree and graduate programmes leading to M.S. (Research) and Ph.D. degrees. Our interdisciplinary approach, which combines the principles of molecular biology and chemical engineering, has yielded academic recognition and reward.

The BTIS sub-centre at IIT Delhi was established in 1989 by the support of the DBT, GOI, New Delhi, as a part of the nationwide networking of Biotechnology Institutions of National importance. The BTIS sub-centre is very actively engaged several aspects of Computational Genomics. These include web-based approaches to bioinformatics, going from protein sequence to structure and function and studying protein recognition and function. Using computational methods, we are also trying to elucidate the interactions between drug compounds and their target molecules. For the past few years, our Centre has been associated with developing novel methods to study molecular recognition of DNA by proteins.

#### **4.53 Indian Veterinary Research Institute, Izatnagar**

The Bioinformatics Centre actually started functioning in 1992, is ready to get online /offline information from DICs, sub-DICs and another centre's to meet users specific requirements also to provide online/offline information to DIC, DISC, etc. The Centre has following credentials at its credit.

Sites of many databases listed for utilisation in research work. Livestock disease database has developed; three monographs and three compendiums were prepared. Centres doing research in the area of Biotechnology for developing improved diagnostics/vaccines for differential diagnosis of economically important diseases of livestock and poultry using recombinant DNA technique and synthetic peptides chemistry etc. with the help of bioinformatics databases and software's available at the centre.

#### **4.54 Institute of Bioresources and Sustainable Development (IBSD), Imphal**

The Institute of Bioresources and Sustainable Development, Autonomous Institute of the Department of Biotechnology, Govt. of India. Takyelpat, Imphal established in the year 2001 to carry out research and development work in basic and applied areas of bioresources conservation, management and utilization of the Indian region of Indo-Burma mega biodiversity hotspot for socio-economic Development of the region. Presently Institute carries out research work in Plant, Microbial, and Bioresources database development of the North Eastern region.

The Bioinformatics Centre at the Institute of Bioresources and Sustainable Development established under Biotechnology Information System Network (BTISNet) of DBT in the year 2006. This centre is having a state of the art bioinformatics laboratory with all the necessary requirements like software, hardware and internet facilities for the researchers and students of the region. The centre is maintaining and developing a biodiversity database for the North East region on Flora, Fauna and Microbes of the region. Some training programmes have been successfully organised by the centre to train the teachers and researchers in the field of bioinformatics.

To develop a database in the areas of biological sciences, organise training programmes in bioinformatics and Biodiversity Informatics. Centre is maintaining DBT's electronic Library Consortium (DeLCON) to provide access and assistance to the Institute and other users.

#### **4.55 Jawaharlal Nehru Tropical Botanic Garden and Research Institute (JNRBGRI)**

The Bioinformatics programme initiated at JNTBGRI in 1998 by the launching of a Sub-Distributed Information Centre, as part of the Biotechnology Information System Network (BTISNET) programme of Department of Biotechnology, Government of India. The program initially aimed to establish computer and communication infrastructure facilities for promoting biotechnology-based R & D. Objectives of JNTBGRI to prepare a comprehensive information system on plant genetic diversity of the country particularly of the Western Ghats and novel discoveries in plant science, the Institute has established the Bioinformatics R & D Centre in 2002 with financial support from DBT in a separate campus at SaraswathyThangavelu Centre of JNTBGRI, Puthenthope, Thiruvananthapuram.

To establish JNTBGRI as a National Nodal Knowledge Centre for plants and fungal diversity information particularly of the Western Ghats. Bioprospecting of medicinal plants used in Indian systems of traditional medicine for novel drug discovery. Promoting education and human resource development in Bioinformatics. Dissemination of biodiversity and bioinformatics information on the web.

To prepare comprehensive information about the plants and fungal diversity of the Western Ghats the Centre has developed several databases for different categories of plants and fungi and all these databases connected on a common web portal. The databases developed by JNTBGRI.

BTISNet Publication and Library: An online web portal integrating the details of publication and library resources of all the centre's including Centre of Excellence (COEs), Distributed Information Centre's (DICs), Sub--Distributed Information Centres (Sub-DICs) and Bioinformatics Facility Centres (BIFs) distributed all over India.

Virtual Herbarium - The Herbarium of JNTBGRI established in 1979 and currently recognised internationally with the acronym TBGT. It comprises 20,500 specimens of flowering plants and 10,000 specimens of the mushroom group for ready reference. In view of catering the taxonomic study, the Bioinformatics and



Taxonomic groups of JNTBGRI jointly started the digitising of the valuable specimens and made available on the web for ready reference and further interaction.

Mushrooms of Wayanad - The database provides taxonomic information including macroscopic and microscopic details, images and other information about the mushroom diversity of Wayanad district in Kerala. The information presented on the database collected as part of a 3-year project funded by the Ministry of Environment & Forests, Govt. of India, New Delhi to analyse the diversity of mushrooms of Wayanad area.

The database comprises information such as legitimate name of each fungal species with literature citation and systematic classification, scientific name and family of host plants, taxonomic description of each species with illustrations and images, taxonomic characteristic features in the form of digital formula and general information about fungi.

The database provides information about 700 tree species conserved at JNTBGRI campus. Information is arranged under the head taxonomic details, vernacular name, habit, distribution, flowering period, fruiting period, conservation category, propagation, nature of wood, useful parts, economic importance, etc. Image zooming facility, navigation tool and dynamic search engine are the special features of the database application.

SeedPack- Database application package for the management of seed bank data. The key features of the application package are tools for cataloguing of seeds, seed storage and germination data analysis, auto-generation of reports on administrative decisions, wizard for online seed request and exchange, dynamic search engine and navigation tool.

LitFriend is a user-friendly application with advanced search options for personal storage of bibliographic data and their frequent/easy retrieval for further exploitation. This package also provides reference style customization for different journals. BioLit- The software package developed for the management of publications in a research centre. Using this software package, the R&D centre can store and retrieve individual scientist's publications in the standard format.

#### **4.56 Karnataka Veterinary, Animal & Fisheries Science University, Mangalore**

The Department of Fishery Microbiology is a major Department of Karnataka Veterinary, Animal & Fisheries Sciences University, College of Fisheries, Mangalore. UNESCO as a MIRCEN (Microbial Resource Centre) in Marine Biotechnology has recognised the Department. The mission of the Department is to impart education and carry out research in the area of Fishery Microbiology. There is an excellent combination of courses in both traditional microbiology and modern molecular biology.

The Bioinformatics Centre, at the Department of Fishery Microbiology, College of Fisheries is one of the Distributed Information Sub-Centre (Sub-DIC) set up with financial support from the Department of Biotechnology, Government of India. The Centre established in 2000. The Centre is actively involved in carrying out research, preparing databases and conducting training programmes in the area of Aquatic bioinformatics. The centre conducts the training programme in bioinformatics and provides bioinformatics support to neighbouring scientific institutions.

#### **4.57 Mahatma Gandhi Institute of Medical Sciences, Wardha**

Bioinformatics Centre at JB Tropical Disease Research Centre, Mahatma Gandhi Institute of Medical Sciences established in March 1999 with support from Department of Biotechnology, as part of National Bioinformatics Network. To providing academic bibliography service and in-house Training programme for staff involved in Hospital Information service, the Centre organises yearly National level Workshop and Symposium.

This Centre also publishes SEVAMED a Quarterly Update on Infectious Disease Research and Traditional Medicine enters the 15th year of its publication and well received by the medical teachers and scientists throughout India. In addition to giving selected references and abstracts in hard copy 'SEVAMED' is now available online with complete bibliography and link to abstracts for easy retrieval

with interactive web pages, beneficial to the researchers, medical practitioners and teachers.

The Bioinformatics Centre has thrust on Medical Informatics Quarterly updating SEVAMED publication, a quarterly bibliography journal with thrust on infectious diseases & lifestyle health problems. Developing & updating web portal on advances in research and health information on emerging infectious diseases and lifestyle health problems. Promoting education and human resource development in Bioinformatics. Particularly conducting six monthly Online Health Informatics Certification Course and Organizing annual National Level Workshops on Biomedical Informatics.

SEVAMED goes online with a complete bibliography and with the link to abstracts. It is a quarterly bibliography journal with thrust on infectious diseases & lifestyle health problems has entered the 15th year of its publication. This well received by the scientists & medical teachers in medical colleges.

Centre has launched MGIMS-JBTDR Arogya Web Portal which presents progress made in Holistic Healthcare and Research in Lifestyle diseases by Indian Institutions for better awareness, interaction and advancement in holistic therapy and research. Centre has developed customised Database Software for patients' information and further databases developed on Mycobacterial proteases, Mycobacterium tuberculosis Proteome comparison and Human Papillomavirus Proteome.

#### **4.58 National Botanical Research Institute, Lucknow**

Bioinformatics SubDIC initiated by Shri Y.K. Alagh, the then Hon'ble Minister of Science and Technology and VP CSIR, as joint venture in between DBT and CSIR in the year 1997 on the basis of a base paper on International Legume Database (ILDIS) programme of the National Botanical Research Institute (NBRI).

To undertake Bioinformatics research for providing stimulus to bioinformatics by initiating database standards, software production, digitization of plant diversity information and bringing Bioinformatics to many traditional botanists

and several other institutions at regional, national and international level. To facilitate the study and conservation of Indian biodiversity by the development and maintenance of plant species diversity database. This includes: a comprehensive database of all Indian plants on the web.

To update and upgrade the Legume database of South Asia, which is developed and maintained in collaboration with ILDIS, UK. Establish an herbarium database and network the herbaria of India. Further strengthen the linkages with national (DBT's BTIS network) and international (ILDIS, UK, etc.) and other international database programmes.

As the main activity, under the aegis of International Legume Database and Information Service (ILDIS), a scientifically validated unique database of 2030 legumes of eight South Asian Countries viz. India, Nepal, Bhutan, Bangladesh, Sri Lanka, Maldives, Myanmar and Pakistan was developed at NBRI Bioinformatics subDIC (NBRI-subDIC) and established the linkage with ILDIS, UK and database are available on the internet. South Asia legume database is an online resource of DBT. NBRI subDIC is continuously updating and upgrading this database.

Plants of India database initiated and it aims to develop an online database of all groups of plants of India. A database of 19000 species of higher plants (Angiosperms) developed. Using unique software designed and developed by NBRI subDIC in collaboration with IIT, Kanpur. The database contains information on species nomenclature, including scientific names, common names, geographical distribution, descriptors, uses, etc.

NBRI SubDIC entrusted the responsibility and establishment of India Nodal Station on the Asia-Pacific Traditional Medicine Network (APTMNET) by D/o AYUSH, Govt. of India. NBRI – Bioinformatics has developed software in collaboration with IIT, Kanpur. A database of selected medicinal plants of national importance made and domain name and web space was booked with NIC, Govt. of India.

NBRI SubDIC also assigned a nodal role in CSIR network project “TKDL”. NBRI subDIC undertook development database on nomenclature and uses of 2600 species identified by CSIR TKDL Apex Centre situated at HRDC, Ghaziabad.

#### **4.59 National Dairy Research Institute, Karnal**

The major areas of research include Embryo Biotechnology; Reproduction Augmentation, Livestock Genomics in general, and Buffalo Genomics in particular, Biological pathway analysis of lactating mammary gland in cow and buffalo, Probiotic attributes of lactobacilli in milk.

Development of recombinant dairy enzymes, PCR-based test kits for detection of foodborne pathogens, Structural Biology of biological macro-molecules, Gene expression analysis and proteomics of mammary gland.

#### **4.60 National Institute of Oceanography, Goa**

Bioinformatics Centre at NIO established in 1990 with a focus on marine biodiversity informatics. It works towards improving the understanding of the marine biota in the Indian waters. The basic aim of the Centre is to study and record the marine biodiversity of Indian waters and to make it available in the form of digital data. The main objectives are to collect, collate and validate all the taxonomic data available from the Indian Ocean region and catalogue and disseminate the data electronically to the International Community.

The centre makes marine biodiversity data available in formats which is easy to understand and can be readily used by the policy makers, the research community, educational institutions and stakeholders. The Centre sees itself as a dynamic component of the National Institute of Oceanography, and is actively following the mission of the Institute which is “to continuously improve our understanding of the seas around us and to translate this knowledge to benefit all”. Study of novel metabolites from marine microorganism a potential source for the human health and related activities

#### **4.61 National Institute of Plant Genome Research**

The Distributed Information Sub-Centre (SubDIC) at NIPGR set up by the Department of Biotechnology under the Biotechnology Information System Network (BTISNet) programme. BTISNet is a major distributed bioinformatics network spread across the country. The network has geared up to undertake advanced

research in frontier areas of biotechnology with the intensive application of bioinformatics. The network also aims to develop human resource in bioinformatics and establish effective academia-industry interface, in order to create world-class platforms for technology development, transfer and commercialization.

The SubDIC at NIPGR was established in early 2007 and aims to serve as a support structure for all IT related issues at the institute, in addition to providing computational facilities, bioinformatics related services to the researchers in various laboratories at the Institute, catering to the needs of scientists in plant biology, physiology and agriculture.

The centre has also begun an initiative to develop manpower in Bioinformatics by arranging annual training for Post-graduate students.

Maintenance and constant safety-related support for all computers spread over the LAN. Management of the leased line and constant network and internet related support to all users. Support for heavy data download/Uploads via Email or Webserver. Bioinformatics related assistance and data analyses. Conduct of Workshops for enhancing Bioinformatics awareness.

#### **4.62 National Institute of Technology, Raipur**

Department of Biotechnology established in 2003 with the mission of defining and establishing a new discipline fusing life sciences with engineering. The goal of this discipline is to advance fundamental understanding of how biological systems operate and to develop effective biology-based technologies for applications across a wide spectrum of societal needs through research and education. The innovative educational programmes reflect this emphasis on integrating life sciences with a quantitative, systems-oriented engineering analysis and synthesis approach, offering opportunities at the undergraduate level and at the graduate level for the Ph.D.

Research work in Bioinformatics was carried by students of M. Tech./M.Phil./M.Sc./B.Tech Bioinformatics, Biomedical, Biotechnology, and Computer Technology. Research work initiated and carried in the Bioinformatics especially in Homology Modelling, Artificial Intelligence, Vaccine and Drug

Designing and Evolutionary Analysis. One month certificate course has started on 'Basics of Bioinformatics' and 'Protein Modelling & Analysis'. The centre initiated database generation and Data mining.

#### **4.63 Punjab Agricultural University, Ludhiana**

The Sub Distributed Information Centre (SubDIC) at Punjab Agricultural University, Ludhiana was sanctioned by the Department of Biotechnology, Ministry of Science & Technology, Govt. of India in November 1998 as a part of Biotechnology Information System (BTISNet) Network to function as a Computerized Information Base in the fields related to Agricultural Biotechnology. The programme initially aimed to establish Computer and Communication Infrastructure Facilities for promoting biotechnology-based R&D.

Applications of Bioinformatics in Agriculture Mining genes of economic importance from wild relatives of crop plants, Genome assembly and developing physical map Transcriptome analysis.

Comparative genomics analysis - A Pedigree retrieval database Pedigree Retrieval cum Morphological Diversity in Wheat version 1.0 software developed by the centre for data mining could scan and sort genetically diverse and agronomically superior genotypes from wheat germplasm. This software is very useful for plant breeders.

The Punjab Agricultural University, the premier agricultural university of India has released a number of varieties for different crop plants since its inception. The information regarding the current varieties and their agronomic practices was available in the Package of Practices, which published for the farmers. However, for the use of the agricultural scientists, the detailed information was available with the respective crop breeders.

The Punjab Agricultural University established in 1962 to serve the state of erstwhile Punjab. On trifurcation of Punjab in November 1966, an Act of Parliament carved Haryana Agricultural University out of PAU in February 1970. Later, in July 1970, Himachal Pradesh KrishiVishvavidalya established.

#### **4.64 Rajiv Gandhi Centre for Biotechnology, Thiruvananthapuram**

The Distributed Information Sub-Centre (SubDIC) at RGCB, set up and funded by DBT, GOI under the National Bioinformatics Network program started functioning from May 2002 with a view to catering the needs of the scientific community and to augmenting their research activities through information inputs. The main function of the Centre is to act as a member of Bioinformatics Network System for providing information to the interested users on topics pertaining to the relevant areas of Biotechnology especially genomics and proteomics.

To provide a national bio-information network designed to bridge the interdisciplinary gaps in biotechnology information and to establish a link among scientists in organisations involved in R&D and manufacturing activities in biotechnology. To build up information resources, prepare databases on biotechnology and to develop relevant information handling tools and techniques.

To evolve and implement a programme on an education of users and training of information scientists responsible for handling of biotechnology information and its applications to biotechnology research and development. To develop, support and enhance public information resources for biotechnology e.g. Gene banks, molecular biology data and related research information resources. To provide services for the analysis of biological data, bibliographic references to published literature in science and technology.

Training programmes held in Bioinformatics. The PG course (M.Tech) in Bioinformatics specialisation has introduced this year; however, this is an independent activity of the university.

#### **4.65 Sikkim State Council of Science & Technology Development Area, Gangtok, Sikkim**

The Sikkim Bioinformatics centre established in November 2001 with the support of Department of Biotechnology, Government of India, in a capacity of Sub-Distributed Information Centre. The centre is playing a major role for the



development of Biological researchers in the state. It is acting in the form of a hub for the Bio-resources related researchers in Sikkim. The centre in Bioinformatics trained more than 200 personnel's and Biology related fields.

To promote Biotechnology and Bioinformatics in the state through training, seminars and workshops. Database preparation of various bio-resources of the state Encouraging young researchers to take up research work in bioinformatics and biotechnology

National levels Bioinformatics Meeting: The centre has been able to conduct major National Level Bioinformatics Coordinators' Meetings like XVIIIth All India BTISNet Coordinators' Meet, 2007 and 1st NEBInet Coordinators' Meet, 2008.

The centre has prepared various biological database of Sikkim Himalaya such as Rhododendrons of Sikkim, Medicinal Plants of Sikkim Himalaya, Orchids of Sikkim Himalaya, Butterflies of Sikkim Himalaya, Scientific personals of Sikkim, and Floral diseases of Sikkim etc.

Books on Bioresources of Sikkim Himalaya: The centre has prepared a book on Bioresources (Volume I, II, III) of Sikkim, by means of compilation from a various journal published research articles. The book has become a good support to all the concerned researchers in and across the state.

News Letter (BIOGYAN): The centre has been successfully publishing quarterly based News Letter BIOGYAN. The centre has published various biological research articles on different International and National journals.

The centre has conducted various crucial training and workshops on Biological sciences and Bioinformatics among the scientists, professors, researchers and students. Online e-journal library since 2011 the centre has started online free access of scientific e-journals provided by DeLCON consortium, with the support of Department of Biotechnology, Government of India. The online e-journal facility is playing a vital role among the scientists, researchers from across the state for the development and publication of research articles in various reputed journals.

Biological Software packages with a view of supporting convenient teaching methodology and easy understanding of biological sciences, the centre has prepared

various animation software packages on biological sciences. The packages successfully distributed among the schools and their concerned teachers in the state. It has developed an interest of students towards the studies on biological sciences.

Video graphic Documentation for the first of its kind in the state, the centre has successfully documented video graphic film on all the existing *Rhododendron* species of Sikkim Himalaya. The centre has well-maintained library facility with good numbers of biological books.

#### **4.66 T.M. Bhagalpur University, Bhagalpur**

University Centre of Bioinformatics, T.M. Bhagalpur University, Bhagalpur was established in the year 2005 under BTISNet Programme by Department of Biotechnology, Ministry of Science & Technology, Govt. of India. It is a matter of great pride for our University that this is the only Sub-DIC Bioinformatics Centre in the State of Bihar.

The Centre is an established unit of T.M. Bhagalpur University and it has been engaging, regular classes on Computer application & Bioinformatics for the Post & Undergraduate students of Science Faculty and also providing information to the teachers & research scholars for Ph.D. works since its inception. As such, it has been acting as integrated information resource on all aspects of research, molecular biological data and Data Mining of Biological resources. The centre has developed adequate infrastructure with good dry lab which has been availed by the teachers, staffs & students of this University. About 150-200 users are taking benefit of it in a month. The centre has also its own research activities on different aspects of plant science & arranging a workshop at local, regional & national level.

To create awareness regarding, the utility of bioinformatics in different branches of biological sciences by organising workshop/seminar. To impart teaching and research activities in the field of bioinformatics to the students, researchers and faculty of biological sciences

To conduct various training programme/Hands on practices in Bioinformatics by several invited lectures. To help various Universities and colleges for project development & training.

Database developed on “Medicinal Plant of Bihar & Jharkhand region”. It can be used of particular plants, disease symptoms of medicinal plants and what fungi are responsible for causing their diseases. The Centre published one book on “Emerging Fields in Bioinformatics”.

#### **4.67 Tamil Nadu Agricultural University, Coimbatore**

The Distributed Information Sub-Centre (SubDIC) housed at Centre for Plant Molecular Biology, Tamil Nadu Agricultural University is functioning with the financial support of DBT since 1989. It is actively engaged in educational and research activities of biotechnology and bioinformatics.

The internet connectivity in the bioinformatics lab upgraded to 2 Mbps for the benefit of scientists and students. Organised 29 bioinformatics training programmes since inception. Development of genetically modified plants in rice (drought and salinity tolerance), maize (low phytate), brinjal (shoot and fruit borer resistant), cotton, banana, papaya, groundnut and soybean for both biotic and abiotic stresses

Marker-assisted selection for the blast, bacterial leaf blight and gall midge resistance genes in rice through functional markers. QTL mapping and marker aided selection for drought tolerance in rice and cotton. Cloning and characterization of abiotic stress inducible promoters from rice. Development of agriculturally important databases, and sequence analysis tools.

#### **4.68 Tamilnadu Veterinary and Animal Sciences University, Chennai**

The Bioinformatics Centre at Madras Veterinary College has been identified as one node in the BTISNET network as Distributed Information Sub-centres (SubDICs) and established in the year 1990-1991 to cater to the needs of scientists of Veterinary, Animal & Fishery Sciences in the field of Bioinformatics and Biotechnology. Subsequently this centre offers degree and diploma programmes in Bioinformatics, supports Bioinformatics research community, conducts periodical training and workshops for the benefit of research scholars and teaching faculties and develops bioinformatics related databases.

To provide a national bio information network among scientists working in organisations involved in R&D and manufacturing activities in the country. Building information resources and databases on biotechnology and allied sciences. Develop relevant information handling tools and techniques.

To undertake research into advanced methods of computer-based molecular interaction analysis. Coordinate efforts to access Biotechnology information worldwide including establishing linkages with some of the international resources of Biotechnology information.

To evolve and implement programmes on education training. Establishing regional and international collaborations to exchange scientific information and expertise in biotechnology, bioinformatics and allied sciences. PG Diploma in Bioinformatics during 2004 among the Veterinary Universities and 19 students have completed the course. M.Sc Bioinformatics during 2011 among the Veterinary Universities is undergoing.

Information Dissemination - So far Information was disseminated to 13,000 research scholars of veterinary and animal science colleges in India using CDROM databases in area bases of Veterinary, Animal, fisheries and food science subscribed from 1992 to 2004 and Information related with biotechnology, biology & Education retrieved from online resources and provided to 4000 research scholars of life science.

Human Resource - Staff (Information Officer, Technical Assistant and Data Entry Operator) of Bioinformatics centre absorbed by TANUVAS. Research - So far 75 external student research projects in the areas of Docking / Drug Discovery, Lead optimization, Epitope Prediction, Microarray Analysis, Comparative Proteomics, Pathway Analysis, Database Creation, Modelling, Comparative Genomics have been guided by staff of this centre

Copyright awarded for Information Retrieval Package developed at this centre. Information Resources - Online information retrieval carried out through VSNL using dial-up modem in 1995, NICNET, MEDLARS databases through VSAT connection (1996-2000), Tata Indicom's broadband during 2000-2005, Leased line connection 2006-2012 and 1GB ISDN connection presently

Aquatic Science and Fisheries Abstracts (1978-2002), Animal Production Database on CDROM (1973 - November 2004), FSTA - Food Science, & Technology Abstracts (1969 - April 2003), Veterinary Science Database on CDROM (1973 - November 2004)

#### **4.69 University of Delhi South Campus, New Delhi**

The University of Delhi, a premier University of India, attracts a large number of students from all over the country and from abroad. Founded in 1922, it has grown phenomenally in size and complexity over the decades and at present has 13 faculties, 64 post graduate departments, 79 colleges and about 185,000 students. In the mid-eighties a new Campus of the University, namely, South Campus, which actually started in 1973.

The Bioinformatics Centre set up at the Department of Biochemistry University of Delhi, in 1987 under Biotechnology Information Systems Programme of DBT with specialisation on Membrane and Molecular Biology. The centre is equipped with sophisticated computer and communication systems. The databases available with the centre include Medline, Entrez, NUCSSI, andAgris. The most important database prepared by the centre is on Membrane Technology. The centre has connectivity to the world through the BTIS. The Centre has organised various workshops and conferences for the benefit of users.

The Distributed Information Sub-Centre provides facilities and assistance to a very large number of investigators and students. Total computer and communications support to the potential users in the form of information.

All Scientists, Research Scholars, JRF's, SRF's and MSc students from various departments such as Biochemistry, Microbiology, Plant Molecular Biology, Genetics, and Biophysics continuously make use of all that is available at the sub-centre. The centre does not specifically assist any particular project or the investigator. However, every faculty provided with all the help possible in terms of Medline search, sending and receiving emails, faxes, graphic works, and access to the internet, surfing and downloading of the information.

A new workstation installed for carrying computations in research areas related to protein crystallography, protein modelling ligand docking and bioinformatics research.

#### **4.70 University of Kashmir, Srinagar**

The Bioinformatics centre here at the university established to popularise the importance of information technology for pursuing advanced research in modern biology and biotechnology. Bioinformatics has become a very successful vehicle for transfer and exchange of information, scientific knowledge, technology packages, and references in the country involving thousands of scientific personnel.

The Bioinformatics network has emerged as a very sophisticated scientific infrastructure for bioinformatics involving state-of-the-art computational and communication facilities. The computer communication network, linking all the bioinformatics centres, is playing a vital role in the success of the bioinformatics programme

Developed a database on “Medicinal & Aromatic Plants” of J&K State. The database is available on our website. Successfully conducted eight national level workshops. To providing services, to various Institutes of the valley and Science departments of the University campus.

Has acquired several Software packages related to biosciences and the research scholars from Biosciences field benefited from these packages. Centre has started one-year PG diploma in Bioinformatics course.

#### **4.71 Indian Institute of Chemical Biology, Kolkata**

Since its inception in 2002, the Centre has been involved in various scientific projects on comparative genome/proteome analysis of microbial, fungal and mammalian organisms. Among the problems addressed so far were multivariate analysis of macromolecular composition of microbial pathogens, delineation of distinct, niche-specific proteome signatures in microbial extremophiles, comparative analysis of evolutionary trends in mouse and human orthologs and clustering of proteins involved in signal transduction pathways.

A number of novel genome data mining software tools and specialised databases have developed by the centre. IICB, a constituent national laboratory of the Council of Scientific and Industrial Research (CSIR), is engaged in interfacial research on chemical and biological sciences addressing biomedical problems of national importance as well as of global interest.

At BIC, IICB, various databases and software are being developed and applied for genome and proteome data mining, analysis of macromolecular composition/structures and elucidation of their interactions with bioactive molecules that may facilitate lead optimization for rational drug design.

#### **4.72 Biotech Consortium India Limited, New Delhi**

Since its inception in 1992, the Distributed Information Sub-Centre (SubDIC) at Biotech Consortium India Limited (BCIL) has taken up various activities to facilitate the commercialisation of biotechnology. It has brought out a number of publications and periodicals, databases and status reports and has organised several seminars and workshops. For a promotion of commercial biotechnology.

Current activities include compilation of databases and directories, preparation of industry specific status reports on different aspect of biotechnology and organizing national and international workshops, seminars, conferences and entrepreneurs' meets to create awareness on issues relevant to commercialization of biotechnology. The SubDIC also runs a Biotechnology Club. The biotech club membership offered on annual and the life membership's basis to individuals, institutions and corporate bodies interested in biotechnology. Members receive BCIL's publications and, participate in events organised by BCIL, either free of cost or at a discount.

BCIL's main objective is to provide linkages to facilitate the commercialization of biotechnology. BCIL has been engaged in technology transfer, consultancy, project management, IPR facilitation, certification services, information dissemination, and manpower training related to biotechnology.

**Figure 4.1 Centres under BTISNET**



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# Chapter 5

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*Approach to Resource Sharing in BTISNet Centres*

## **5.1 Introduction**

Librarians and experts as the realistic means of meeting the multifarious demands of the users almost universally accept the concept of resource sharing and networking. It is found that all the evidence indicate that resources sharing and networking in libraries hold the future hopes of fulfilling user needs. A close look at the literature indicates that easy access to information and physical availability of required information has become the main concern of the librarians, worldwide. The age-old informal inter-relationship among a few local libraries is securing the shape of a large, comprehensive, sophisticated and formal system of cooperation; breaking geographical barriers.

The focus now is on providing library users with ready access to library resources available anywhere. The emphasis is shifting from a number of library holdings to access and delivery of library materials rather than attempting for self-sufficiency. Dreaming for self-sufficiency is an enduring impossibility for any library in the world, how so ever resourceful it may be. However, the importance of strategically developed collection in a library cannot be underestimated and it constitutes the important component of the main shareable resource.

## **5.2 Document Resource Development**

The effectiveness and efficiency of any library and satisfaction of its users are directly dependent on quality and strength of collection and information sources available with the library. The information resource is the main item, which is shareable and without having the collection of appropriate materials, the resource sharing is inconceivable. The principal information resource for the scientific and research libraries consists of books including society publications, journals, standards, patents, reprints, trade literature, maps and non-print forms such as audio-visuals, online and CD-databases etc. A library is required to continuously endeavor to enrich its collection, best suited to fulfill the information needs of its users in meeting the institutional goals and objectives. It is equally essential to create the database of information sources in electronic form to facilitate easy access of information about the documents available in the holding of a library. Also, the

database in machine-readable form is an essential pre-requisite for resource sharing and networking among libraries. Various steps involved in document resource development and creation of database and related issues are discussed as under:

### **5.3 Collection Development**

“Collection development covers a broad range of activities related to the policies and procedures of selection, assessing user’s needs, and evaluation. Collection development is a continuous process in all types of libraries worldwide. Any library failing in adding latest materials of the present collection, weeding out and storing part of the collection and planning for resource sharing”<sup>1</sup>, its collection will have the poor rating by the users. As stated by Evans, collection development “is a universal process in the library world whereby the library staff brings together a variety of materials to meet patron’s demands.”<sup>2</sup> In view of the documents and tremendous developments in the field of IT, the total concept of library collection and services has completely changed.

### **5.4 Collection Development Policy**

Collection development of libraries should be based on proper planning in consideration with advancements in IT and the availability of information in digital format and through the internet along with plenty of documents in printed form. Their organization and maintenance are more challenging and it requires a regular recurring cost. Decision-making about procurement of documents in the variety of forms gives rise to many more variables and decision based on personal perception may not be judicious. Therefore, the collection of a library should necessarily be based on well-defined policies and norms ensuring the consistent and balanced growth of the collection.

“ A collection development policy statement is an orderly expression of those priorities as they relate to the development of the library resources”<sup>3</sup> Osburn<sup>4</sup> states five functions of collection development policy, viz. shaping the collection, training the selector, planning, rationalizing the budget, and interpreting needs and

operations. Besides these, the policy supports in justifying the selections and minimizes personal bias on the part of individual selectors adding efficiency in routine decisions related to the collection. A collection development policy should include “balancing ownership and access, cooperative efforts and evaluation.”<sup>5</sup>

It is pertinent that a collection development policy of a subject specific library network like BTISNet should emerge out of the broader perceptions of goals, objectives and social mission of all the participating institutions. All the member libraries should evolve a policy in this regard. “In an IT-based environment, the entire approach and philosophy of collection development needs to be changed, as simply duplicating the collection practices responsive to current needs or capabilities”.<sup>6</sup> It is observed that most of the libraries, under study, have traditional collection and are engaged in the same practice.

It is notable that IMTECH library has started subscribing 45 journals in electronic form along with print media and a digitised database of 6500 grey literature has also been created. The obvious challenge to all the libraries is the problem of how to integrate and manage both types of resources. It is, therefore, necessary for all the participating Bioinformatics centers under proposed Public to evolve a collection development policy governing acquisition both electronic resources and development of specialized collection by each library in assigned subject fields. Seetharama mentions, “balancing ownership and access; cooperative efforts; and evaluation,”<sup>7</sup> as key issues for redefining a collection development policy.

### **5.5 Development of Specialized Collection**

It has been observed that many of the institutions under study are assigned the responsibility to carry out research related with specific problems of the regions of their location. Though all the institutions are primarily involved in a like research, training and education in Bioinformatics, they may be designed to concentrate and develop rich, sound and specialised collection in their areas.

## **5.6 Development of Core Collection**

There are basic documents and reading materials, which are essential for having general comprehensive and understanding about a branch of knowledge. All such documents are commonly called as a core collection for that subject area. While considering for networking in BTISNet libraries that each library must attempt to build a collection of such materials, which serve the basic information needs of general users. The literature concerning resource sharing indicates that the libraries should not depend on other libraries for every requirement and information. It is suggested that all the participating libraries of BTISNet should have important information resources in the field of Bioinformatics and related discipline, which are commonly required to fulfil the general information needs. The common and cheaper reference books and journals, which are frequently demanded and consulted by the users, are also included in the core collection.

## **5.7 Collection of Journals**

Journals are the indispensable source of information and are unavoidable for any scientific and research library. Being an important component for scientific research and communication, periodicals require judicious selection in view of the unprecedented growth of periodical literature. Periodicals are more important than books for researchers and specialists. The majority of scientific and research libraries are forced to spend a big chunk of their annual budget for a subscription to journals.

Even if it is decided to subscribe to two copies of these journals, there will be a saving if been taken into account. This provides a solid ground for rationalization in subscription to journals by these libraries and the resources thus saved may be utilized judiciously for further strengthening and enriching journal collection for achieving enhanced readers satisfaction and mutual benefits without any additional expenditure.

## **5.8 Electronic Journals**

Electronic journals are those journals, which are available in the electronic or digital form, with or without their print version. The electronic publishing has open new vistas in the field of information storage, dissemination and resource sharing. Electronic publication is the product of amalgamation of electronic technology, computer technology, and communication availability of e-journals and other documents on the internet puts tremendous pressure on library professionals, while deciding what is to acquire and what is not to acquire. Abdus Sattar Chaudhry says “availability of individual article supply service like UNCOVER, BIDS (Both Information and Data services) and OCLC’s article first and availability of electronic journals on network are promoting libraries to replace subscriptions with lease arrangements, where libraries pay only for those articles which are required by the users.”<sup>8</sup>

Michael Killer says that “main concern is that the paradigm of access instead of ownership leads ultimately to an environment where all is meta-information.”<sup>9</sup> It is feared that having information about the existence of information, with dependent resource base, may lead to user dissatisfaction at times and free flow of information may be affected in adverse political, economic and global situations.

Considering the prevalent and emerging technologies, Nisonger says that “a library will frequently have four options for providing its patrons access to a particular journal title: (1) subscription to a print version (2) subscription to an electronic version; 3) subscription to both print and electronic versions; and (4) no subscription, but access through commercial document delivery.”<sup>10</sup> Another option seems to be the acquisition of full-text databases consisting of the collection of back volumes through vendors.

## **5.9 Collection of Electronic Databases**

Library and Information centers have always been dependent on the development in the publishing industry and in scholarly research and communication. Changes in publication process have a direct impact on the information systems and services. It is observed that by and large information field

has been flooded with an attractive electronic form of publication along with continued production of traditional sources of information. Electronic publications including the CD-ROM databases are increasingly becoming popular, Amudhavalli says “ an electronic collection can be more flexible and dynamic leaving wider variety (world’s information resources) and choice of selecting only that part of the document (a page or an article) that is relevant and the whole source need not be acquired.”<sup>11</sup>

### **5.10 CD-ROM Databases**

The libraries have been facing serious problems in collection, organization, storage, retrieval and dissemination of information. The problems of storage, maintenance and retrieval have come acute, especially in developing countries. It has been observed that “the print and other media are becoming obsolete and incompatible to meet the demands of storage and retrieval of this huge bulk of literature produced.”<sup>12</sup> The CD-ROM and DVD-ROM have emerged as a versatile and robust medium with optical storage devices having less or no maintenance cost and speedy access of information. Its advantages include “broad user base, user friendliness, convenience of use, relevance affordability, portability, durability, exposure to automated information, retrieval skills for the first time, space saving, suitability or resource sharing and image raising.”<sup>13</sup>

The CD-ROMs (Compact Disc- Read Only Memory) were first used in the form of bibliographic databases consisting of large indexes and abstracting services. The CDs, besides texts, can store still images, photographs, drawings, audio, view, animations etc. The encyclopaedia’s, dictionaries and other references sources are available on CD in the form of multimedia. Outlining the strengths of CD-ROM from librarian’s point of view, Hanson mentions these as “(i) fixed known cost; (ii) easy interfaces; (iii) convenience and power and (iv) portability.”<sup>14</sup> Besides above durability, low price, long life, damage resistance, data security etc. are the other characteristics of CD-ROM. Digital Versatile Disc/ Digital Technology. “DVD Technology uses double layer packing of data of both sides of the disc providing 6-7

times greater storage capacity than CD having same aerial space,”<sup>15</sup> Main characteristics of DVD-ROM are high storage capacity with increased multimedia capacity, higher audio and video quality, faster data access, cost effectiveness, easy for networking eliminating Jukeboxes, etc. For the purpose of discussion in dissertation both CD and DVD may be known as CD-ROM.

It is found that in recent years, the large number of databases including full-text databases encyclopaedias, dictionaries and other reference sources are available on CD-ROM. The cost of CD-ROM production has come down very drastically. It has been observed that the Bioinformatics centers libraries in India have also started adding CD-ROM databases to their collection but in a humble way. In this regards, Wegner rightly states “While en route from automated to truly electronic libraries, this is a transitional period with much ambiguity and uncertainty. Information scientists are technologically capable of creating the largely digital research library in the very new future, but a complex a fiscal, psychological and even sociological barriers present them from doing so anytime soon.”<sup>16</sup>

It has been noticed that CD-ROM databases are still very costly, especially the full-text databases, and at times their acquisition seems to the budgetary provisions of many libraries. Considering its usefulness and efficiency in information dissemination to the researchers and scientists, it is advisable that such databases are acquired through cooperative acquisition or some of other system and made available to the member libraries through network (host) by devising some formal system for use. The EBSCO information Services, USA offers sound solutions to complex information needs of libraries with a collection of specially designed, comprehensive full-text database available online via EBSCO host and via CD-ROM for each type of library setting.”<sup>17</sup> The experiences show that it is promising to go in for networking of CD-ROM database. Tedd says, “networking CD-ROMs provides advantage such as easier access to a range of CD-ROMs, access from the user’s own workstation, simultaneous access by several users to the same databases and better security.”<sup>18</sup>



## 5.11 Online Databases

The databases, which are accessed instantly from the web or local network, are named as online databases. The internet offers a powerful new way to communicate and gain access to information of all types. The internet has emerged as a growing technological phenomenon as a source of electronic information resource and effective medium of communication. The whole process from generation of information, dissemination, absorption and feedback has become instantaneous with the internet.”<sup>19</sup>

It is found that there is variation in software and hardware used by bibliographical databases and it is difficult for professionals to be aware of the specific features of each system. In order to overcome the problems of database search with many search languages and to share the bibliographical information electronically, a standard namely ANSI/ISO Z39.50 has been developed. Being an open communication protocol, Z39.50 is platform independent allowing “uniform access to a large number of diverse and heterogeneous information resources”.<sup>20</sup> Its latest version 3 was accepted in 1995. While searching through Internet or www databases, Z39.50 protocol is essentially needed.

“Internet was totally reshaped by the world wide web (WWW) software,”<sup>21</sup> allowing access to the internet through it. Information sources on the internet are all stored as computer files of some kind or other. These files contain varied materials. Much of the sources available on internet are of reference type in nature, which include “electronic journal, preprints, technical reports, numerical and graphical data, software, campus-wide information systems, databases, library catalogues, educational materials, company profiles, patents, standards information on societies, institutions, associations, etc.”<sup>22</sup>

In view of the above, the Libraries under BTISNet may be required to review their collection development policy. A lot of information is available on the internet and many a times it may be duplicate or irrelevant. In such a situation, it is very difficult, time-consuming and constant intensive exercise to search all the sources on Internet and select the useful sources or information for downloading. The duration of available information is also not certain. The information may be completely removed or changed from time to time and much of this information is less

permanent in nature. Rao states “In these circumstances it is very difficult for Information scientist / librarian to decide:

- What should be acquired (by downloading, stored and organized)?
- Who should do it (most of such information is accessed directly by users, without bringing into the knowledge of librarians)?
- What standards to be followed?
- Users locate and access the information; information is not usually structured; no rules or codes are followed and no one controls the information that is made available.”<sup>23</sup>

Rao further adds, “The data or information may be of different types. To organize the data or information, we require cataloguing practice and it calls for an appropriate data model for organizing data with the standard front. Specialized technologies are needed for compressing as well as for organizing information. It is essential that effective techniques are developed for storing and searching downloaded data from the internet.”<sup>24</sup> In view of the existing fluid situation and non-perfection of technology, organization, processing and storage of information available through Internet, it is advisable for BTISNet to wait for some time before taking concrete steps and going for heavy investments.

## **5.12 Software**

Software requirement for a network can be grouped as follows:

- i. System software
- ii. Application software
- iii. Networking software

System software is usually a part of the hardware and is offered along with the hardware by the vendor. Windows, Ms Dos are good application software for database creation in the library, but SCO Unix or Red Hat Linux are essential for networking providing security to the database. So far the application software is concerned, now Koha, NEWGENLIB, SLIM21, WINISIS, LIBSYS, SOUL

(INFLIBNET), DELPLUS (DELNET) etc. are available for use in Indian libraries. It is found that most of the Bioinformatics centre libraries having and using CDS/ISIS software. The performance of LIBSYS is satisfactory as it is being used by IITs, IIMs and other important institutions, but it is very costly and its Annual Maintenance Charges (AMC) charge is exorbitant. However, the Bioinformatics centre libraries, under study, may continue to use other software such as Open source Koha software without any problem.

To discuss in details about library software and its qualities is out of the purview of this study. However while selecting the library software it should be ensured that protects data from unauthorized access by providing a password and other security measures.

1. Data can be export/ import through MARC or ISO format
2. Supports TCP/IP for communication and networking.
3. ANSI Z39.50 compliant Search engine (The Information Retrieval protocol accepted worldwide)
4. Web OPAC to enable access of Bibliographic Databases through Internet and Intranet
5. Options for MARC 21 Implementation
6. Images and Multi-media interface with Search Engine (Various formats include Bitmap, TIFF, Wave, Midi, Audiovisual interface, etc.)
7. Flexibility in choosing operating platforms. It supports Linux, UNIX, and Windows in Client-Server environment using TCP/IP protocol.

### **5.13 Networking Software**

Networking software refers to the clustering of programmes on computer's hard disc that enables the PC or Server to communicate on a network. As done in the cause of UNIX-Based and Microsoft's Windows, the networking programmes may be integrated into the operating system. The networking software is generally referred as Network Operating System and it differs from a desktop operating system in that it allows for greater scale and resource utilization.

#### **5.14 Communication Infrastructure**

It is found that almost all the BTISNet libraries have Internet connectivity, email facility and LAN. The dedicated telephone lines or satellite links are the appropriate channels of communication. In a satellite-based network, reliability and higher transmission speed are main characteristics with economical access to remote locations. However, all the institutions are having Internet connectivity either through ISDN (or) Dedicated Leased lines and have the same facility has been made available to libraries also. It is presumed that with the up gradation of main communication facility with the institution, the libraries will simultaneously have the improved communication facilities and linkages.

There has been an enormous advancement in the field of IT resulting into multiple and incredible facilities for information transfer. The technologies used for document transfer are email, File transfer Protocol (FTP), Point to Point Protocol (PPP) from Bharat Sanchar Nigam Limited (BSNL), ERNET – Education and Research Network ,and NKN- National Knowledge Network Connectivity.

#### **5.15 Database Creation**

Proper organization of documents and other reading materials is the key component for efficient and effective service to the users, especially in physical location and accessing the documents. The system of description and indexing in the information retrieval model involve the process of identifying the subject content of the documents and then representing it in a way, which matches the search approach of users. This requires systems of classification and cataloguing that help us to describe precisely the subject content of an item in a consistent and user-friendly way. It is essential to develop records of documents in electronic form, as these are an essential resource for resource sharing and networking.

### **5.16 Classification System**

The main purpose of classification in the library is to assign a unique identification number to each document – to fix its location and place in the storage area facilitating a mechanical system for their placement and location. Studies have revealed that physical arrangement of materials based on subject grouping by assigning artificial notation is the most helpful arrangement. It also brings together all the related documents at one place, providing an opportunity to users to browse and select the suitable documents from the collection serving his/her needs. In past, a lot of emphases was placed on depth classification because of the manual arrangement of catalogue cards making permutation and combination very difficult, while searching. Now in the age of IT application and availability of electronic records, where a high degree of permutation and combination is possible during the search, the need for depth classification is lessening. Prem Singh says, ” with the introduction of IT, depth classification would become redundant resulting in a saving of a lot of time.”<sup>25</sup>

It is observed that three schemes of classification are used in BTINet libraries. These are DDC, UDC, and LCC. Ideally, it is better if all the BTISNet libraries of a network use uniform scheme of classification. But it would not possible to change over to one classification scheme in all participating libraries at this juncture. Otherwise, also it may not be worth attempting at this stage. However, it is observed that DDC is used by as many as five libraries, UDC is used by as many as four libraries, and LCC is used by as many as one library.

### **5.17 Cataloguing System**

Catalogues are prepared to satisfy different approaches of users and they function as retrieval tools that support the physical arrangement of documents by providing alternative access points in different sequences. They act as a tool, which reveal the documents by an author and title and documents on a subject. In fact that catalogue removes the artificiality of classification numbers and facilitates the search in alphabetical order through approach words or subject terms.

The work of creation of bibliographic records can be divided into two parts namely. Descriptive cataloguing and Subject cataloguing. Descriptive cataloguing is the phase of creating a bibliographic record, which describes an item accurately as per its title, author edition, physical description etc. There are two prevalent cataloguing codes i.e. Anglo-American Cataloguing Rules II (AACR II) and Classified Catalogue Code (CCC). It is revealed that the AACR II is being used all over the world because of its international acceptance and provisions for both print and non-print materials. The AACR II is found to be in use by the entire BTISNet libraries, under study. It is essential that the libraries follow same rules and procedures with similar variations if any. This will facilitate uniformity in cataloguing procedure and display of information in a similar fashion.

Classification determines the location of the item on shelves in the form of artificial notation to achieve mechanical arrangement and subject cataloguing eliminates artificiality of class numbers and interprets the same in common subject terms matching the user's choice. There are several methods of deriving subject headings used the controlled vocabulary. "The Library of Congress Subject Headings (LCSH) is an up-to-date tool being widely used in Libraries for deriving subject descriptors. The LCSH is "the oldest controlled vocabulary which is still in use all over the world."<sup>26</sup> It is found that many of the BTISNet libraries, under study, are using LCSH for assigning subject headings and some are using Sear's List of subject heading or thesaurus. Looking to wide use and up-to-date-ness of LCSH, it would be appropriate that the BTISNet libraries under BTISNet make use of it.

### **5.18 Retrospective Conversion**

It has been observed that very few BTISNET libraries have achieved full automation of their operations. Even database creation, having bibliographical details of the collection, has not been either taken up or completed in many BTISNET libraries. The database creation of documents available in stock of library has completed in BI, IARI, JNU, MKU, and SPPU library, whereas in the rest of libraries it is under way. In AU, BU, PU, TNAU, and UC, this could not be taken up

because of non-availability of library software and personnel. Retrospective conversion of card catalogue or creation of fresh records into machine-readable form involves handling of the tremendous amount of data with many technical activities.

### **5.19 Bibliographic Standards**

While cataloguing the use of uniform bibliographic standards in the process of machine readable or electronic record creation, thus has been the concern of the specialists and professionals working in this field. Standards are the “Instructions for doing uniformly.”<sup>27</sup> Standardization in the creation of bibliographic records is very significant in this age of growing libraries with growing budget cuts and ever growing demands. Murthy says, “Standardization helps promote predictability of retrieval as opposed to guessing work, promoting serendipity in retrieval and promoting depth of access to books.”<sup>28</sup>

Resource sharing and shared collection development relies heavily on standard bibliographic formats. The conception of resource sharing is impossible without bibliographic access, which in turn is dependent on the use of standards. It means no reliable retrieval is possible if the union catalogues of libraries or bibliographical utilities do not follow a standard format. Describing the advantage of standardization of bibliographic records, Murthy states “it facilitates copy cataloguing, which is a recognized way of economical cataloguing. A library can make use of the work already done by another library by copying the bibliographic record and make a few changes to the record if needed.”<sup>29</sup>

A cataloguing standard ensure uniformity of identity and means of access points such as author, title, subject terms, etc. Standards help in identifying and communicating a library’s holding and exchange data online in an integrated BTISNet. The use of different standards may work as an obstruction in identification of material and interchanging the records in electronic form. Many standards have

been developed in due course of time viz. MARC, UKMARC, USMARC, UNIMARC, for encoding the bibliographical details of documents in the database.

## **5.20 Formats**

“A format is a method for coding information regarding bibliographical details of holdings and location to enable computers to process information for storage, exchange and retrieval,”<sup>30</sup> Number of formats mentioned earlier are in use by different libraries. Among India networks, the CALIBNET is using MARC format with compatibility to the ISO-2709, the DELNET till recently used CCF format and has switched on to MARC format. It has been observed that most of the BTISNet libraries are using WINISIS. “The MARC formats are standards for the representation and communication of bibliographic and related information in machine-readable form,”<sup>31</sup>.

## **5.21 MARC 21**

A new, revised and updated version of MARC has been developed and is termed as MARC 21. “The MARC 21 formats are widely used for the representation and exchange of authority, bibliographic, classification, community information and holdings data in machine-readable form,”<sup>32</sup> A MARC 21 formats is a set of codes and contents designators defined for encoding machine-readable records. Formats are defined for five types of data: bibliographic, holdings, authority, classification and community information.”<sup>33</sup> “The MARC 21 formats are communication formats primarily designed to provide specifications for the exchange of bibliographic and related information between systems.”<sup>34</sup> Its compatibility with UNIMARC and UKMARC has been preserved. Standardized bibliographic data input, utilizing MARC formats, ensures the integrity of the online public catalogue in storage and retrieval of information. Without good, accurate MARC records; patrons cannot find the great resources in the library.



## **5.22 Standards for Electronic Resources**

As discussed earlier, the full-text electronic databases and the various other databases available on the internet will also be the part of the collection of libraries under BTISNet. A vast quantity of data with text, graphics, sound, audio, animated videos etc, available at the internet can be downloaded easily for use. As is known the internet or networked information is fluid and interactive and is updated frequently. In order to gain effective access to electronic resources, it is essential to provide an index of available items for saving users' time and reducing network overload. This index or catalogue should narrate the date of updating, frequency, format and accuracy of electronic resources.

The data or record about the digital sources across the network is known as metadata. Chidambaram states "In general, metadata is data about data. Specifically it is information about information."<sup>35</sup> "Metadata acts as a surrogate for a larger work. It characterises the original work sufficiently covering its purpose, source and condition of use. Metadata serves many important purposes including data browsing, data transfer and data documentation." In metadata "The local information is held within the record in such a way to allow direct document delivery from appropriate application software."<sup>36</sup> For a creation of metadata in a uniform way, a standard metadata format is used, which is known as DUBLIN CORE. Which does the Dublin core Metadata Initiative (DCMI)? The standard metadata provides the easy format to access, retrieving and indexing the electronic resources in the proper way. It needs the standard formats, which can be used by the end user from any field to store interested website.

## **5.23 Stages of Networking of BTISNET libraries**

It has been observed and discussed that the libraries, under study, are at different stages of automation and database creation of their holdings. In view of this, it is suggested that networking of bioinformatics centers Libraries should be taken up in three phases:

## **Phase I**

Networking among libraries having completed their database creation viz. BI, IARI, JNU, MKU, and SP.PU, should be initiated by convening a meeting of their librarians followed by a meeting of Head of Institutions for arriving at formal consensus and agreement in this regard. The list of journals should be exchanged and rationalization of periodicals should be decided after having a preliminary discussion. The union list of holding of periodicals is exchanged between all the libraries along with the other forestry libraries of prospective institutions. The database of the library holding including books and another type of documents should be transferred to UP library being the central host for the creation of union catalogue to be made available online to the member libraries. Regular exchange of content pages of periodicals, a list of the new addition of documents, an index of articles etc. should be done. Also, ILL service and document delivery service by email should be provided ensuring maximum sincerity and consistency. Once the resource sharing and networking among the libraries become operational and librarians and user experience the benefits, the person-to-person publicity will motivate many BTISNet libraries to appreciate and join the network.

## **Phase II**

In second phase the libraries left out in first phase along with other institutions like AU, Chennai; BU, Bhopal; PU, Pondicherry; TNAU, Coimbatore; and UC, Kolkatta; creation of union catalogue to be made available online to the member libraries. Regular exchange of content pages of periodicals, a list of the new addition of documents, an index of articles etc. should be done. Also, ILL service and document delivery service by email should be provided ensuring maximum sincerity and consistency.

## **Phase III**

In third phase all the remaining BTISNet libraries of central and state governments and along with universities, private industries and non-governmental organizations (NGOs) working in biotechnology and interested in bioinformatics information may be included as active members of BTISNet.

It is presumed that the completion of the above phases will take about 5-6 years. It is believed that by the year 2020, the networking and resource sharing will be so common, that BTISNet libraries themselves will approach for membership and services.

#### **5.24 Services of BTISNet**

The service aspects of the network have already been discussed in chapter 4. The BTISNet, including other services as per requirements and changing needs, should provide the services mentioned therein. A mechanism needs to be devised for inclusion of changing the additional services other than usual network services

#### **5.25 Membership**

The membership of BTISNet should be provided to any bioinformatics centre against admission fee and annual membership fee after MOU devised for the purpose. The membership fee, admission fee, terms and conditions for membership and MOU should be finalized. The leadership role may be assigned to SP. Pune University of, as it is the most developed centre.

#### **5.26 Training facility for Library Personnel**

The rapid changes, changing user needs and advancements in IT have put an assertive demand for skilled manpower to carry out the modern responsibilities and also to transform the existing libraries into electronic one. The necessity of advanced training is consistently being felt in the libraries making use of modern Information Technology (IT). It is felt that the candidates completing traditional professional courses run by various universities, generally, lack exposure and knowledge to work in IT environment. The report of working group of Planning Commission on Libraries and Informatics for the Ninth Five Year Plan, 1997-2002, clarifies, that “the content and quality of professional education imparted by these institutions is at

variance and in view of the technological developments and the need for their application in libraries and information centres need an urgent fresh look.”<sup>35</sup>

In view of the existing position of manpower and present demand for IT application in libraries, the BTISNet must plan for providing regular in-service training for professionals managing these libraries. Training programmes related with database creation, assigning subject headings, maintenance of standards and qualitative services etc. should be organized. Along with technical and IT components, the motivational, ethical and psychological aspects of personnel should also be include in training programmes.

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# Chapter 6

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*Library Resources and Services: Data Analysis*

## **6.1 Introduction**

This chapter deals with the analysis and interpretation of the data collected through questionnaire from 62 BTISNet libraries located throughout in India. These centres deal with Bioinformatics teaching, training and research development.

Data has been collected data resource sharing and networking to library pertaining to the following components:

1. Print Resources
2. E- Resources
3. Physical Network Resources
4. Human Resources
5. Financial Resources
6. Services

Two sets of questionnaires designed to achieve the objective of the study. The perceptions of librarians regarding study the use of resource sharing and networking facility in BTISNet librarians of all 62 BTISNet Centres were selected. It was perception of user's feedback in order to study of BTISNet Libraries resources and services. The researcher received forty print questionnaires and twenty online questionnaires filled by users.

The data was also supported by using direct interview, observation and field visit method of research. Furthermore, for the analysis the purpose data was collected, verified, scanned, coded, tabulated, and interpreted systematically. The observations out of these interpretations were also made of their proper places as and when required.

The researcher sent questionnaires to 7 COEs, 11 DICs, and 51 SUBDICs. Out of which all the 7 COEs, 11 DICS and 44 SUBDICs responded. This total number of responses was 62 out of which 42 reported through Google online forms and 20 questionnaires through Print forms.



## 6.2 Data analysis – Librarian questionnaire

As mentioned earlier researcher collected data from 62 BTISNet librarians. The following paragraphs provide an overview of the data collected. It is to be mentioned that for each parameter data presented in tabular format as well as in graphical format for the sake of proper and clear understanding of the findings.

### 6.3 Total numbers of print resources in BTISNet libraries

The following table 6.1 and figure 6.1 gives an idea of total number of print resources in BTISNet libraries

**Table No: 6.1 - Total No. of Print Resources in BTISNet Libraries**

Type of Centres	No. of Print Resources
COEs	42905 (21%)
DICs	60089(29%)
SUBDICs	104330(50%)
Total	207324(100%)

**Figure 6.1: Total No. of Print Resources in BTISNet Libraries**

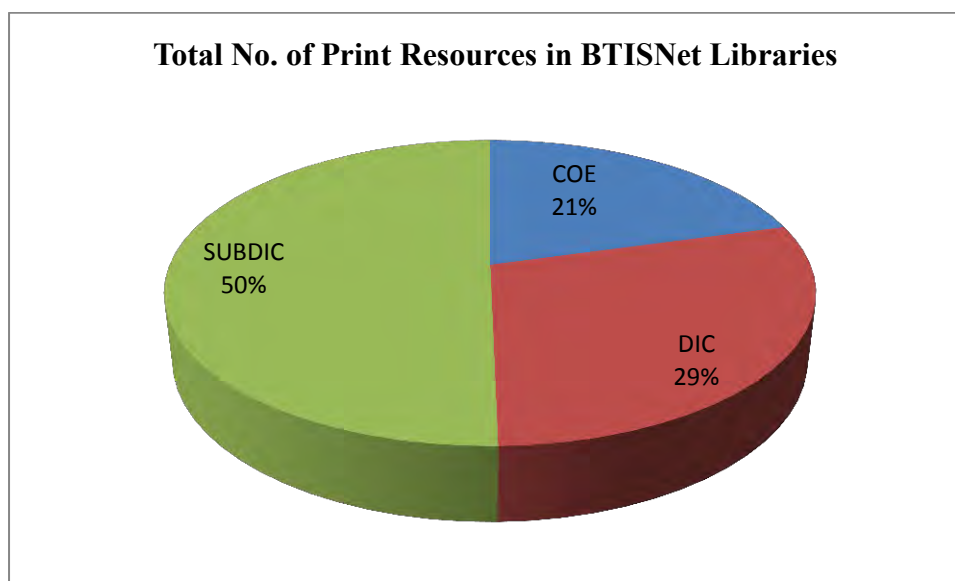


Table 6.1 and Figure 6.1 show the total print resources available in different types of BTISNet Libraries India. COEs are having 42905 print resources which is 21% of the total print resources. DICs have 60089 print resources which is 29% of the total print resources. Collection of SubDICs is 1, 04,530 print resources which is 50% of this total Print collection.

#### 6.4 Categorization of BTISNet Libraries on basis of Print Resources

The following table 6.2 and figure 6.2 give an idea about number of print resources available in BTISNet libraries, Print resources are divided into six groups on the basis of collection strength.

**Table 6.2: Categorization BTISNet Libraries on basis of Print Resources**

Sl.No	No. of Print Resources	Types of Centres		
		COEs	DICs	SUB-DICs
1.	≤ 500	1(14%)		2(4%)
2.	501-2500			23(52%)
3.	2501-4500		3(28%)	15(34%)
4.	4501-6500	1(14%)	4(36%)	4(10%)
5.	6501-8000	5(72%)	4(36%)	
6.	>8000			
	<b>Total</b>	<b>7</b>	<b>11</b>	<b>44</b>

**Figure 6. 2: Categorization of BTISNet Libraries on basis of Print Resources**

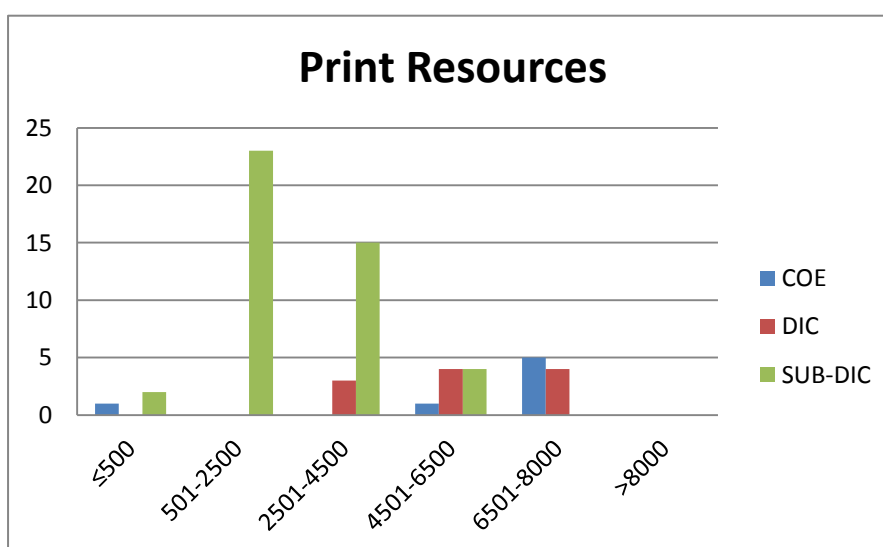


Table 6.2 and Figure 6. 2 show the Categorization of BTISNet Libraries on basis of Print Resources. Collection range is between 6501–8000 in 5COEs which is total print collection and 4 DICs. Collection range is between 4501– 6500 in 1COE and 4DICs. Collection range is between 2501-4500 in 3DICs while 15 SubDICs have the same range of print collection.

### 6.5 Total number of CD/ DVDs in BTISNet libraries

These table 6.3 gives ideas about total Number of CD/DVDs are available in their BTISNet centres.

**Table 6. 3: Total No. of CD/ DVDs in BTISNet libraries**

Type of Centres	Total No of CD/ DVDs
COEs	2470(25%)
DICs	1750(18%)
SUBDICs	5604(57%)
TOTAL	9824

**Figure 6. 3: Total No. of CD/ DVDs in BTISNet Libraries**

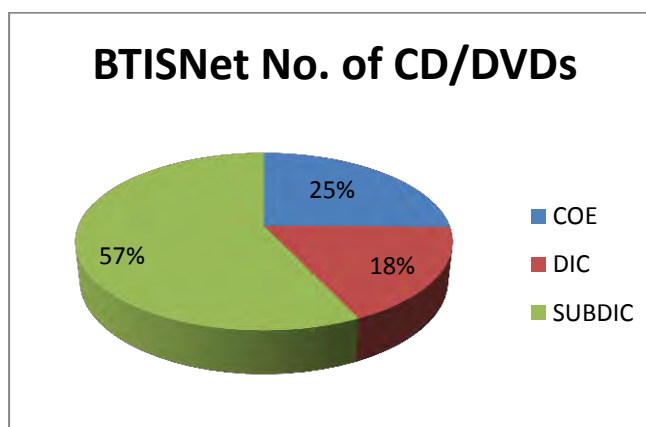


Table 6.3 and Figure 6. 3 represent the total numbers of CD/DVDs resources available in different types of BTISNet libraries in India. COEs are having 2470 CD/DVDs resources which 25% of total CD/DVDs resources. The collection of CD/DVDs in DICs is 1750 which forms 18% of total collection. Collection of SubDICs is 5604 CD/DVDs resources which is 57% of the total CD/DVDs collection.

## 6.6 Number of CD/DVDs Resources in BTISNet Libraries

Table number 6.4 gives an idea about range (number-wise) of CD/DVDs available in the libraries of BTISNet centres.

**Table 6.4: No. of CD/DVDs Resources in BTISNet Libraries**

Sl.No	CD/DVDS	Types of Centres		
		COEs	DICs	SUB-DICs
1.	≤100	1(14%)	5(46%)	14(32%)
2.	101-300	2(29%)	5(46%)	30(68%)
3.	300-500	3(43%)	1(8%)	
4.	501-700			
5.	>700	1(14%)		
	Total	7	11	44

**Figure 6.4: No. of CD/DVDs Resources in BTISNet libraries**

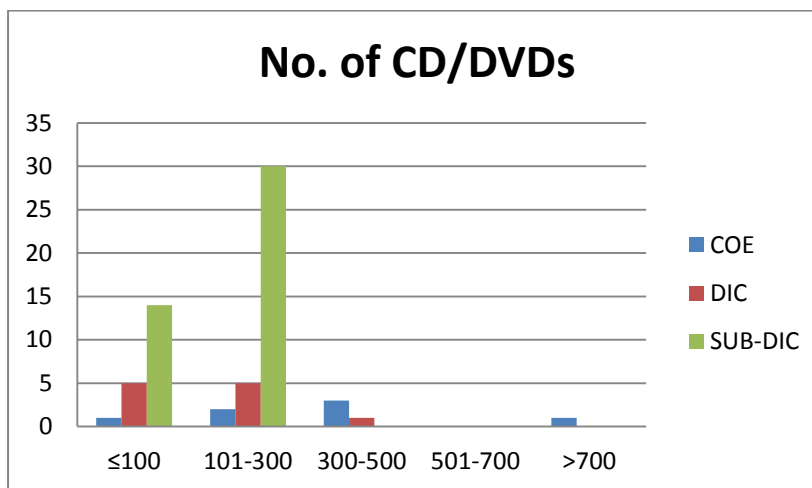


Table 6.4 and Figure 6.4 represent the number of CD/DVDs resources available in different types of BTISNet libraries in India. As depicted in the Table and Figure, 3 COEs are having a collection range of 300–500 CD/DVDs. Similarly 1 DIC is having a collection range of 300–500 CD/DVDs. As far as SUBDICs are concerned, the collection of CD/DVDs seems to be poor as none of the SUBDICs

are having collection range either between 500 – 700 or 300-500. 30 SUBDICs are having CD/DVDs ranging from 101 to 300. Many SUBDICs (14) are having CD/DVDs collection of less than 100.

### 6.7 Total Number of E-Books in BTISNet Libraries

Table 6.5 gives an idea about total number of E-Books available in the of BTISNet libraries

**Table 6.5: Total No. of E-Books in BTISNet Libraries**

Type of Centres	Total No. of E-Books
COEs	208(41%)
DICs	100(20%)
SUBDICs	200(39%)
Total	508

**Figure 6.5: Total No. E-Books in BTISNet Libraries**

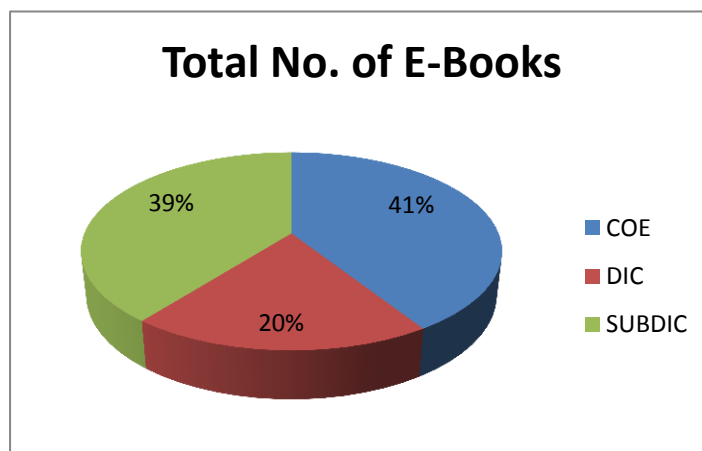


Table 6.5 and Figure 6.5 show the total number of E-Book resources available in different types of BTISNet libraries India. As depicted in the Table and Figure, 5. COEs are having 208 E-book resources in which (41%) of total E-book resources. The collections of (DICs) are having 100 E-book resources in which forms (20%) total E-book resources. Collection of SubDICs is 200 E-Books resources in which is (39%) of the total E-Book collection.

## 6.8 Number of E-Books in BTISNet Libraries

Table 6.6 and figure 6.6 gives an idea about number of E-book resources are available in BTISNet libraries, E-book resources are divided into five groups on the basis of collection strength.

**Table No: 6.6- No. of E-Book Resources in BTISNet Libraries**

Sl. No	No. of E-BOOKS	Types of Centres		
		COEs	DICs	SUB-DICs
1	≤25	4(58%)	9(82%)	42(96%)
2	26-50	1(14%)	2(18%)	1(2%)
3	51-75	1(14%)		
4	76-100	1(14%)		
5	>100			1(2%)
	Total	7	11	44

**Figure : 6.6 - No. of E-Book Resources in BTISNet Libraries**

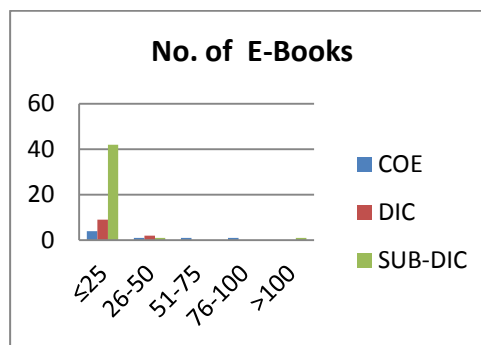


Table 6.6 and Figure 6.6 show the categorization BTISNet Libraries on basis of E-Book resources. As depicted in the Table and Figure, 1 COE is having a collection range of 76–100 & 51 -75 Ebooks. Similarly 1 COE, 2 DICs and 1 SUBDIC are having a collection range of 26-50 Ebooks. As far as DICs and SUBDICs are concerned, the collection of Ebooks seems to be poor as none of the DICS, SUBDICs are having collection range either between 51–75 or 76-100. 4 COEs, 9 DICs and 42 SUBDICs are having Ebooks collection of less than 25.

## 6.9 Total Number of E-Journals resources in BTISNet Libraries

Table 6.7 gives ideas about total number of E-Journals are available in their BTISNet centres.

**Table: 6. 7- Total No. E-Journals resources in BTISNet Libraries**

Type of Centres	Total No. of E-Journals
COEs	170(17%)
DICs	203(20%)
SUBDICs	646(63%)
Total	1019

**Figure: 6.7 - Total No. E-Journals resources in BTISNet Libraries**

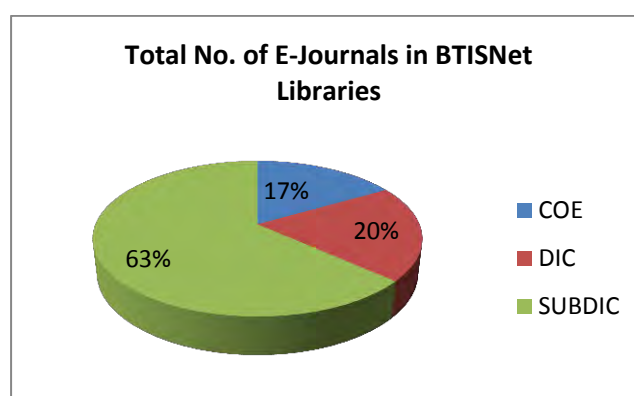


Table 6.7 and Figure 6.7 Show the total E-Journal resources available in different types of BTISNet Libraries India. COEs is having 170 E-Journal resources in which are total (17%) E-Journal resources. DICs is having 203 E-Journal resources in which are total (20%) Print resources. Collection of SubDICs is 646 E-Journal resources in which is (63%) of this total Print collection.

## 6.10 Number of E-Journals Resources in BTISNet Libraries

Table 6.8 gives ideas about number of E-Journals are available in their BTISNet centres, E-Journal resources are divided into five groups on the basis of collection strength.

**Table : 6.8 – No. of E-Journals Resources in BTISNet Libraries**

Sl. No	No. of E-Journals	Types of Centres		
		COEs	DICs	SUB-DICs
1.	≤10	1(14%)	1(9%)	7(16%)
2.	11-30	4(57%)	10(91%)	36(82%)
3.	31-50	2(29%)		1(2%)
4.	>50			
	Total	7	11	44

**Figure : 6.8 – No. of E-Journals Resources in BTISNet Libraries**

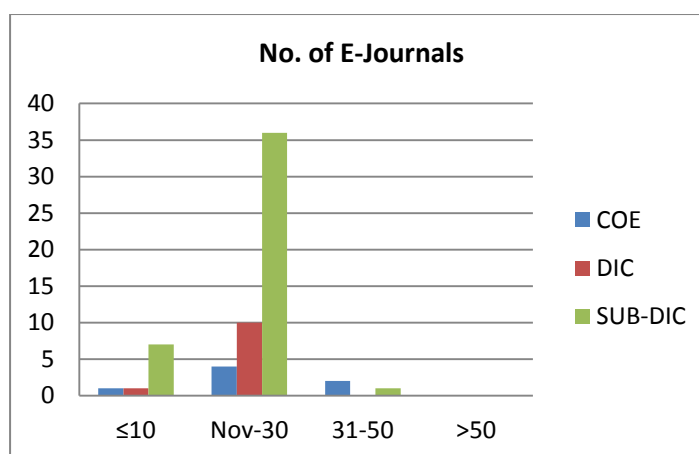


Table 6.8 and Figure 6.8 indicate that number of E-Journals Resources in BTISNet Libraries. 4 COEs e-journals subscription ranges between are 11– 30 are subscribed with is total (57%) e-Journals subscription COEs. 10 DICs e-journals subscription range between 11– 30 are subscribed with is total (91%) e- Journals subscription DICs. 36 SubDICs e-journals subscription range between 11– 30 are subscribed with is total (82%) e-Journals subscription SubDICs 2 COEs e-journals subscription ranges between 31–50 are subscribed with is total (29%) e- Journals subscription COEs.

### **6.11 Total Number of Technical Staff in BTISNet Libraries**

Table 6.9 gives ideas about total number of Technical staff are available in their BTISNet centres.



**Table : 6.9- Total No. of Technical Staff in BTISNet Libraries**

Type of Centres	Total No. of Technical Staff
COEs	12(14%)
DICs	28(33%)
SubDICs	44(53%)
Total	84(100%)

**Figure : 6.9–Total No. of Technical Staff in BTISNet Libraries**

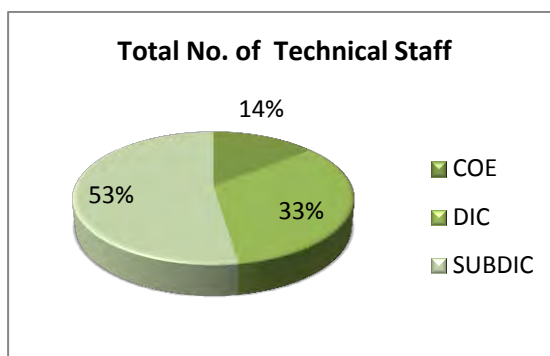


Table 6.9 and Figure 6.9 show the total number Technical staffs are available in BTISNet libraries India. COEs is having 12 Technical staffs in which are total (14%) Technical staffs are available. DICs is having 28 Technical staffs in which are total (33%) Technical staffs are available. SubDics is 44 Technical staffs in which are total (53%) Technical staffs are available.

### 6.12 Categorization on the basis No. of Technical Staffs in BTISNet Libraries

Table 6.10 gives ideas about number of Technical staffs are available in their BTISNet centres, technical staffs are divided into three groups on the basis of staff strength.

**Table: 6.10 Categorization on the basis No. of Technical Staffs in BTISNet Libraries**

Sl. No	No. of Technical Staff in BTISNet Libraries	Types of Centres		
		COEs	DICs	SUB-DICs
1.	≤2	6(86%)	5(46%)	44 (100%)
2.	3-4	1(14%)	6(54%)	
3.	>4			
	<b>Total</b>	<b>7</b>	<b>11</b>	<b>44</b>

**Figure No: 6.10 – Categorization on the basis No. of Technical Staffs in BTISNet Libraries**

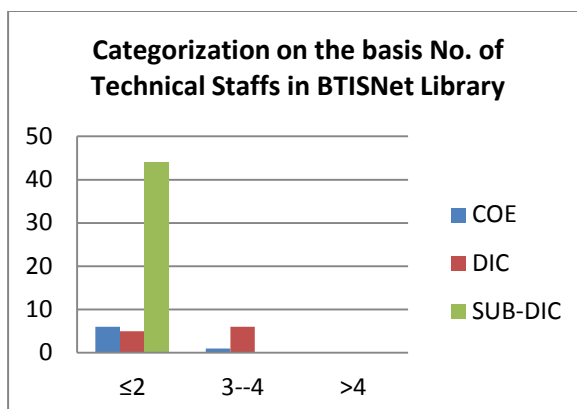


Table 6.10 and Figure 6.10 indicate that number of technical staffs in BTISNet Libraries. Total staff strength categorise into 3 groups on the basis available staffs strength. 3-4 staff group are available 1 COE which is total (14%) staff strength, 6 DICs which is total (54%) staff strength. Two and less than two staff members available in 6 COEs which is total (86%) staff strength, 5 DICs which is total (46%) staff strength and 44 SubDics which is total (100%) staff strength.

### 6.13 Total Budget Allocation year wise in BTISNet Libraries

Table 6. 11 give ideas about total budget allocation in BTISNet libraries in their BTISNet centres

**Table : 6.11 Total Budget Allocation year wise in BTISNet Libraries**

Sl. No.	Type of Centres	Total Budget Allocation		
		2011-12 – Budget Amount (In Lakhs)	2012-13 – Budget Amount (In Lakhs)	2013-14 – Budget Amount (In Lakhs)
1	COEs	18.9(9%)	18.25(10%)	20.85(12%)
2	DICs	36(18%)	31.25(17%)	29.35(17%)
3	SUBDICs	146.8(73%)	134.5(73%)	124.7(71%)
	Total	201.7	184	174.9

**Figure : 6.11 Total Budget Allocation year wise in BTISNet Libraries**

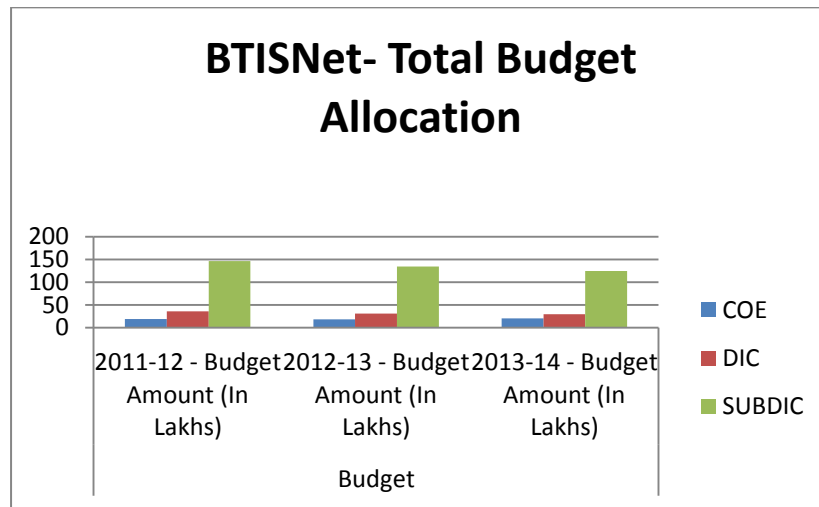


Table 6.11 and Figure 6.11 Indicate that total overall budget all 62 BTISNet centre libraries is having total budget 201.7 (in lakhs) in 2011-12 but 2012-13 total budget 174.9. Around 26.8 lakhs is budget reduced. It is found that SUBDICs is having gradually decreasing budget from 2011-12 – 146.8(73%) in lakhs, 2012-13 – 134.5(73%) in lakhs and 2013-14 -124.7(71%) in lakhs.

#### 6.14 Categorization BTISNet Libraries on the basis year wise Budget Distribution

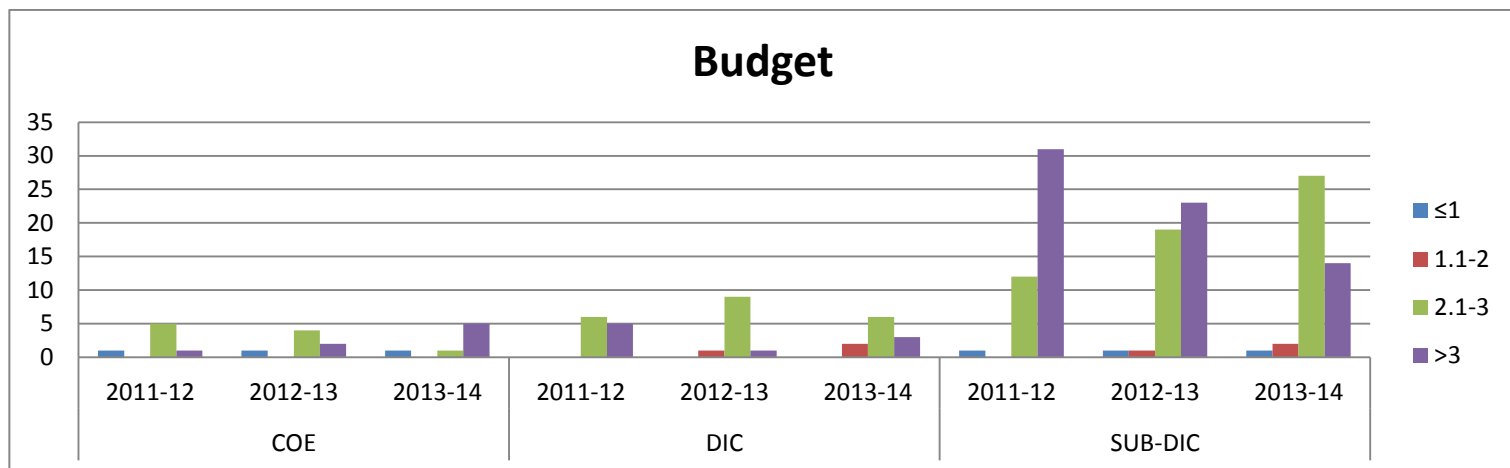
Table 6. 12 give ideas about Categorization BTISNet Libraries on the basis year wise Budget Distribution in their BTISNet centres

**Table: 6.12- Categorization BTISNet Libraries on the basis year wise Budget Distribution**

Sl. No	Budget (In Lakhs)	Type of Centres								
		COEs			DICs			SUB-DICs		
		2011-12	2012-13	2013-14	2011-12	2012-13	2013-14	2011-12	2012-13	2013-14
1.	≤1	1 (14%)	1 (14%)	1 (14%)				1 (2%)	1 (2%)	1 (2%)
2.	1.1-2					1 (9%)	2 (18%)		1 (2%)	2 (5%)
3.	2.1-3	5 (72%)	4 (57%)	1 (14%)	6 (55%)	9 (82%)	6 (55%)	12 (27%)	19 (43%)	27 (61%)
4.	>3	1 (14%)	2 (29%)	5 (72%)	5 (45%)	1 (9%)	3 (27%)	31 (71%)	23 (53%)	14 (32%)
	Total	7			11			44		

Table 6.12 and Figure 6.12 shows that Total budget all 62 BTISNet centre libraries divided into four groups 1 lakh, 1.1 – 2 lakhs, and 2.1 – 3 lakhs and above 3 lakhs. It is found that above 3 lakhs getting grant COEs 5 in the year 2013-14 it is positive sign to improve academic and research activity, further strengthen infrastructure like hardware, software and library facilities. Similar year of 2011-12 5 DICs getting above 3 lakhs grant but year 2013-14 only 2 DICs getting above 3 lakhs grant. This decrease grant will affect library services and infrastructure facilities. However, SUBDICs grant are gradually increase from financial year 2011-12 and 2012-13, Gradual decrease from financial year 2013-14. More than 3 lakhs grant received 31 SUBDICs on year of 2011-12 but 17 SUBDICs on year of 2013-14.

**Figure: 6.12 – Categorization BTISNet Libraries on the basis year wise Budget Distribution**



**6.15 Categorization BTISNet Libraries on the basis of budgetary resources**

Table number 13 gives ideas about Categorization BTISNet Libraries on the basis Resources wise Budget Distribution in BTISNet centres during 2011- 12, 2012-13 and 2013-14. **Table :6.13 — Categorization BTISNet Libraries on the basis of budgetary resources**

Type of Centres	Resources wise Budget Distributions								
	2011-12 - Budget Amount (In Rupees)			2012-13 - Budget Amount (In Rupees)			2013-14 - Budget Amount (In Rupees)		
	Books	Journals	E Resources	Books	Journals	E Resources	Books	Journals	E Resources
COEs	2,00,000 (7%)	15,20,000 (14%)	80000 (3%)	2,85,000 (10%)	13,95,000 (13%)	1,45,000 (8%)	2,65,000 (11%)	15,15,000 (15%)	3,05,000 (21%)
DICs	5,10,000 (18%)	15,70,000 (15%)	200000 (6%)	5,50,000 (19%)	21,10,000 (20%)	1,30,000 (7%)	3,00,000 (13%)	23,75,000 (23%)	20,000 (1%)
SUBDICs	21,50,000 (75%)	74,85,000 (71%)	29,30,000 (91%)	20,50,000 (71%)	70,30,000 (67%)	15,65,000 (85%)	18,15,000 (76%)	62,65,000 (62%)	11,49,000 (78%)
Total	28,60,000	1,05,75,000	32,10,000	28,85,000	1,05,35,000	18,40,000	23,80,000	1,01,55,000	14,74,000

**Figure: 6.13— Categorization BTISNet Libraries on the basis of budgetary resources**

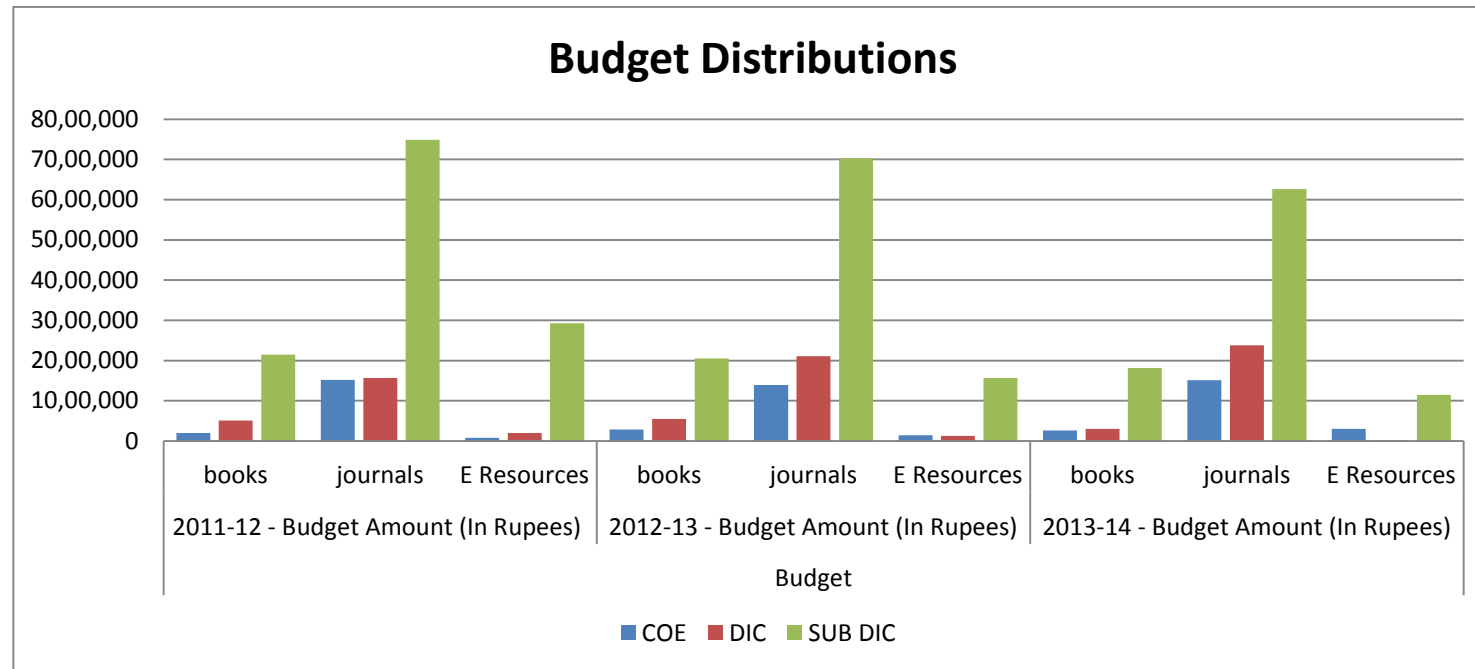


Table 6.13 figure 6.13 indicates that financial year 2011-12 SubDICs utilise budgets for journal purchase 74.85 lakhs (71%), 2012-13- 70.30 lakhs(67%) and 2013-14 -62.65 lakhs(62%). It found that E-resources allocation fund very minimal during 2011-12 -29.30 lakhs (91%), 2012-13- 15.65 lakhs (85%), and 2013-14- 11.49 lakhs (62%) limited budget SUBDICs are unable spend for E resources are Database; E journals are unable to subscribed. This will affect library services. DICs are spending E-resources allocations are 2011-12- 2.00 lakhs (6%), 2012-13- 1.30 lakhs (7%), 2013-14-20,000 (1%) very minimal. Journal subscription during 2011-12 in Rs. 1,05,75,000 ,2012-13 in Rs.1,05,35,000, and 2013-14in Rs.1,01,55,000 spending . If you go for Journal subscription through consortia .We can maximum save budget for another e-resources and infrastructure development. The Table itself indicate resource sharing and networking unavoidable one. BTISNet Coordinator takes appropriate steps to join Delcon consortia as soon as possible.

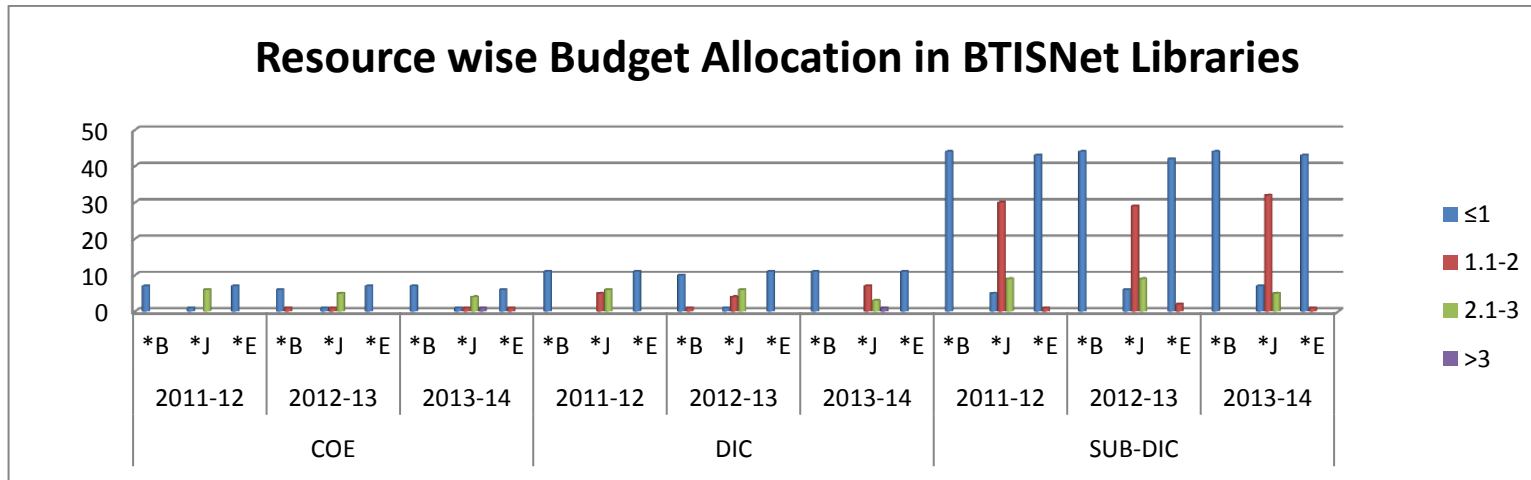
**6.16 Resource wise Budget Allocation in BTISNet Libraries**

Table 6.14 gives ideas about resources wise budget are allocated in BTISNet libraries during 2011- 12, 2012-13 and 2013-14.

**Table: 6.14 – Resource wise Budget Allocation in BTISNet Libraries**

S L. n o	Bud get (Lak hs)	Type of Centres																										
		COEs									DICs									SUB-DICs								
		2011-12			2012-13			2013-14			2011-12			2012-13			2013-14			2011-12			2012-13			2013-14		
		*B	*J	*E	*B	*J	*E	*B	*J	*E	*B	*J	*E	*B	*J	*E	*B	*J	*E	*B	*J	*E	*B	*J	*E	*B	*J	*E
1.	≤1	7 (100 %)	1 (14 %)	7 (100 %)	6 (86 %)	1 (14 %)	7 (100 %)	7(10 0%)	1 (14 %)	6 (86 %)	11 (100 %)		11 (100 %)	10 (91 %)	1 (9 %)	11 (100 %)	11 (100 %)		11 (100 %)	44 (100 %)	5 (11 %)	43 (98 %)	44 (100 %)	6 (13 %)	42(9 5%)	44 (100 %)	7 (16 %)	43 (98 %)
2.	1.1-2				1 (14 %)	1 (14 %)			1 (14 %)	1 (14 %)		5 (45 %)		1 (9 %)	4 (36 %)			7 (64 %)		30 (68 %)	1 (2 %)		29 (66 %)	2 (5%)			32 (73 %)	1 (2 %)
3.	2.1-3		6 (86 %)			5 (72 %)			4 (58 %)			6 (55 %)			6 (55 %)			3 (27 %)		9 (21 %)			9 (21 %)				5 (11 %)	
4.	>3								1 (14 %)									1(9 %)										
	Total	7									11									44								

Figure: 6.14- Resource wise Budget Allocation in BTISNet Libraries



≤1 – 1 Lakh , 1.1-2 - 1.1 lakh - 2 Lakhs, 2.1-3 – 2.1 lakh – 3 lakhs , >3 - More than 3 lakhs

\*B – Books \*J – Journals \*E – E-resources

Table 6.14 and figure 6.14 indicates that in financial year 2013-14 COEs and DICs sanction budgets of more than 3 lakhs for journals purchase. However, minimal budget BTISNet centre are unable budget allocation for our books and e-resources. Few BTISNet centres are come under DBT, autonomous institution. This BTISNet are not affect budget allocation for different purposes. All BTISNet Coordinators are requesting DBT to provide all required e-resources through Delcon Consortia. This will improve strengthen network as well E-resources sharing will happen in BTISNet in India.



## 6.17 Library Services in BTISNet Libraries

Table 6.15 gives ideas about different types of library services are providing in BTISNet libraries with categorization of COEs, DICs and SubDICs.

**Table: 6.15 - Library Services in BTISNet Libraries**

Type of Centres	Generating Fund through Library Services
COEs	Fine, Photocopying, organizing workshop Article delivery service
DICs	Fine, Photocopying, organizing workshop Article delivery service
SUBDICs	Fine, Photocopying, organizing workshop Article delivery service

Table 6.15 indicates that COEs, DICs and SubDICs generate fund through following activities: collecting fine, photocopying and article delivery service and actively participating organizing workshop in their centres. Particularly organizing workshop every year in BTISNet centres to develop trained manpower in this area.

## 6.18 Online library services in BTISNet libraries

Table 16 gives ideas about different types of online library services are providing in BTISNet libraries with categorization of COEs, DICs and SubDICs.

**Table: 6.16 - Online library services in BTISNet Libraries**

Type of Centres	library services are provide online through library's website
COEs	Institutional Repository, FAQ, Web OPAC
DICs	Institutional Repository, CD-ROM server , Plant database with IRS, Web OPAC, OSDD - Customize OS for Drug Discovery, Bio bits -Quarterly Newsletter
SUBDICs	Web OPAC, website DOMP -Database of Medicinal & Aromatic Plants in Rajasthan Bioinfo LAB, Institutional Repository

Table 6.16 show that COEs IR setup facility and centre website is available with help of Host Institution, DICs is having services like CDROM server, IR facility and specialised database made available for their researchers and students. Plant database with IRS, Web OPAC, OSDD- Customize OS for Drug Discovery, Bio bits-Quarterly Newsletter. SUBDICs are having services like Web OPAC, website DOMP-Database of Medicinal & Aromatic Plants in Rajasthan, and Bioinfo LAB Institutional Repository.

### 6.19 Consortia's membership in BTISNet libraries

Table 6.17 and figure number 18 gives ideas about different types of online library services are providing in BTISNet libraries with categorization of COEs, DICs and SubDICs.

**Table: 6.17 Consortia's membership in BTISNet Libraries**

Type of Centres	Consortia's membership
COEs	DeLCON, NKRC , INDEST, and UGC-INFONET
DICs	UGC-INFONET, NKRC, CeRA - (Con. for E-Resources in Agriculture),DeLCON,
SUBDICs	UGC-INFONET,ERMED,UGC-DAE Consortium,NKRC, CeRA, DeLCON

**Figure : 6.15 Consortia's membership in BTISNet libraries**

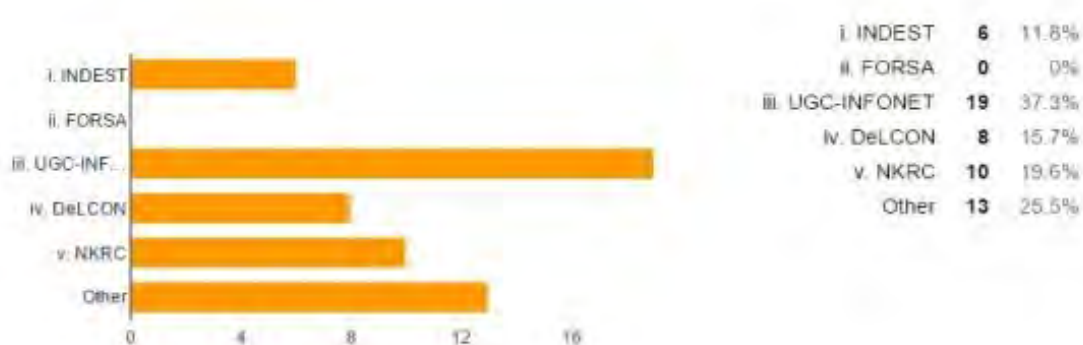


Figure 6.15 indicate that 19 (37.3%) BTISNet libraries are membership with UGC-INFONET. 10(19.6%) BTISNet libraries are membership with NKRC. 8 (15.7%) BTISNet libraries are membership in Delcon. DelCon Consortia cover few

DICs, few SubDICs, and one Bioinformatics Apex Centre. Majority BTISNet Libraries are covered with host institution Consortia access. 13(25.5%) other BTISNet libraries are membership with CeRA Consortia, UGC-DAE Consortium, and NKRC.

## 6.20 Types of resources available in BTISNet Libraries

Table 6.18 gives an idea about type of resources are provided by the type of BTISNet libraries

**Table: 6.18 - Types of Resources Available in BTISNet Libraries**

<b>Type of Centres</b>	<b>Type of Resources Available</b>
COEs	Conference Proceedings, Publication databases, Scientific databases, E-books and online journals
DICs	Course materials, Conference Proceedings, Publication databases, E-books and online journals
SUBDICs	Course materials, Conference Proceedings. Publication databases, Scientific databases, E-books and online journals

Table 6.18 indicate that BTISNet - COEs is having conference proceedings, scientific databases and publication database include biotechnology abstracts, online journals and e-books are available in their libraries. BTISNet – DICs is having Course materials along with Conference Proceedings, Scientific Databases, and publication database include Biotechnology Abstracts, Online journals and E-books are available in their libraries. BTISNet – SUBDICs is having Course materials along with Conference Proceedings, Scientific Databases, and publication database include Biotechnology Abstracts, Online journals and E-books are available in their libraries.

## 6.21 Resources sharing through network in BTISNet Libraries

Figure 6.16 gives an idea about type of resources and resource sharing through network in BTISNet Libraries.

**Figure : 6.16 -Resources sharing through network in BTISNet Libraries**

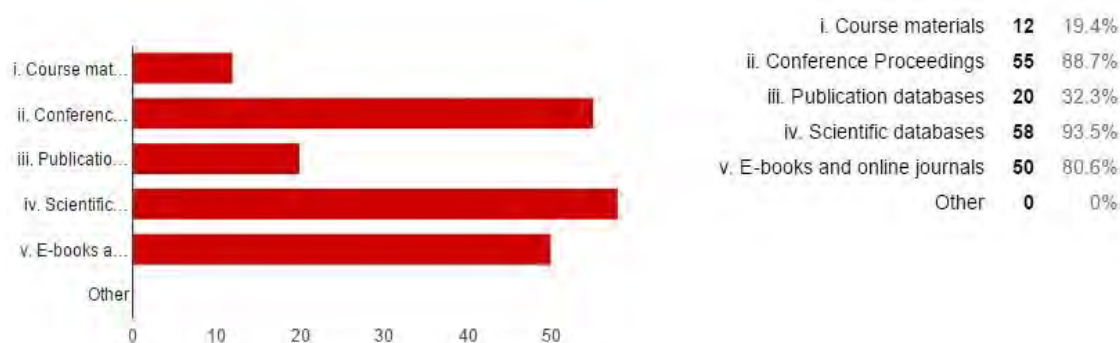


Figure 6.16 indicates that Scientific Databases and conference proceedings and E-books and journals resources are shared in this BTISNet. Course materials resources only 12 (19.4%) shared among BTISNet. Some of the BTISNet centres are running M.Sc courses. Most of the centres are considering with Bioinformatics Research. 58 (93.5%) Scientific databases are Mirror with IMTECH & NBRC Bioinformatics centres are shared among BTISNet network. This Service mainly used for Project students and Research scholar in Bioinformatics. 55(88.7%) BTISNet Annual Conference Proceedings, Bioinformatics national, and International Conference Proceedings are shared among BTISNet centre through website. 20(32.3%) Bioinformatics Publication is shared through Bioinformatics library Publication portal, which is presently maintained by JNTBGRI. 50 (80.6%) E-books and E-journals are shared with this network.

## 6.22 Resources sharing through network in BTISNet Libraries

Table 6. 19 gives an ideas about Centre wise types of resources available in BTISNET Libraries

**Table No: 6.19- Centre wise types of Resources Available in BTISNET Libraries**

Sl. No.	Type of Centres	Types of Resources Available
1	COEs	Sharing / access of online resources, Exchange of manpower, Joint /combined subscription of print resources, Joint /combined subscription of online resources
2	DICs	Sharing / access of online resources, Joint /combined subscription of print resources, Joint /combined subscription of online resources
3	SUBDICs	Sharing / access of online resources, Joint /combined subscription of print resources, Joint /combined subscription of online resources

Table 6.19 indicate that BTISNet – COEs activities is Sharing / access of online resources, Exchange of manpower, Joint /combined subscription of print resources, Joint /combined subscription of online resources. This joint subscription services are encouraging in this Network. BTISNet – DICs activities is Sharing / access of online resources, Exchange of manpower, Joined subscription of print resources, Joint /combined subscription of online resources. This Combined subscription services are encouraging in this Network. BTISNet – SUBDICs activities is Sharing / access of online resources, Exchange of manpower, Joint subscription of print resources, Joint /combined subscription of online resources. This combined subscription services are encouraging in this Network.

## 6.22 Type of services available through BTISNet Libraries

**Figure 6.17** gives an idea about type of services available through network in BTISNet Libraries.

**Figure 6.17 Type of services available through BTISNet Libraries**

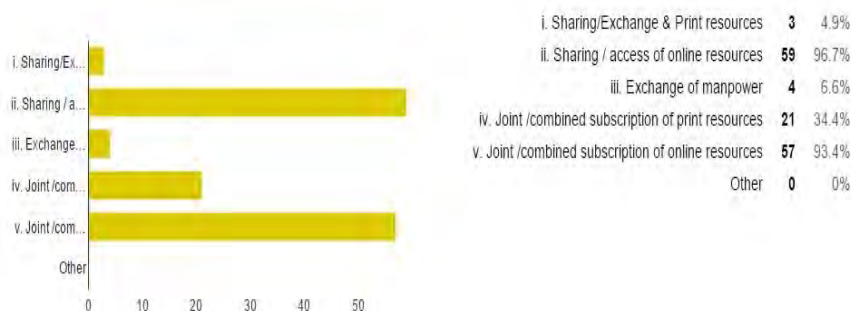


Figure 6.17 indicate that 59 (96.7%) Sharing /access of online resources 57 (93.4%) Joint subscription of online resources. 21 (34.4%) Joint subscription of print resources only. They have to develop combined acquisition policy within BTISNet. This will help particularly SUBDICs libraries should develop print resources in their libraries. 4(6.6%) exchanging of manpower. This area need urgent attention BTISNet – COEs are having trained manpower they should come forward to develop exchanging manpower programme. It will help Other BTISNet- SubDICs can start Diploma courses in Bioinformatics.

### 6.23 Types of services available through BTISNet Libraries

Table 6.20 gives an idea about dissemination of E-Resources in BTISNet libraries

**Table: 6.20 - Dissemination of E-Resources in BTISNet libraries**

Type of Centres	Dissemination of E-Resources
COEs	Portal, OPAC , A-Z list
DICs	Portal, DIACAN, Rice Info, Spice Info, Crop Varieties, website, IBIN online access facility of Library resources
SUBDICs	Portal, OPAC , A-Z list, DLI- Digital Library of India

Table 6.21 Indicate that BTISNet – COEs are E-resources Dissemination handling through Portal, Online Public Access Catalogue(OPAC) and organising e-resources information on their website using A-Z list. BTISNet- DICs are maintaining Interactive websites and they develops database for Rice Info, Spice Info, Crop Varieties information. This database can easily search and retrieved

relevant information. Researchers and farmers can get authentic information through this database. BTISNet- SUBDICs are E-resources Dissemination handling through Portal, Online Public Access Catalogue (OPAC) and organising e-resources information on their website using A-Z list. They are contributing Digital library of India (DLI) Project. Few SUBDICs are doing remarkable task with less manpower. If they get more manpower, they can also develop databases and IR.

### 6.24 Dissemination of E-Resources in BTISNet Libraries

Figure 6.18 gives an idea about dissemination of E-Resources in BTISNet libraries

**Figure 6.18 Dissemination of E-Resources in BTISNet Libraries**

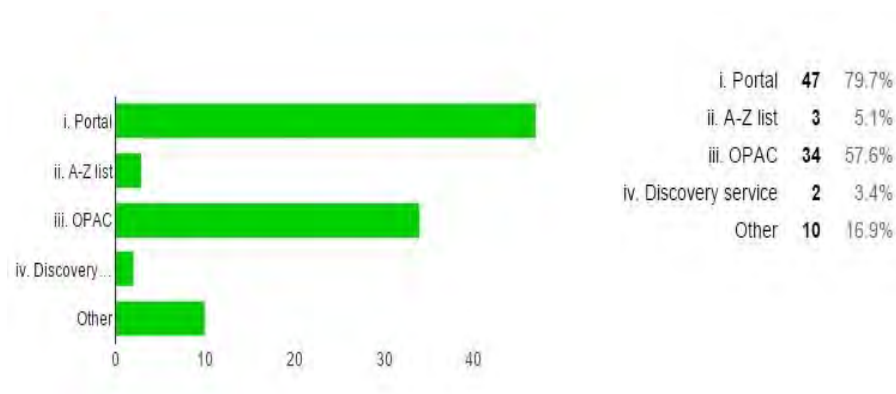


Figure 6.21 most of BTISNet centres are providing 47 (79.7%) portal services, 34 (57.6%) OPAC services, this will indicate only 34 BTISNet libraries providing OPAC services to users. In Libraries OPAC is one of the important services to local user to remote user. This is not sufficient library services. BTISNet Coordinator has to start fast action in this regard. However, existing BTISNet libraries they should know what they have library collection before buying new books. 3(5.1%) A-Z list and 2(3.4%) Discovery services are provided. Other services like specially made Information related plant species database are provided by JNTBGRI.

### 6.25 Other Funding Agencies Apart From DBT in BTISNet Centres

Table 6.21 gives an idea about other funding agency apart from DBT in BTISNet Centres

**Table: 6.21 Other Funding Agencies Apart From DBT in BTISNet Centres**

Type of Centres	Other Funding Agencies Apart From DBT
COEs	DST,MHRD, MCIT,DST, State Govt.
DICs	DST,CSIR, Ministry of Agriculture, UGC
SUBDICs	MHFW,DAE ,State Govt. , UGC, ICAR,CSIR

Table 6. 21 show that most of BTISNet-COEs centres are getting grant from DST, MHRD, Project grant from MCIT, DST. BTISNet-DICs centres are getting grant from DST, Ministry of Agriculture, and Project fund from UGC. BTISNet-SUBDICs centres are getting grant from DAE, CSIR, ICAR, UGC and State Government.

#### 6.26 Levels of satisfaction on the services provided under BTISNet Libraries

Table 6.22, Figure 6.19 gives an idea about levels of satisfaction on the services provided under BTISNet Libraries.

**Table: 6.22 - Levels of satisfaction on the services provided under BTISNet Libraries**

Sl. No	Levels of Satisfaction On The Services	Types of Centres		
		COEs	DICs	SUB-DICs
1.	Excellent	1(14%)	2(18%)	1(2%)
2.	Very good	4(57%)	7(64%)	19(44%)
3.	Good	2(29%)	1(9%)	23(52%)
4.	Average		1(9%)	1(2%)
5.	Poor			
	<b>Total</b>	<b>7</b>	<b>11</b>	<b>44</b>



**Figure: 6.19 - Levels of satisfaction on the services provided under BTISNet Libraries**



Table 6.23, Figure 6.19 show that level of satisfaction as per working librarians under BTISNet – COEs centres are 1(14%), DICs 2(18%) and SUBDICs 1(2%) service are excellent. BTISNet – COEs centres are 4(57%) DICs 7(64%) and SUBDICs 19(44%) service are very good. BTISNet – COEs centres are 2(29%) DICs 1(9%) and SUBDICs 23(52%) service are good.

### 6.27 Sufficient Resources under BTISNet Libraries

**Figure : 6.20 Sufficient Resources under BTISNet Libraries**

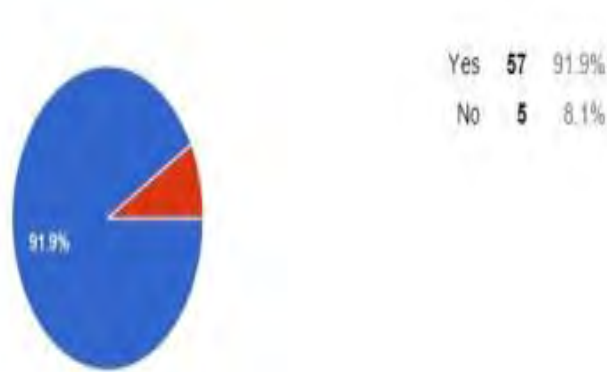


Figure 6.20 indicates that out of 62 responses 57(91.9%) they feel resources sufficient for their centre level. However, more Resources are required to actively involve resource sharing programme in this BTISNet Network. Apex bioinformatics centre to have consideration in this regard to sanction additional grant to fill up gap library resources. 5 (8.1%) SubDICs are not sufficient library resources because they are new upcoming centres with less trained manpower. The host institution and Apex

Bioinformatics Centre to have looked into serious to solve this issue on priority basis.

## 6.28 Library software used in BTISNet Libraries

Figure 6.21 - Library software used in BTISNet Libraries

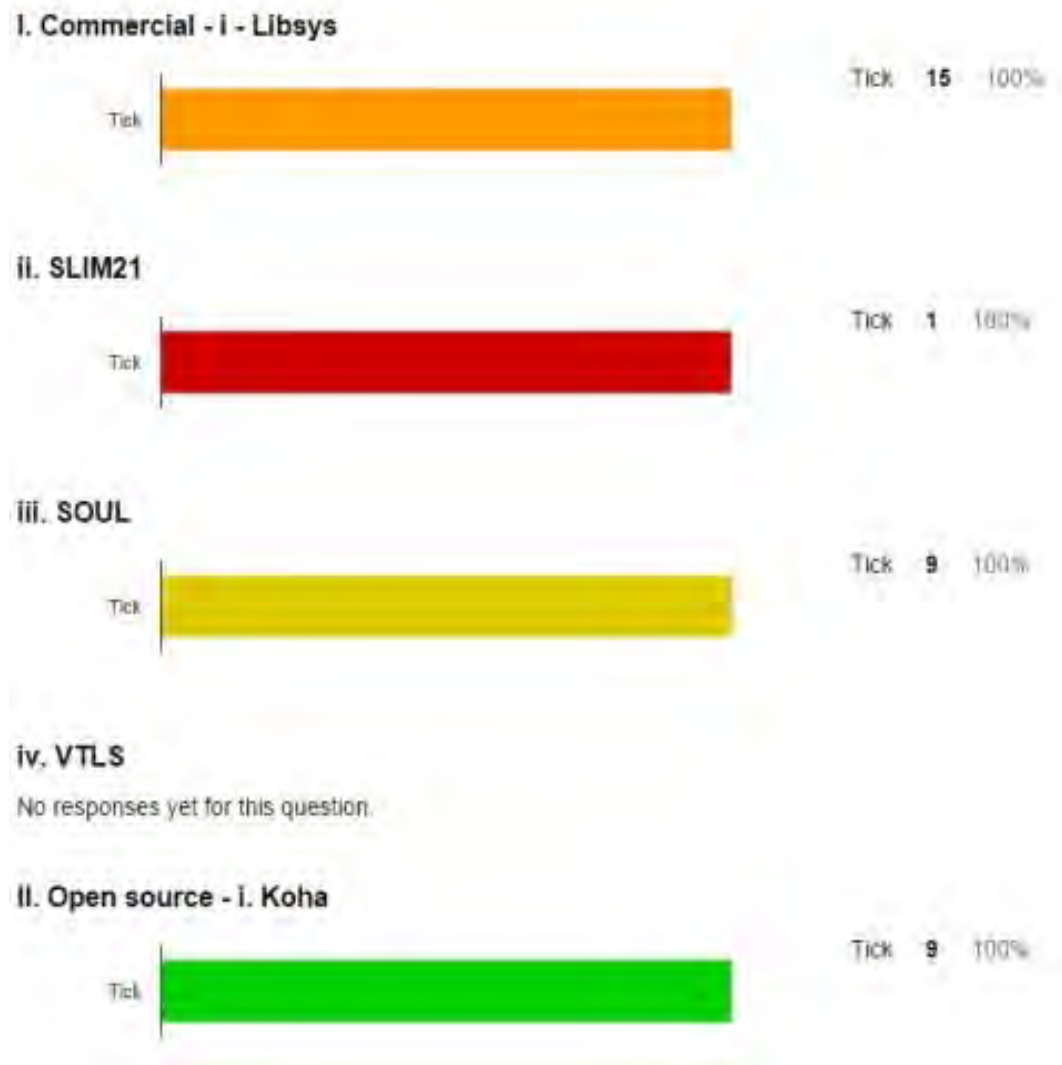


Figure 6.21 indicates that 15 libraries use LibSys Library software , 1 Library uses SLIM21, Universities BTISNet libraries are using SOUL and few SubDICs are using Koha library software.

## 6.29 Literature Database available at BTISNet Libraries

Figure: 6.22 Literature Database available at BTISNet Libraries

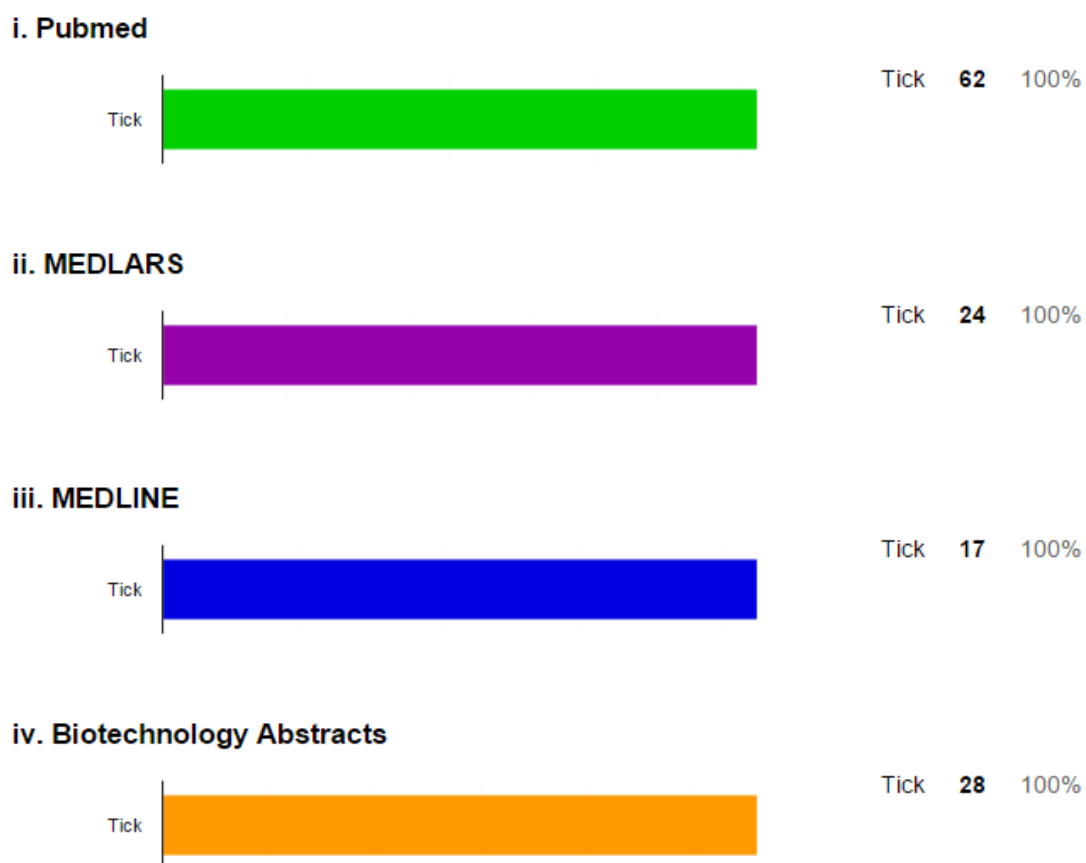


Figure 6.22 indicates that most of the BTISNet Libraries depend Pubmed 62% literature database, 28% Biotechnology Abstracts, 24% Medlars Database, 17% Medline.

### 6.30 Internet Infrastructures in BTISNet Libraries

Figure: 6.23 Internet Infrastructures in BTISNet Libraries

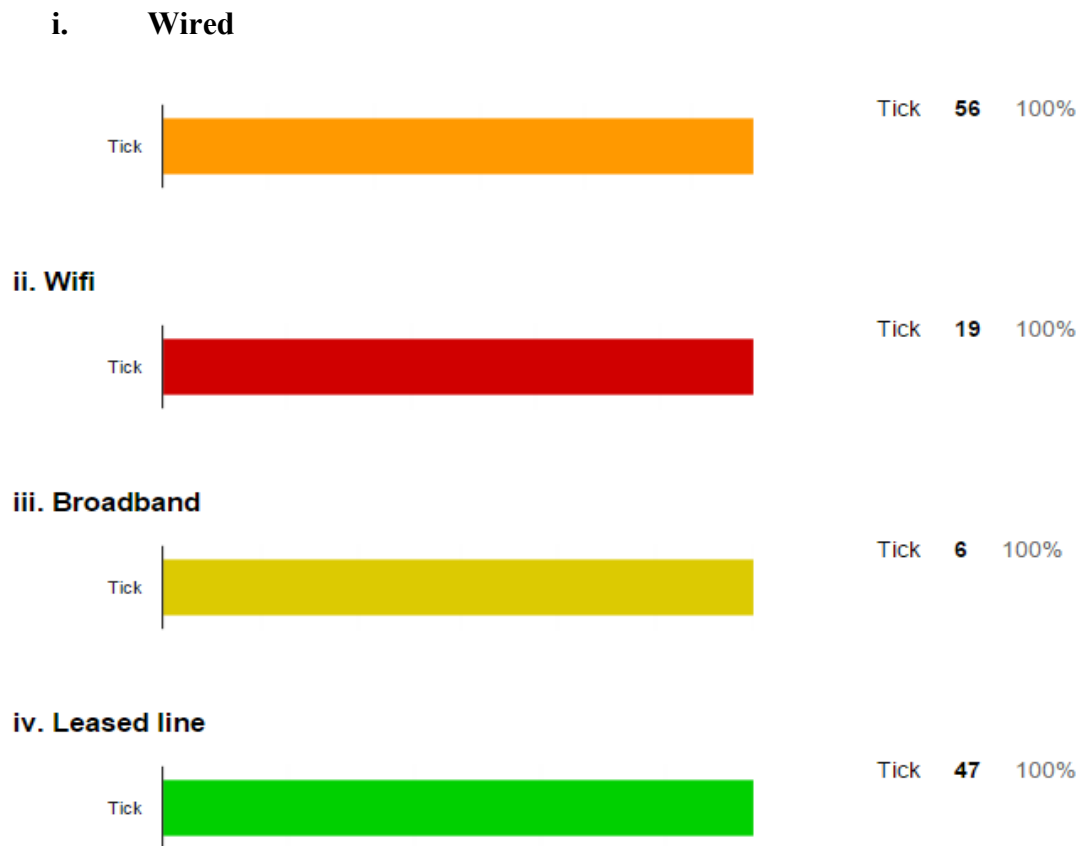


Figure 6.23 show that 56% centres are connected physical wired internet connectivity, 47% Leased Line Internet Connectivity for fast data exchange and communication among BTISNet centre throughout INDIA. 19% WIFI internet Connectivity and 6% Broadband Internet connectivity.

### 6.31 Internet Infrastructures in BTISNet Libraries

Figure 6.24: Network Connectivity in BTISNet Libraries

NKN Network



**ii. ERNET Network**



Figure 6.24 Indicate that out of 62 BTISNet centres 37 Centres are NKN Network gateway connected to the world. One centre is connected with NKN Network gateway connected to the world

**6.32 E-resources on the basis Video Lectures platform used in BTISNet Libraries**

**Figure: 6.25 E-resources on the basis Video Lectures platform used in BTISNet Libraries**

**ii. From Internet portals e-resources - i. Videolectures.net**



**ii. Youtube**



**iii. Khan Academy**



Figure 6.25 shows that E-resources on the basis video lectures platform used in BTISNet Libraries for Bioinformatics studies and research purpose. Students are frequently accessing 60% E-resources are accessing from YouTube website, 51% Video lectures from Videolectures.net, 5% video lectures accessing from Khan Academy. It shows the internet era of today. So many students have developed skills from it in addition to classroom lectures as well video lectures from internet.

### 6.33 Scientific Databases are shared among BTISNet Centres

Figure: 6.26 Scientific Databases are shared among BTISNet Centres

**a. Nucleotide Sequence Database - i. EMBL- European Molecular Biology Laboratory**



**ii. GenBank Genetic Sequence Database**



**iii. DDBJ: DNA Data Bank of Japan**



**b. Protein databases - i. Swiss-Prot annotated protein sequence database**



**ii. TrEMBL Translation of EMBL Nucleotide Sequence Databases**



**iii. PIR Protein Information Resource**



**iv. PSD Protein Sequence Database**



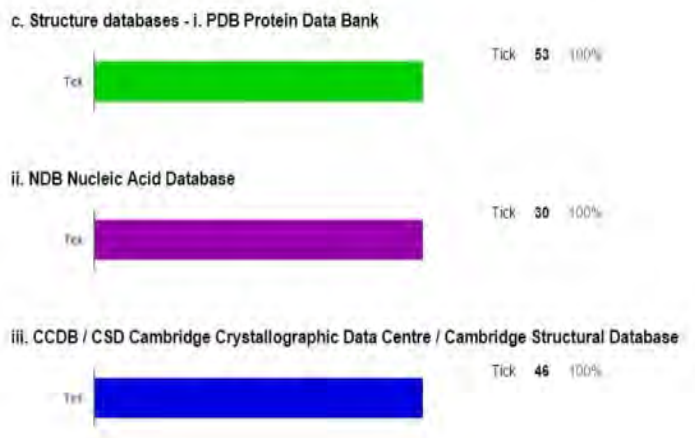


Figure 6.26 indicates that BTISNet centre are mostly for research analysis using scientific database like sequence, protein, and structure database. Librarians are trying to helping students solving their biological research problems as well train this database.

### 6.34 Sharing data through Union Catalogue

**Figure:6.27 Sharing data through Union Catalogue**

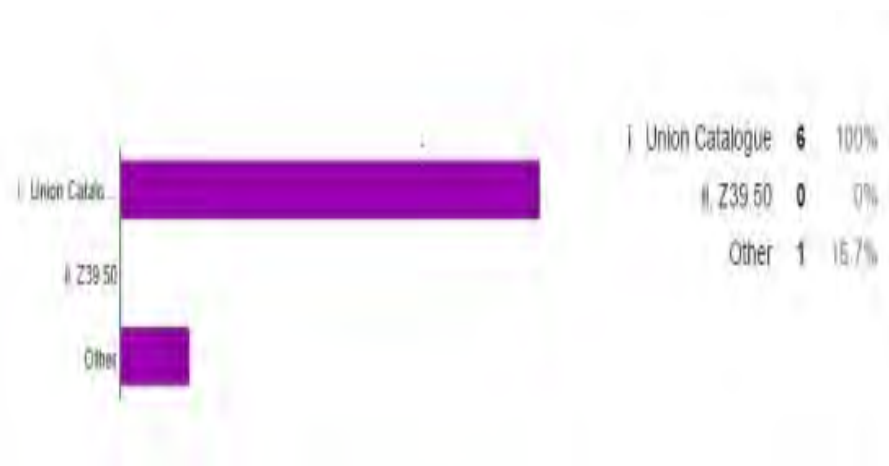


Figure 6.27 show that sharing bibliographic data sharing through Union catalogue in agricultural universities hosted BTISNet centres. They have Library are automated with Koha Library software. Their data are hosted at central place and sharing their bibliographic data among BTISNet Network.

### 6.35 Data analysis – User questionnaire

The researcher sent questionnaires to 7 COEs, 11 DICs, 51 SUBDICs. Out there, the entire BTISNet centre only 60 user responded. This total number of responses was 60 out of which 40 reported through Google online forms and 20 questionnaires through Print forms received from SP Pune University.

### 6.36 Types of resources primarily use in BTISNet Libraries

Table 6.23, Figure 6.28 get idea about Types of resources primarily use in BTISNet Libraries

**Table: 6.23 - Types of resources primarily use in BTISNet Libraries**

Resources	Nos	Percentage
Printed Books	54	90%
Printed Journals	43	71.7%
E-Books	12	20%
E-Journals	43	71.7%
Other	2	3.3%

**Figure: 6.28 Types of resources primarily used in BTISNet Libraries**





Table 6.24 and Figure.6.28 out of 60 responses 54 (90%) they need print books for their research and studies. Therefore, BTISNet libraries should concrete increase book collection in their libraries. Out of 60 responses 43 (71.7%) they prefer to use printed journals for their research and studies. 12 (20%) they prefer to use e-books.

### 6.37 Users availing services in BTISNet libraries

Table 6.24, get idea about Users availing services in BTISNet libraries

**Table: 6.24 – Users availing services in BTISNet libraries**

Services	Nos.	Percentage
Interlibrary loan	<b>32</b>	58.2%
Article Delivery Service	<b>29</b>	52.7%
Other	<b>16</b>	29.1%

Table 6.24 shows that out of 60 responses 54 (90%) they need print books for their research and studies. Therefore, BTISNet libraries should further increase book collection in their libraries. Out of 60 responses 43 (71.7%) they prefer to use printed journals for their research and studies. 12 (20%) they prefer to use e-books.

### 6.38 User requirements met in BTISNet libraries

Table 6.25, Figure 6.29 get idea about User requirements met in BTISNet libraries.

**Table: 6.25 – User requirements met in BTISNet libraries**

Rating	Nos.	Percentage
81-100%: 1	<b>22</b>	36.7%
61 – 80%: 2	<b>32</b>	53.3%
41 – 60%: 3	<b>6</b>	10%
21 – 40%: 4	<b>0</b>	0%
1- 20%: 5	<b>0</b>	0%

**Figure 6.29 User requirements met in BTISNet libraries**

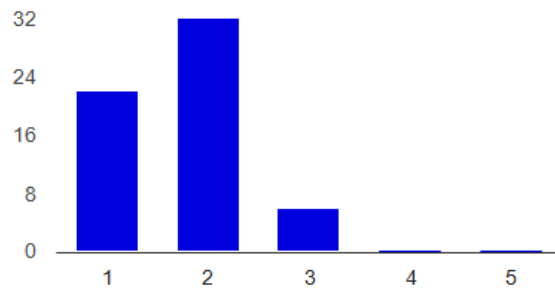


Table 6.25 Figure 6.29 shows that out of 60 responses 22 (36.7%) user requirement met (81-100%) , 32 (53.3%) user requirement met (61-80%) and 6 (10%) user requirement met (41-60%) more that 50% user feel that need more print as well e-resources in BTISNet libraries. Therefore, BTISNet libraries should get further increase in budget for collection development.

### 6.39 Reference collections on the basis of user rating in BTISNet Libraries

Table 6.26, Figure 6.30 get idea about Reference collections on the basis of user rating in BTISNet Libraries.

**Table: 6.26 Reference collections on the basis of user rating in BTISNet Libraries**

Rating	Nos.	Percentage
Excellent: 1	9	15%
Very Good 2	35	58.3%
Good: 3	16	26.7%
Average: 4	0	0%
Poor: 5	0	0%

**Figure 6.30 Reference collections on the basis of user rating in BTISNet Libraries**



Table 6.26, Figure 6.30 get idea about Reference collections on the basis of user rating in BTISNet Libraries.

Table 6.26 and Figure 6.30 shows that out of 60 responses 9 (15 %) user feedback about reference collections are excellent, 35 (58.3%) user feedback about reference collections are very good, and 16 (26.7%) user feedback about reference collections are good 16 (26.7%). Therefore, BTISNet libraries should get further increase budget for collection development, particularly reference collection.

#### 6.40 Back Volume Journal collection in BTISNet Libraries on user Rating

Table 6.27, Figure 6.31 get idea about Back Volume Journal collection in BTISNet Libraries on user Rating

**Table: 6.27 Back Volume Journal collection in BTISNet Libraries on user Rating**

Rating	Nos.	Percentage
Excellent: 1	10	16.9%
Very Good 2	39	66.1%
Good: 3	10	16.9%
Average: 4	0	0%
Poor: 5	0	0%

**Figure 6.31 Back Volume Journal collection in BTISNet Libraries on user Rating**

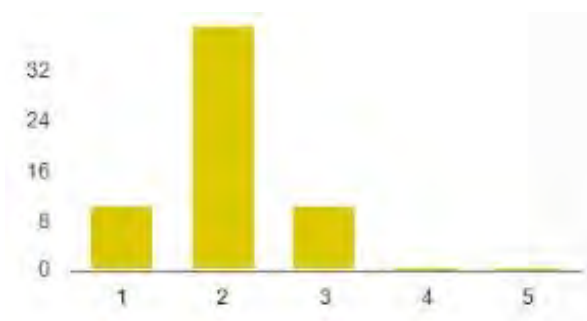


Table 6.27 and Figure 6.31 shows that out of 60 responses 9 (15 %) user feedback about back volume collections are excellent, 10 (16.9%) user feedback about back volume collections are very good, and 39 (66.1%) user feedback about reference collections are good 10 (16.9%). Therefore, BTISNet libraries should get further increase budget for collection development, particularly reference collection.

#### 6.41 Back Volume Journal collection in BTISNet Libraries on user Rating

Table 6.28; get idea about literature database in BTISNet Libraries on User Rating.

**Table: 6.28 literature database in BTISNet Libraries on User Rating**

Rating	Nos.	Percentage
Excellent: 1	4	7%
Very Good 2	30	52.6%
Good: 3	19	33.3%
Average: 4	4	7%
Poor: 5	0	0%

Table 6.28 shows that user of out 60 responses 4 students (7%) are using literature database user rating excellent, 30 students (52.6%) are using literature database user rating very good, 19 students (33.3%) are using literature database user rating good.

#### 6.42 Abstracting Service as User Prescriptive

Figure 6.32 get idea about abstracting service as user prescriptive

**Figure: 6.32 Abstracting Service as User Prescriptive**

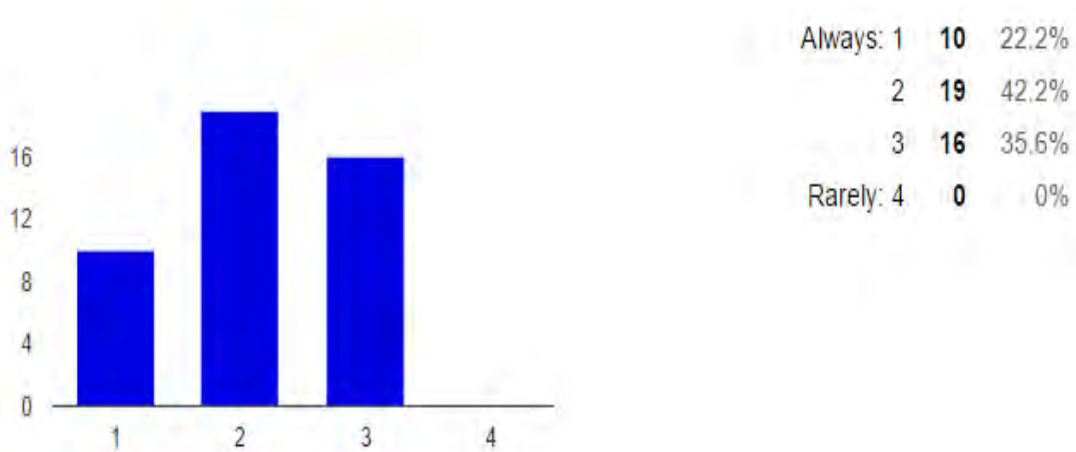
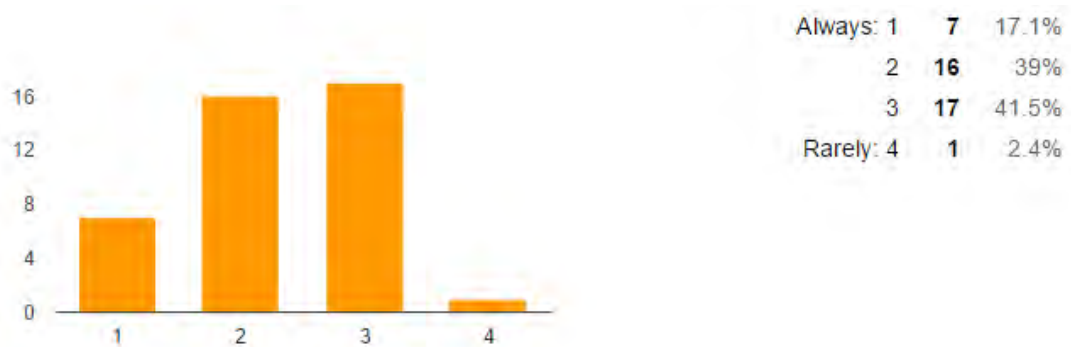


Figure 6.32 shows that user responses out of 60, 16 Students (35.6%) sometimes can use bibliographic service, 19 students (42.2%) mostly can use abstracting service, and 10 students (22.2%) use abstracting service always for their research studies in BTISNet Libraries. Students can use sometimes abstracting service in their research studies.

### 6.43 Bibliographic service

Figure 6.33 get idea about Bibliographic service as user prescriptive

**Figure : 6.33 Bibliographic service**



**1. Always 2. Mostly 3. Sometimes 4. Rarely**

Figure 6.33 shows that user responses out of 60, 17 Students (41.5%) are sometimes can use bibliographic service , 16 students (39%) are mostly can use bibliographic service, and 7 students (17.1%) use bibliographic service always for their research studies in BTISNet Libraries Students can use sometimes bibliographic service in their research studies

#### 6.44 ILL Service

Figure 6.34 get idea about ILL service as user prescriptive

**Figure: 6.34 ILL Service**

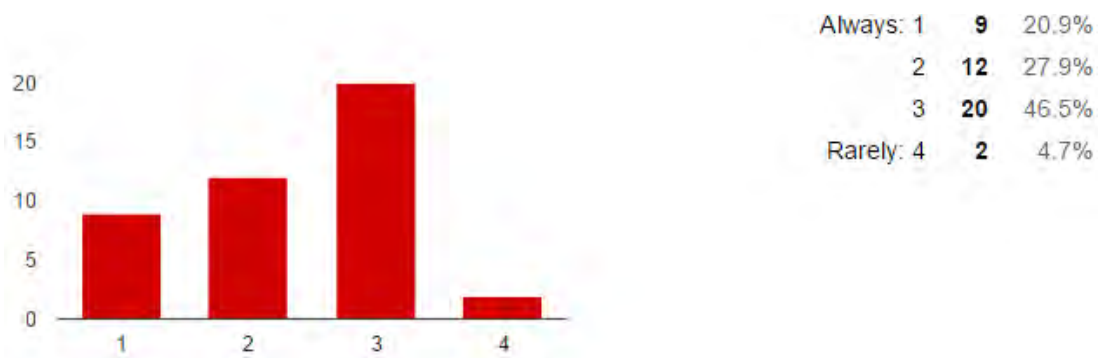


Figure 6.34 shows that user responses out of 60 , 23 Students (50%) can use ILL service for their research in BTISNet Libraries. It is found 50% students are not using ILL service. Therefore, that BTISNet should start ILL service as per user requirement.

#### 6.45 SDI Service

Figure 6.35 get idea about SDI service as user prescriptive

**Figure: 6.35 SDI Service**



**1. Always 2. Mostly 3. Sometimes 4. Rarely**

Figure 6.35 shows that user responses out of 60 ,9 students (20.9%) can use SDI service always, 12 students (27.9%) can use SDI service mostly, and 20

students (46.5%) can use SDI service sometimes for their Bioinformatics recent research development in BTISNet Libraries

### 6.46 OPAC Service

Figure 6.36 get idea about OPAC service as user prescriptive

**Figure: 6.36 OPAC Service**

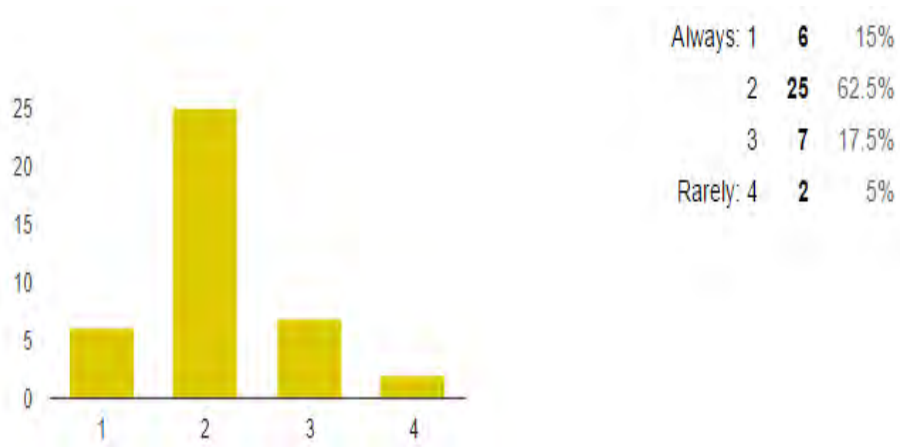


Figure 6.36 shows that user responses out of, 6 students (15%) always user OPAC service. 25 Students (62.5%) can use OPAC service mostly for their research studies in BTISNet Libraries

### 6.47 Others Centre use

Figure 6.37 get idea about Others Centre use as user prescriptive

**Figure: 6.37 Others Centre use**



Figure 6.37 shows that user responses out of 60, 46 students (80.7%) for research consultation and reference resources they use other BTISNet centre libraries 11 students (19.3%) for research consultation and reference resources they are not use other BTISNet centre libraries

#### 6.48 Service attitude towards BTISNet library Staff

Figure 6.38 get idea about service attitude towards BTISNet library staff

**Figure: 6.38 Service Attitude towards BTISNet library Staff**

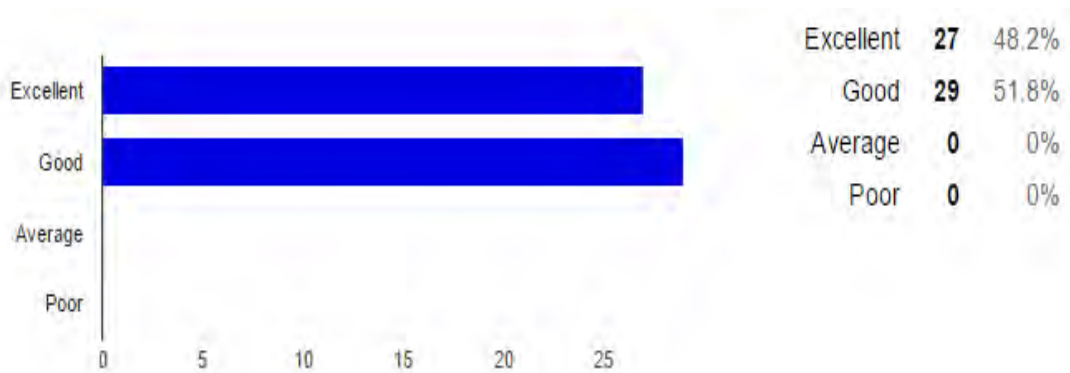


Figure 6.38 shows that service attitude towards BTISNet library staff User responses out of 60, 29 students (51.8%) and 27 Students (48.2%) for their feedback.



# Chapter 7

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*Conclusions and Recommendations*

## 7.1 Introduction

Today, we live in an information era. Every day, a lot of publications published throughout the world. Therefore, it is impossible for any modern library to pose all the resources to meet the various needs of the users. Several factors such as rapid growth of publications, shrinking financial resources, escalation of prices and ever increasing expectations of users have made the libraries to look for alternative means of resources. One of the important means is sharing of resources among themselves. The most important goal of resource sharing is to maximize the availability of materials and services at the minimum expenses. In present day, over ten million journal articles are published every year besides news items, editorials and articles that are appearing in popular print media information professionals who would be the leaders in the twenty-first century depend on information for their work. Access to information holds the key to development.

Library resource sharing, library co-operation library consortium, library linkage, library network are various terms given to the same activity which means that a group of libraries have come together and entered into some kind of formal understanding for the purpose of sharing the resources of each other's materials, functions, services, and the staff to their mutual benefit) realizing that only through resource sharing the greatest amount of the best information can be provided to most of the users at the maximum reasonable cost.

Raynard C. Swank <sup>1</sup> defined library networks as a "Concept that includes the development of co-operative systems of libraries on geographical, subject, and other lines each with some kind of centre that not only coordinates the internal activities of the system but also serves composed of two or more libraries and/or other organizations engaged in a common pattern of information exchange, through communications for some functional purpose."

Biotechnology revolution began in the 1970s and early 1980s when scientists learned to alter precisely the genetic constitution of living organisms by processes out with traditional breeding practices. This 'genetic engineering' has had a profound impact on almost all areas of traditional BT and further lead to breakthroughs in medicine and agriculture, Some of the most exciting advances will be in new pharmaceutical drugs and gene therapies to treat previously incurable diseases, to

produce healthier foods, safer pesticides, innovative environmental technologies and new energy sources.

The Indian Government had the foresight to invest in the creation of infrastructure for BT way back in 1985 by setting up a dedicated Department for Biotechnology (DBT) when the biotech wave was at best. DBT is the nodal agency for policy, promotion of research and development (R&D), international cooperation and manufacturing activities.

It is in this context, setting up of Biotechnology Information Systems Network (BTISNet)<sup>2</sup> was initiated. This has now grown up in a large information network. Though the BTISNet has started functioning, there is genuine for preparing a strategic plan for careful execution and desired successful results.

Keeping in view the above points and foregoing discussions and observations made by the investigator during the study, the following conclusions are arrived at and recommendations are put forward under following subheads:

## **7.2 Finance for Library Resource Development**

The libraries, being spending institutions, need higher budget allocations for various purposes to meet the varying information needs of the users. The various committees and commissions have given recommendations for budget allocation of around six-seven percent of the total institutional allocation for the library and information centre. Despite this norm for budget allocation, it is found that the libraries of BTISNet are getting insufficient fund for resource development. The SP Pune University Bioinformatics library is getting optimum funding and as a result, the library is well developed and well equipped. Discussed on Table 10, 11)

Table 10 and Figure 10 Indicate that Total Overall budget all 62 BTISNet centre libraries' is having total budget 201.7 (in Lakhs) -2011-12 but 2012-13 total budget 174.9. Around 26.8 lakhs is budget reduced. Apex Bioinformatics centre has to give priority to develop existing BTISNet centre in terms Infrastructure, Library collection development, Manpower. It is found that SUBDICs is having gradually decreasing budget from 2011-12 – 146.8(73%) in Lakhs, 2012-13 – 134.5(73%) in Lakhs and 2013-14 -124.7(71%) in Lakhs. Increasing SUBDICs Budget should gradually increase. This centre can easily cope up with Technological challenges

like networking security, speed access, providing service like webserver, and FTP services among BTISNet centre libraries in India.

Table 11 and Figure 11 Indicate that Total budget all 62 BTISNet centre libraries divided into four groups 1lakh, 1.1 – 2 lakhs, and 2.1 – 3 lakhs and above 3 lakhs. It is found that above 3 lakhs getting grant COEs 5 in the year 2013-14 it is positive sign to improve academic and research activity, further strengthen infrastructure like hardware, software and library facilities. Similar year of 2011-12 5 DICs getting above 3 lakhs grant but year 2013-14 only 2 DICs getting above 3 lakhs grant. This decreased grant will affect library services and infrastructure facilities. However, SUBDICs grant are gradually increase from financial year 2011-12 and 2012-13, Gradual decrease from financial year 2013-14. More than 3 lakhs grant received 31 SUBDICs on year of 2011-12 but 17 SUBDICs on year of 2013-14. This study indicates more than 50% reduced grant received from DBT, New Delhi. SUBDICs urgent need infrastructure, manpower, library resources like book, journals, and e-resources. Present scenario they are getting library resources from host institution. They are unable to self-sustain. Therefore, forthcoming financial year Apex Bioinformatics centre, DBT, to have make clear budget policy for SUBDICs centre. To further Strength Bioinformatics teaching and research activities with in BTISNet in India.

In the view of the prevailing resource, availability and looking to resource crunch in all the sphere of activities, there is no hope that situation will improve desirable. In order to solve this problem in a consistent way, it is recommended that:

There should be a separate and regular budget for the libraries of bioinformatics centres. In addition, an initial lump sum grant should be provided as start-up cost in addition to the regular annual budget.

It is observed that bioinformatics centres are continuously engaged in research projects and assignment. It is suggested that at the stage of project preparation, the provision for earmarking 10% of project cost for development of BTISNet Libraries. This will help provide an additional regular fund for BTISNet Libraries.

### 7.3 Document Resource Development

The quality and strength of collection and information resources available in the library work as parameters for measuring the effectiveness and efficiency of library services and users satisfaction. As discussed earlier, it is found that book and journal collection in most of the BTISNet libraries is inadequate reflecting low or medium satisfaction level. Discussed on Table 1 – 7

#### **Findings:**

Table Number 1 shows that total print resources are available at adequate levels in COEs But, DICs print resources are satisfactory. However, SUBDICs print resources are not satisfactory.

Table 2 and Figure 2 show that these Print resources are not sufficient for carryout research projects. Less than 2500 Print resources are available in 25 SubDics are need very urgent to increase print resources in their libraries.

Table 3 and Figure 3 represent that No. of CD/DVDs resources are available in different types of BTISNet Libraries in India. More than 2400 CD/DVDs resources are available COEs This centre CD/DVDs resources collections are satisfactory. However, very Less CD/DVDs resources are available in SUBDICs. These CD/DVDs resources are not sufficient for carryout teaching programme. Authority can made effort to buy More CD/DVDs through DelCon consortia. This will help further enhance Resource sharing and networking objective can achieved.

Table 4 and Figure 4 represent that comparatively very less in numbers E-books. Considering available Manpower, they have to buy/ subscribe more E-books in this Bioinformatics and allied subjects in their libraries. Apex bioinformatics centre has taken steps to negotiate the procure more E-books from different publishers through Delcon Consortia.

Table 5 and Figure 5 show the total number of E-Book resources available in different types of BTISNet Libraries India. It is found that overall E-Book resources very less in number among BTISNet libraries. Authority to give attention improving these resources among BTISNet libraries.

Table 6 and figure 6 gives an idea about Number of E-book resources available in BTISNet libraries, E-book resources are divided into five groups' basis of collection strength. BTISNet authorities have to look serious about these E-book resources in their libraries. First, it has to be found Students/ Researchers face difficulty to use E-books in their computers. If yes, authorities have to sanction separate budget for acquiring e-book reader device like amazon kindle. This activity is increase habits use e-books their research study. Contact user survey and other aspects to find out solution what is the barrier to acquire more e-books in these BTISNet libraries. If found that technology barrier and access licenses issues. They have to discuss e-books vendors about theses issue and negotiate cheaper price acquiring more subject and back collection of Bioinformatics. This will boost the library Reference Collection as well E-books.

Table 6 and Figure 6 show that Centre for Excellence (COEs) overall total Nos.1019 E-journals are subscribed in among 62 BTISNet libraries. COEs 170 (17%) E-journals are subscribed. SubDics 203(20%) E-journals are subscribed. This will indicate Delcon Consortia has to allow access instead of all DBT autonomous institution's all BTISNet centre libraries has access through their requirement. SubDics 646(63%) E-Journals are subscribed. This study found that Most of SubDics libraries depends on the host institution for information resources as well as manpower. Apex Bioinformatics centre has to sanction immediate budget for improving their libraries in terms of information resources and man power.

Table 8 and Figure 8 indicate that Number of E-Journals Resources in BTISNet Libraries. This number is not sufficient have to increase e-journal subscription through Delcon Consortia. Taking an advantage of Delcon consortia within BTISNet. Authorities have to make step organize regular meeting BTISNet Centre Coordinator with Delcon Consortia Coordinator. This meeting will resolve E-journals access issues, and understanding their requirement. Bioinformatics deal with different subjects, Biology, Mathematics, Chemistry, Physics, Medicine, Statistics and Engineering. Integrated Bioinformatics studies need more electronic resources across through BTISNet network. Today most of BTISNet centre libraries are connected with ERNET and National Knowledge Network (NKN) network connectivity .Take this benefit to further strengthen sharing more e-resources like books, journals, research reports and Database within BTISNet network.

#### **7.4 Database creation**

Proper organization and cataloguing of library's holding is essential for efficient location and access. The records of documents and other materials in electronic form work as a basic resource for networking. It is found that the automation of BTISNet libraries has not been properly attempted.

Figure 30 Indicate that 15 libraries using LibSys Library software, 1 Library using SLIM21, Universities BTISNet libraries are using SOUL and few SubDICs are using Koha library software.

#### **7.5 Man power**

Table 9 and Figure 9 show the total number 84 Technical staffs are available in BTISNet libraries India. This staff number is not sufficient to handle library routine tasks like acquisition, collection development, cataloguing, Technical processing, creating database and library services, CAS and SDI, Article Delivery service, ILL, Developing IR Collection. Apex Bioinformatics insist on recruiting more technical staff including library professional urgently needs at hosted BTISNet Centre around India Particularly SubDics severe manpower crunch. This is will help further strengthen this network and provide effective information services to Bioinformatics scholars.

Table 10 found that and 44 SubDics are available only one staff is available. Manpower is not sufficient to handle library services related to Network related queries and handling library management software's, unable to give time for user education and assessing user needs. Every SubDICs coordinators can approach host institution authorities as well Apex Bioinformatics Centre, DBT, New Delhi for sanctioning more staff number. Speed up library services like Union Catalogue, Article delivery service, Cooperative acquisition, Technical processing. This task should be taken up high priority among all SUBDICs BTISNet centres in India.

## 7.6 Coordinated Resource Sharing and Networking

It has been seen that all the existing BICs are working under DBT and there is the need to streamline the procedures and systems for proper coordination among the existing BICs and new BICs to setup. The following recommendations are put forward:

A policy document with minute details should be prepared at national level by DBT to provide the guideline for proper functioning of BTISNet.

Centralised procurement of costly databases and journals as well as eBooks should be initiated Deacon DBT Consortium. In addition, the facilities and resources available through INFLIBNET, Indian National Digital Library in Engineering Science & Technology (INDEST) Consortium should be utilized for enhanced accessibility of information resources. This will produce more skilled manpower in this area. The efficient system of document delivery should be established to meet the requirements of users.

In the recent meeting of the Coordinators of BICs<sup>1</sup>, it has been recommended that there should be provision for availability of online literature retrieval system within BTISNet. Taking this into consideration it is suggested to establish Publication of Bioinformatics Literature in India (PubBioinfo literature Database) on the pattern of Publication of Medical Literature Central (PubMed literature Database) existing in medical sciences established by National Centre for Biotechnology Information (NCBI), USA at international level.

Table 17 show that each BTISNet centre few are hosted in Bose Institute are part of NKRC consortia, Other IIT, Delhi, IIT Kharagpur, BTISNet centre are part of INDEST and, Other University BTISNet centre are part of UGC-INFONET consortia. NII, NBRC and NIPGR Bioinformatics centres are consortia member of Delcon because they are DBT Research Institutions, Agricultural Universities BTISNet centres are part of CeRA Consortia

DelCon Consortia should be covering all BTISNet libraries to full fill their journal requirement. They publication database portal should be updated regular basis. They should follow DBT Open access policy for their Bioinformatics Publications



They should recruit more qualified library professionals with computer knowledge personnel to handle sharing information services in this network

They should allow participating Institutional Repository (IR-DBT) in BTISNet centres. It will increase scholarly communication through BTISNet Centres.

### **7.7 Library Services**

The study found that all the Bioinformatics centres under BTISNet, Department of Biotechnology, New Delhi are providing manual library housekeeping operation around 60 per cent BTISNet Libraries are Providing computer based library services in their libraries. It is further found that BTISNet Libraries, 34 (57.6%) are providing OPAC services and of Centre for Excellence (COEs) are providing computer based reference services. Least importance has been given to document delivery services among the BTISNet libraries.

Subscribed E-journals are should access through network. Due to copyright and licences policy are restricted to access these resources all BTISNet centre. Suggestion is that Apex Bioinformatics negotiate to publisher all bioinformatics and allied subjects resources made available through this BTISNet Network.

### **7.8 Implications of the Study**

The study has focused on a modern area of interest; hence, it would be a welcome addition to the increasing literature in the library and information science.

The study will throw light on the recent expansions in the area of resource sharing and networking. Therefore, it is hoped that it will be of use to the library and information professionals.

The study has a practical orientation. Therefore, it may act as a guide to the information professionals in planning and establishing an information network. The study is inter-disciplinary in nature. As such, it is not only the library and information professionals who would be benefited but also others.

The findings suggest that BTISNet libraries are already well connected by Network Topology with National Knowledge Network (NKN) connectivity. Researcher is not proposing any network model. Because of well connectivity of BTISNet Institutions by NKN, exchanging Scientific Database among BTISNet is smooth. At present Network infrastructure is sufficient to support an efficient library network. So in the study no network is being proposed. The researcher tried to emphasise such parameters as following uniform cataloguing procedures, standardization of technical practices, adaptation of same library software, etc. which can be helpful or effective resource sharing and networking

## **7.9 Conclusion**

In view of foregoing discussions, it is apparent that libraries in present centuries will become the centres of resource sharing with no boundaries, words so ever. Library networks are expected to play major roles as partners in global networking of information centres. In the field of biotechnology in India, SP University of Pune, Bioinformatics centre has made a good beginning by coordinating Pune Library Network (PUNE-NET)<sup>3</sup>. This centre may be given responsibility to coordinate all the resource sharing activities within BTISNet. It is hoped that with right kind of initiatives in this direction will certainly give a boost to research activities in the field of bioinformatics in the country.

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From,  
**Mr. N. Nageswaran**  
**Scientific Assistant - III, IUCAA Library**  
**Pune University campus**  
**Pune - 411007.**

Respected Sir/Madam

I Mr. N. Nageswaran am working as a Scientific Assistant at IUCAA Library, Pune. I am pursuing Ph.D. Programme in the field of Library and information Science at Tilak Maharashtra Vidyapeeth (TMV), Pune under the supervision of Dr. P.N. Rath, Deputy Librarian, Gokhale Institute of Politics and Economics, Pune. My research title is “**Resource sharing and Networking in BTISNet Libraries in India**”. I shall be very grateful if you kindly spare few minutes of your valuable time to complete the questionnaire through online. Your views and information on said topics make important contribution for study of various facets of Library and Information Sciences. Your comments and suggestions will add values to my endeavor.

I shall be very grateful to you for your contribution towards my research. I assure you that the data provided by you will be coded used only for the research purpose and confidentiality will be maintained.

## **Questionnaire for Librarians**

### **1. General Information**

Name of the institution :  
Year of Establishment :  
Address :  
:  
Website :  
Email :

1.1 Type of the Centre: **COE/DIC/SUB-DIC/BNF:**  
(Please Tick any one)

## 2. Library Resources –

### 2.1. Printed in Nos.

i. Books

ii. Journal back volumes

iii. Mimeographs

iv. Grey literature

v. Other print resources

ii. Journals loose issues

i. Indian

ii. International

### 2.2. CD/ DVDs in Nos.

i. Animated CD/DVD

ii. Lectures CD/DVD (NPTEL)

iii. Any other please specify\_\_\_\_\_

## 3. Give the details of e-resources available in your library?

### 3.1. E Books in Nos.

i. Subscribed (Annual licensing)

ii. One-time Purchased

iii. Internet Archives

iv. Websites

### 3.2. E journals in Nos.

i. **Indian Journals**

i. Biology journal

ii. Bioinformatics journal

iii. Other Journals

ii. **International – Journals**

i. Biology journal

ii. Bioinformatics journal

iii. Other Journals

- 3.3. E-lectures in Nos.**
- i. Demonstration videos  ii. Video-lectures
- iii. Video-clips  iv. Any other please specify \_\_\_\_\_

**3.4. E-learning - Bioinformatics Online Courses**

i. creating e-resources Yes / No If yes. Please specify

- i. E-clipping
- ii. E-Content
- iii. E-thesis
- ii. Any other please specify \_\_\_\_\_

ii. From Internet portals e-resources

- i. Videlectures.net  ii. Youtube
- iii. Khan Academy  iv. Coursea
- v. Any other please specify \_\_\_\_\_

**3.5. E-Database**

**3.5.1. Literature databases**

- i. Pubmed  ii. MEDLARS  iii. MEDLINE
- iv. Biotechnology Abstracts  v. Grey literature yes / no.
- If yes how much volume \_\_\_\_\_

**3.5.2. Scientific databases**

**a. Nucleotide Sequence Database**

- i. EMBL- European Molecular Biology Laboratory
- ii. GenBank Genetic Sequence Database
- iii. DDBJDNA Data Bank of Japan
- iv. any other please specify \_\_\_\_\_

**b. Protein databases**

- i. Swiss-Prot annotated protein sequence database

ii. TrEMBL Translation of EMBL Nucleotide Sequence Databases

iii. PIR Protein Information Resource

iv. PSD Protein Sequence Database

v. any other please specify \_\_\_\_\_

**c. Structure databases**

i. PDB Protein Data Bank

ii. NDB Nucleic Acid Database

iii. CCDB / CSD Cambridge Crystallographic Data Centre / Cambridge Structural Database

iv. any other please specify \_\_\_\_\_

4. Give the details of Physical Networking infrastructure available in your library?

i. Wired  ii. Wi-Fi  iii. Broadband

iv. Leased line

4.1. Are you connected with any national network?

i. NKN Network  ii. ERNET Network  iii. Eduroam Wifi

5. What kind of type of Library management software packages using in your library?

i. Commercial

a. Libsys  b. SLIM21  c. SOUL

d. VTLS

ii. Open source

a. Koha  b. NewGenlib

iii. Any other - Please name and specify whether a commercial

or Open source Product \_\_\_\_\_

6. No. of Technical Staff in your Library

7. Please provide your library budget for last three years?



- i. Centralized budget  ii. Separate budget for library

Year	Budget Amount (In Lakhs)
2011-12	
2012-13	
2013-14	

8. Please furnish details of your budget under the following heads?

- i. Books  ii. Journals  iii. E-Resources   
 iv. Networking  v. Other \_\_\_\_\_

Year – 2011-12	Books	Journals	E-resources
Budget Amount			
Year – 2012-13	Books	Journals	E-resources
Budget Amount			
Year – 2013-14	Books	Journals	E-resources
Budget Amount			

9. Is the provisions in library budget are sufficient to meet your requirements

- i. Yes  ii. No.

9.1. If No. how does you meet you deficit?

- i. Generation of fund by library  ii. Donors

iii. Other sources (Please specify)\_\_\_\_\_

10. Are you generating fund through library services? Yes / No

If yes through which of the following

- i. Fine  ii. Photocopying  iii. Article delivery service  
 iv. Organizing workshop  v. Any other  
 \_\_\_\_\_

11. Which of the following library services are provide online through your library's website?

- i. Institutional Repository  ii. FAQ  iii. User Profile   
iv. Subjects Guide  v. Web OPAC   
vi. Any other \_\_\_\_\_

12. Which of the following library Consortia's membership your library has

- i. INDEST  ii. FORSA  iii. UGC-INFONET   
iv. DeLCON  v. NKRC  iv. Any other \_\_\_\_\_

13. Which type of resources available through network (BTISNet)?

- i. Course materials  
ii. Conference Proceedings  
iii. Publication databases  
iv. Scientific databases  
v. E-books and online journals  
vi. Any other please specify \_\_\_\_\_

14. What type of services do you avail through BTISNet?

- i. Sharing/Exchange & Print resources  
ii. Sharing / access of online resources  
iii. Exchange of manpower  
iv. Joint /combined subscription of print resources  
v. Joint /combined subscription of online resources  
vi. Any other please specify \_\_\_\_\_

15. Please mention the resources not covered by BTISNet

- i.  
ii.  
iii.  
iv.  
v.

16. How do you disseminate your E-resources?

- i. Portal  ii. A-Z list  iii. OPAC   
iv. Discovery service  v. Any other please specify\_\_\_\_\_

17. Apart from DBT do you receive fund from any other funding agency?

Yes/ No If yes please specify \_\_\_\_\_

18. You are sharing your library catalogue through?

- i. Union Catalogue  ii. Z39.50   
iii. Any other please specify\_\_\_\_\_

19. Please rate your level of satisfaction on the services provided under BTISNet

- i. Excellent  ii. Very good  iii. Good   
iv. Average  v. Poor

20. What about present status of Resource sharing and networking under BTISNet

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21. If you have any suggestion please specify.

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22. Is there Sufficient Print/ E-resources available in your library? Yes /  
No

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Thank you very much for participation and co-operation

Name:

Designation:

Date:

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From,  
**Mr. N. Nageswaran**  
**Scientific Assistant - III, IUCAA Library**  
**Pune University campus**  
**Pune - 411007.**

Respected Sir/Madam

I Mr. N. Nageswaran am working as a Scientific Assistant at IUCAA Library, Pune. I am pursuing Ph.D. Programme in the field of Library and information Science at Tilak Maharashtra Vidyapeeth (TMV), Pune under the supervision of Dr. P.N. Rath, Deputy Librarian, Gokhale Institute of Politics and Economics, Pune. My research title is “**Resource sharing and Networking in BTISNet Libraries in India**”. I shall be very grateful if you kindly spare few minutes of your valuable time to complete the questionnaire through online. Your views and information on said topics make important contribution for study of various facets of Library and Information Sciences. Your comments and suggestions will add values to my endeavor.

I shall be very grateful to you for your contribution towards my research. I assure you that the data provided by you will be coded used only for the research purpose and confidentiality will be maintained.

### **QUESTIONNAIRE FOR THE LIBRARY USERS**

About yourself :

Post held :

Area of Specialization :

1. What kind of resources do you primarily use?

- i. Printed Books
- ii. Printed Journals
- iii. E-Books
- iv. E-Journals
- v. Any other Please specify \_\_\_\_\_

2. How satisfied are you with library information resources for your requirements? If library information resources did not meet your requirements, which solution do you prefer?

- i. Interlibrary loan
- ii. Article Delivery Service
- iii. Any other Please specify\_\_\_\_\_

3. How long have you been using the Library? \_\_\_\_\_years

3.1 Kindly tick mark (✓) the awareness level about the resources Services and facilities of your library?

Fully / limited / not all above

## 1. Collection

a. Books

(i) Kindly indicate tick mark (✓) the adequacy of library collection in your subject fields.

Excellent / Very good / Good / Average / Poor

(ii) Kindly enlist the Sub subjects / topics having rich collection

- |    |    |
|----|----|
| 1. | 2. |
| 3. | 4. |
| 5. | 6. |

(iii) Kindly mark (✓) the percentage (%) of your requirement met by existing library collection

1-20%      21-40%      41-60%      61-80%      81-100%

(iv) Kindly mark (✓) the rating of reference collection of your Library

Excellent / Very good / Good / Average / Poor

(v) Do you play active role in strengthening the library collection?

Yes / No

b. Journals

- (i) Kindly mark (✓) the rating of Journal collection (Back Volume) in your library

Excellent / Very good / Good / Average / Poor

- (ii) Kindly mark (✓) the adequacy of journal currently subscribed in your subject field.

Excellent / Very good / Good / Average / Poor

- (iii) Kindly mark (✓) the frequency of consultation journals by you

a. Almost daily b. Occasional c. Rare

C. Dissertations / Reports

Your rating to the collection of dissertation and reports in library, if available?

Excellent / Very good / Good / Average / Poor

**2. Services**

How far your library meets your information needs?

Fully / Mostly / Partially / Rarely

Kindly Mark (✓) the service provided by the library with rating of usefulness.

**Service**

**Rating of usefulness**

- a. Information about new arrivals of

Books/periodicals and other documents Yes/ No always/mostly/  
Sometimes/rarely

- b. Abstracting & indexing service Yes/ No always/mostly/  
sometimes/rarely
- c. Bibliographic service Yes/ No always/mostly/  
sometimes/rarely
- d. SDI service Yes/ No always/mostly/  
sometimes/rarely
- e. OPAC service Yes/ No always/mostly/  
sometimes/rarely
- f. Xerox service Yes/ No always/mostly/  
sometimes/rarely
- g. Any other please specify

3. Kindly indicate (✓) your rating with staff numbers of the library as per following broad parameters.

<b>Parameter</b>	<b>Excellent</b>	<b>Good</b>	<b>Average</b>	<b>Poor</b>
i. Knowledge				
ii. Service attitude				
iii. Communication				

4. Which portal do you use to access the electronic resources?

- i. Library Homepage
- ii. OPAC
- iii. Journal Homepage
- iv. Portal
- v. Any other Please specify \_\_\_\_\_



5. What do you primarily use the electronic resources for ?

- i. Research
- ii. Project work
- iii. Writing Research Paper
- iv.

Kindly indicate your views about your library in brief along with suggestions for improvement.

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Signature

## List of Bioinformatics Centre's

Sl. No.	Bioinformatics Centre full name	Short Name
	<b>Centre for Excellence</b>	<b>COEs</b>
1	Bose Institute	BI
2	Indian Institute of Science	IISc
3	Super Computing Facility	IITD
4	Jawaharlal Nehru University	JNU
5	Madurai Kamaraj University	MKU
6	S.P. University of Pune	SPPU
7	Apex Bioinformatics Cente	DBT
	<b>Distribution Information Centre</b>	<b>DICs</b>
8	Anna University	AU
9	Centre for Cellular & Molecular Biology	CCMB
10	Indian Agricultural Research Institute	IARI
11	Institute of Microbial Technology	IMTECH
12	Kerala Agriculture University	KAU
13	M. S. Univeristy of Baroda	MSU
14	National Brain Research Centre	NBRC
15	National Institute of Immunology	NII

## List of Bioinformatics Centre's

Sl. No.	Bioinformatics Centre full name	Short Name
16	North Eastern Hill University	NEHU
17	Pondicherry University	PU
18	University of Calcutta	UC
	<b>Distribution Information Centre- Sub Centre</b>	<b>SUBDICs</b>
19	Aligarh Muslim University	AMU
20	All India Institute of Medical Sciences	AIIMS
21	ACTREC	ACTREC
22	Banasthali University	Banasthali
23	<i>Barkatullah University</i>	BU
24	Banaras Hindu University	BHU
25	Bharathidasan University	BDU
26	Biotech Park in Biotechnology City	Biotech Park
27	Birla Institute of Scientific Research	BISR
28	Birla Institute of Technology	BITS
29	Central Agricultural Research Institute	CIARI
30	Central Institute of Freshwater Aquaculture	CIFA
31	Central Institute of Medicinal And Aromatic Plants	CIMAP

## List of Bioinformatics Centre's

Sl. No.	Bioinformatics Centre full name	Short Name
32	Central Plantation Crops Research Institute	CPCRI
33	CSK Himachal Pradesh Krishi Vishwavidyalaya	CSK HPKV
34	Devi Ahilya Vishwavidyalaya	DAV
35	Dr. Y. S. Parmar University of Horticulture and Forestry	UHF
36	G.B. Pant University of Agriculture and Technology	GBPUAT
37	Guru Nanak Dev University	GNDU
38	Himachal Pradesh University	HPUNIV
39	Indian Institute of Advance Research	IAR
40	Indian Institute of Integrative Medicine	IIIM
41	Indian Institute of Spices Research	IISR
42	Indian Institute of Technology, Delhi	iitd
43	Indian Institute of Technology, Khargapur	iitkgp
44	Indian Veterinary Research Institute	IVRI
45	Institute of Life Sciences	ILS
46	Karnataka Veterinary, Animal & Fisheries Sciences University	KVAFSU
47	Mahatma Gandhi Institute of Medical Sciences	MGIMS
48	National Botanical Research Institute	NBRI

## List of Bioinformatics Centre's

Sl. No.	Bioinformatics Centre full name	Short Name
49	National Dairy Research Institute	NDRI
50	National Institute of Oceanography	NIO
51	National Institute for Plant Genome Research	NIPGR
52	National Institute of Technology	NITRR
53	Punjab Agricultural University	PAU
54	Rajiv Gandhi Centre for Biotechnology	RGCB
55	Sikkim State Council of Science & Technology	DSTSIKKIM
56	T. M. Bhagalpur University	TMBU
57	Tamil Nadu Agricultural University	TNAU
58	Tamil Nadu University for Veterinary and Animal Sciences	TNUVAS
59	Jawaharlal Nehru Tropical Botanic Garden and Research Institute	JNTBGRI
60	University of Delhi, South Campus	DU
61	University of Kashmir	KU
62	Indian Institute of Chemical Biology	IICB