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Developing Managerial Skills for Digital Environment in Engineering College Libraries in Gujarat

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DOCTOR OF PHILOSOPHY

(Library & Information Science)

By

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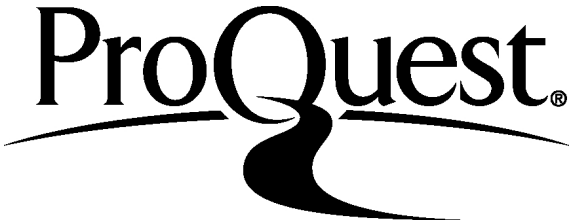

CERTIFICATE

Certified that the work incorporated in thesis entitled, "Developing Managerial Skills for Digital Environment in Engineering College Libraries in Gujarat" submitted by Chandrakant K. Patel comprises the result of independent and original investigations carried out. The material that has been obtained (and used) from other sources has been duly acknowledged in the thesis.

Place : Vallabh Vidyanagar
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Certificate

This is to certify that the research work embodied in this thesis entitled "Developing Managerial Skills for Digital Environment in Engineering College Libraries in Gujarat" was carried out by Chandrakant K. Patel, under my guidance and supervision.

I further certify that the research done by him is of his own and tends to the general advancement of knowledge. The work is original and has not from basis for award of any other degree or diploma by either this university or other university according to best of my knowledge. The work is up to my satisfaction.

Guided by

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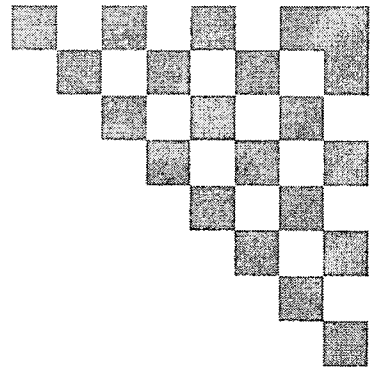
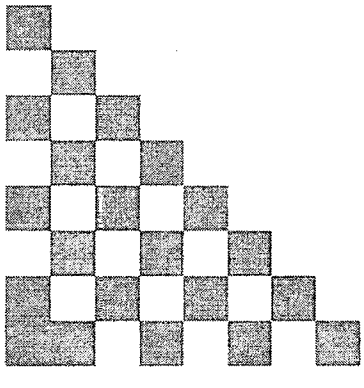


CHAPTER 1

Introduction



Chapter – 1 :

Introduction

1. Introduction:

Revolution in ICT (Information and Communication Technology) in the past couple of decades had drastic and far-reaching impacts on all aspects of human life. The Internet has added a new dimension to information technology, giving birth to such rich concepts as DLs (digital libraries), knowledge management and archiving of indigenous culture and heritage. DLs have emerged as a crucial component of global information infrastructure, adopting the latest ICT to promote an organizations structure that encourages communication between scholars across nations, and helps transcend disciplinary boundaries.

The tremendous explosion of networked information has affected the working environment of librarians in last decade. Though librarians have been organizing the world's information and making it accessible for centuries. But in recent past with the advent of INTERNET their roles has dramatically been changed. Focus has been shifted from traditional libraries to digital libraries including electronic resource management. Now the time of shrinking budgets, major emphasis is on the management of electronic resources including copyright, licensing concept, search engines and certain standards and formats. Establishing and maintaining access to electronic resources can be a painstaking, labor-intensive process full of administrative and technical challenges. Thus new scenario of library has come in to the picture. These welcoming transformations had beaten the various barriers of the traditional system

The information landscape is changing rapidly. There are many reasons for this change. Users increasingly demand resources in Electronic format because of the associated advantages (such as their ubiquitous presence, search ability, manipulability and easy accessibility). More and more library staffs are now at ease with ICT and are happy to explore the functionalities of the software/hardware to the maximum extent. Librarians are also becoming proactive and creating partnerships with the academia to design environments where ICT is being integrated into the new teaching and learning experience. The library & computing services are being integrated to support users. The number of remote users is growing fast and demand access to resources from their homes, work places and while on the move.

Universities are slowly developing institutional repositories where the information generated by its staff is archived and made freely available worldwide. Information publishers, suppliers and agents are more aware of the developing market for electronic resources and are eager to supply electronics resources / services as well as print based materials only. Further, the World Wide Web (WWW) is an important platform for delivery of information and provides a basis for the paradigm shift from ownership of physical collections to access on demand. WWW being a real time information delivery channel has also made CD-ROM based delivery superfluous.

Paradigm shift is not only taking place within the library but throughout the University systems. This is because of the changes in curricula structure provision of distance education and delivery of teaching through VLEs, using the WWW platform.

However, current library management systems are not very helpful in the management of electronic collections as they were primarily designed for print based resources and lack the capability to manage electronic resources. Dedicated electronics resources access & management systems are now appearing on the LMS' are also adding electronic resources management modules to upgrade their systems. These new generation systems will also help in the shifting of electronic resources.

Information explosion, a phenomenon of the past few decades, resulted in the exponential growth of printed matters, which created problems of bibliographical control, storage and dissemination of information. This adversely affected the service to users who had by now become more conscious and appreciative of the value of information. Information is a vital resource for socio-economic development. It affects everybody and its role is so pervasive that it has becomes so wide spread and there is a greater need of applying certain technology to information works and activities to accelerate of its use. It enables the storage, processing, retrieval and dissemination of information quickly and easily. The earlier libraries were open to their clientele for consultation within their premises. They have undergone radical changes and expanded their services over the years.

The modern libraries offer a variety of services like circulation of reading materials, reference services to the users, local information services to their clients,

getting reading materials for the users from other libraries on inter-library loan, on-line information services at national and international levels etc. information technology (IT) covers all activities and technologies that involve the handling of information by electronic means i.e. information acquisition, storage, retrieval, processing, transmission and control. IT has influenced simple business activities to high level research and development work. The quality of work and activities has been greatly change by the presents of application of Information Technology. With the introduction of modern information technology in libraries, the role of library and information science personnel is undergoing a qualitative change. It is becoming a vital component in the overall resource management of library and information centers.

The library environment has been leading towards digital and the concept of "Electronic Library" i.e. paperless documentation and information services has been taking place. "Library Automation" is used to refer the extensive use of mechanical, electronic or microelectronic equipments to perform the functions and activities associated with libraries such as acquisition, serial control, cataloguing and circulation and also to library and information services and networking. The computers are of great significant with the advancement of telecommunication and reprography technologies facilitate information scanning and retrieval of details of micro and macro documents over vast distances in no time.

Information Technology (IT) According to ALA Glossary, "Information is the application of computers and others to the acquisition, organization, storage, retrieval and dissemination of information."

Now-a-days, the current era is known as "Information Era", information industry and the information technology are the most widely known concepts in the scientific world. Information technology in its strict sense is the new science of collecting, storing, processing and transmitting information. On the other hand, the meaning of information technology is the product of fusion of "Information Science and Technology". Information Technology is the study of processes, especially computers, telecommunications etc. for storing, retrieval and sending information of all kinds. It covers all aspects of arts or science of processing data to produce

information. IT has transforming the human society to information society where information is the mainstay and life-blood of both individuals and organization.

1.1 INFORMATION TECHNOLOGY CHANGED THE ROLE OF LIBRARY PROFESSIONALS:

Libraries are knowledge banks. But as far as dissemination of information is concerned, it is not reaching the end users as effectively as it is supposed to. To maintain high standards of user services, academic libraries must continuously enhance their operations, services and understand how Information Technology (IT) fits into the academic environment. In today's environment the librarians should help their user communities by getting updated themselves with the latest technology. LISP should understand that mastery of IT is critical to strategic success and to maintain high standards. IT's importance extends beyond back office and operation, where it influences service and support. IT allows libraries to be responsive, flexible and innovative in the academic environment. The LISP should be taught about knowing how to manage information and IT functioning. The other important factors contributing to the sea change, is the increasing number of people who use and want to use Personal Computers. The computer literacy is ranging from illiteracy in many LISP to few experts. With the result most of the LISP does not still understand the issues that drive Information Science field such as need for good library application software etc. Most of the libraries still think application software as a liability. But the fact is that without application software nothing works. Mature libraries are which realize the service value of information and IT and assimilation of IT into the organization and service.

Today the change for any LISP is that how to manage knowledge, which is coming from all the available information sources. The success or failure of libraries mostly depends on the LISP who is in the middle of the hierarchy. They act as the bridges between the bosses and the subordinates. These are the people who lead the change and preparing them for the change is the key education task. For LISP, now being a PC literate alone is not sufficient, but he or she is also expected to be aware of the underlying issue such as infrastructure, application software and technological developments, in using information as a resource.

1.2 Importance of Engineering Education:

Technical education plays a vital role in human resource development of the country by creating skilled manpower, enhancing industrial productivity and improving the quality of life. Technical education covers courses and programs in Engineering. Technology, Management, Architecture, Pharmacy, Applied Arts and Crafts, Hotel Management and Catering Technology.

The technical education system in the country can be broadly divided into three categories: Central Government funded institutions, State Government funded institutions and self financed institutions.

1.3 Engineering Education: A Scenario

In its very broadest sense, the discipline of engineering is concerned with that body of theory and practice that is relevant to the design and construction of real-world artifacts arising from human endeavor. Engineering education is not only teaching in basic science, but also relies on training some personal and technical skills, modifying the student's way of thinking in a more logical way to achieve creativity at the end. The main goal of engineering education is to model a creative ethical engineer in different engineering and allied domains.

Successful engineering activity requires wide range of skills and knowledge, because the corpus of documented materials relating to engineering is now so large, sub-domains of the subject usually have to be considered for example, electronics, bio-medical, computer, chemical, electrical and so on. Naturally, the fundamental purpose of engineering education is to impart relevant skills and knowledge to those people who are interested in gaining either a general awareness of the subject or who wish to become professional engineer and/or academic researchers.

1.4 Engineering Education in India

India has the potential to be a global technology leader. The India economy has been growing at the rate of 9% per year. The Indian industry has also become

globally competitive in several sectors and can increase its global market share. A critical factor in this will be the success of the technical education systems in India. With economic growth and the spread of technology, the demand for engineers has increased manifold. This has been match by an increase in enrollments in engineering as well as is in number of engineering institutions in India.

Engineering education in India is broadly structured into three levels – at the initial level, Industrial Training Institutes (it is) offer certificate courses, then polytechnics offer three year diploma courses and finally engineering, NIITs, IITs offer graduate and higher degree coursed in various engineering disciplines.

1.5 Problems to be investigated:

The information explosion and recent development of IT have created problems in procuring, organizing and disseminating information for librarians and the actual users. The exponential growth of Engineering Education related literature is creating numerous problems. Even the biggest library system cannot afford to procure all the documents even on a micro topic. No individual can retain in his memory all that he reads his current future interest and the traditional library tools have become considerably ineffective in providing the specific information of an individual's interest.

The present scenario in the field of Engineering Education is many draw back in the adequate library services. Many educational institutes do not have sufficient library sources and do not have a digital environment. In the lacuna of this facilities teachers, researchers, scientists and decision maker face many problems. Duplication of research work, adversely affect on manpower and money.

This fact shows that Gujarat has a well developed Engineering field but all the Engineering education and research institute do not have an effective information system which is required by this field. The dominated library & information centre face money crisis. Information explosion, interaction in information sharing to overcome this problem establishing and effective balanced digital environment is the only

solution. So, researcher has invested his brain to developing managerial skills for digital environment in engineering college for Gujarat. So, researcher suggests

"Developing Managerial Skills for Digital Environment in Engineering College Libraries in Gujarat"

1.6 Key Words

Developing Managerial Skills:

A skill can be described as the ability to translate knowledge into action that results in a desired performance. Traditionally it has been considered that managers use three skills in carrying out their tasks: technical, interpersonal and conceptual. To these may be added diagnostic and analytical skills. Not all of these skills are used in equal proportion. Managers at different levels in the organization need different kinds of skills, and libraries and information centre are no exception to this rule. As librarians or information personnel progress up the hierarchy of the organization, technical and interpersonal skills diminish in importance compared to the conceptual, diagnostic and analytical skills.

Digital Environment:

The term of digital Environment is used in a wider context to include all sources, where the information is available in electronic formats and accessible with the help of computers. These sources include automated libraries, electronic libraries, virtual libraries, paperless libraries, networked libraries, libraries without walls and multimedia libraries, and all such terms are used interchangeably and synonymously.

Engineering College Libraries:

An establishment for engineering education, a college is place where students go to study after they have left school.

Gujarat:

This state is located in western India.

1.7 Need for the Study:

- To promote sharing of resources among the libraries of engineering colleges by collecting, storing, disseminating information and by offering computerized service to the users.
- To co-ordinate efforts for suitable collection development and reduce unnecessary duplication wherever possible.
- To enable the users to acquire the materials not available in their library from other libraries participating in the network systems.
- To establish a referral center for maintaining a central on-line union catalogue of books, serials and non-book material of all participating libraries.
- To develop a specialist bibliographical database of books, serials and non-book material for search and access for users.
- To process and maintain electronic and mechanical equipment's for fast communication of information retrieval.
- To evolve standards and uniform guidelines in techniques, methods, procedure, hardware, software and services for adoption by the participating libraries to facilitate pooling, sharing and exchanging resources and services.
- To co-ordinate with other national and international networks for exchange of information and documents.
- To create a database of projects, specialists and institutions for providing on-line information service.
- To assist locating out of print material and to facilitate fast retrieval in special areas.
- To take initiative for promotion of engineering research, development and innovation of information technology in engineering field.
- To prepare module of engineering college / institutions
- To prepare manpower for engineering field.

1.8 Functions of the Engineering College Libraries:

- To promote sharing of resources among the libraries of engineering colleges.
- Coordinate and communicate the resources and services.
- Facilitate efficient and economic inter – lending of information resources.

- Provide reprographic facilities.
- Establish centralized databank for quick information service.
- Formulate standards for information techniques, procedures, processes and service for use of the libraries forming part of the network.
- Establish co-ordination with other regional, national and international centers, engaged in information handling.
- Staff should be prepared for all types of services.

1.9 Aims and Objectives:

- To study the status of information technology in engineering college libraries.
- To collect the data regarding the engineering college in Gujarat.
- To collect the data of information resources stored at the library and information centers.
- To explore the possibilities to avoid the duplication of work like research, publication and resources and by that way economize the manpower and financial support.
- To explore the feasibility of establishing a common database for the all institute and to develop network in the field of engineering education.
- To find out the best format to exchange the metadata and the entire structure of proposed network including financial, manpower & techniques related to it.
- To establish a mechanism for information access, storage, retrieval and transfer in order to support the academic community.
- To provide information speedily and efficiently.
- To establish centralized databank for quick information service.
- To find out managerial skills in digital environment.
- To find out the awareness of new techniques in digital era.
- To find some guideline, which are better to serve the users.

1.10 Hypothesis:

The hypothesis is meant to provide the researcher with an opportunity, in advance of the actual data collection, to predict the results of the study. These predictions of the results are called the hypothesis of the study.

Predication was that the proper manpower & it was implemental or not. Second whether the data's are available for resource sharing or not, on the basis of his preliminary questionnaire, the researcher visited and given the questionnaire to librarians by getting feedback from them, it was prepared final questionnaires.

Today engineering college libraries in Gujarat are rapidly growing with the effect of gaining in importance. The Developing Managerial Skills for Digital Environment is the only way by which efficient, standardized and faster services to their clients are assured, besides access to a world wide data and information.

1.11 Scope of the Study:

The scope of the study is to evaluate and examine the present status of digitization, IT infrastructure and professionally trained manpower in engineering college libraries. The needs for professional personnel are format and continuing education programme and to suggest measures for improving manpower for digital environment. The idea is to provoke further discussion and reflections rather than to sharply draw any conclusion. The present study evaluated the different managerial skills possessed by libraries professionals working in more than 55 selected engineering colleges in Gujarat.

The library professionals here include the Librarians, Assistant Librarians, Library Assistants, Technical Assistants (Library), Reference Assistants, Cataloguers and Such other professional staff working in the library.

1.12 Limitation of the Study:

1. This study covers in its ambit those engineering college engaged in imparting only degree level courses in the field of engineering & technologies.
2. This study is primarily concerned with those degree engineering colleges functioning within the territorial jurisdiction of the state of Gujarat.
3. After 2009 engineering colleges are not included.

CHAPTER 2

Research Methodology

Chapter – 2 :

Research Methodology

RESEARCH METHEDOLOGY

2 Introduction:

Research is the life-blood of modern society. On it's depended our economic standard of living, our culture, and our age of progress. Research is an endeavor to discover, develop, and verify knowledge. It is an intellectual act that begins with the asking of question and progresses through the critical examination of evidence that is both relevant and reliable, the revelation of truth that is generalization and universal. Its goal is the pursuit of truth, a goal that can never be attained, but which must always to be attainable.

Research, endeavors to formulate new principles or theories and generalizations or concepts without concern for their application, and requires awareness of the state of existing knowledge and a free flow of information. It is at this point library enters into the research process and helps in its advancement. The purpose of research is to expand the horizons of knowledge for our socio-economic advancement, which in turn depends upon the progress in scientific and technological fields. Inherent in research are unpredictable demands for information which would further its direction or lead it into more fruitful paths.

Research is extremely demanding and time consuming. At times it can be trusting and painful, motivation, patience and habit of sustained work. He must be intellectually honest, possess imagination and insight into the problem area. Some of these qualities are inborn while others can be acquired. Sometimes, he would get trusted. But there are joys waiting moments of discovery. End result can be often fulfillment. As a researcher, one should have a focus built around clear objectives. He should use appropriate methods, techniques and instruments of research. He should present his results thoughtfully. A proposal for research must be prepared extremely carefully.

The development of modern research is a natural effect of newly developing social forces. The two fundamental factors leading to this are: (I) Increase in population pressure; and (II) rise in the standard of life. Population pressure has gone beyond the capacity of natural and near-natural commodities to maintain the people. The result of this is (a) the intensification of the production of natural commodities; and (b) the production of artificial commodities. These have to be based on the continuous improvement of technology; and in its turn, this has to be based upon continuous research on large-scale-development,

pragmatic research, applied research, and pure or fundamental research. But the bedrock of research is information. And it is the function of public, university, research and special libraries to disseminate information pin-pointedly, exhaustively and expeditiously.

2.1 Definition

Research in common parlance refers to a search for knowledge. One can also define research as a scientific and systematic search for pertinent information on a specific topic. In fact, research is an art of scientific investigation. The Advanced Learner's Dictionary of Current English lays down the meaning of research as "a careful investigation or inquiry especially through search for new facts in any branch of knowledge." Redman and Mory define research as a "systematized effort to gain new knowledge."

Research is an academic activity and as such the term should be used in a technical sense. According to Charles H Busha research comprises defining and redefining problems, formulating hypothesis or suggested solutions; collecting, organizing and evaluating data; making deductions and reaching conclusions; and at last carefully testing the conclusions to determine whether they fit the formulating hypothesis. D. Slesinger and M. Stephenaon in the Encyclopedia of Social Sciences define research as "the manipulation of things, concepts or symbols for the purpose of generalizing to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art."

Research is, thus, an original contribution to the existing stock of knowledge making for its advancement. It is the pursuit of truth with the help of study, observation, comparison and experiment. In short, the search for knowledge through objective and systematic method of finding solution to a problem is research. The systematic approach concerning generalization and the formulation of a theory is also research.

There is no one agreed definition of the term 'research' due to the reason that, there are different kinds of research having different purposes, settings, etc. *Webster's Third New International Dictionary of the English Language (19SI,* Vol. 2, p.1930) defines research as "as studious inquiry or examination; critical and exhaustive investigation or experimentation having for its aim the discovery of new facts and their correct interpretation, the revision of accepted conclusions,

theories, or laws in the light of newly discovered facts, or practical applications of new or revised conclusions, theories, or laws".

According to Fox D J, "Actually research is simply the process of arriving at dependable solutions to problems through the planned and systematic collection, analysis, and interpretation of data". Fox D J (1969, p.4). This is a definition in the narrow sense of the term emphasizing on the "Process of arriving at dependable solutions to problems", through planned and systematic approach. Fox says, "We must know why we do what we do, and why we do it in the way that we do, and we must also know what ways we have considered and rejected and why"(Fox, 1969, p. v) To quote J.S.Shera, it is "an intellectual process whereby a problem is perceived, divided into its constituent elements and analyzed in the light of certain assumptions ". L V Redman & A V H Moiy has given a simple definition of Research which is as follows: "In the last analysis research *per se* constitutes a method for the discovery of truth which is really a method of critical thinking..."

According to Cook format of research is as follows:

R : Rational way of thinking
E : Expert and exhaustive treatment
S : Search for solution
E : Exactness
A : Analysis
R : Relationship of facts
C : Critical or careful recording
H : Honest and hard working

Research implies the researcher is interested in more than particular result; he is interested in the repeatability of the result and in their extension to more complicated and general situations. Karl Pearson writes "The scientific method is one and same in the branches (of science) and that method is the method of all logically trained minds, the unity of all sciences consists alone in its methods, not its materials, the man who classified facts of any kind whatever who sees their mutual and is a mean of sciences.

It produces new knowledge. It enables discovery of new application for old knowledge. It helps in the development of the researcher intellectually and professionally. It is a continuous process. It leads to better teaching as new knowledge is integrated into teaching programme. It brings prestige to the person and the institutions. It can prove to be a source of income. Funded research is a source of finance. It enables an institution to attract better faculty, researchers and graduate students. It enables finding of solutions to problems, to resolve conflicts in society. It enables man to relate more effectively to his environment and achieve his purposes. It promotes progress of the society.

2.2 Research in Library and Information Science

Research in science and technology and social sciences is well established. However, need for research in Library and Information Science has not been fully recognized. This is especially true in developing countries like India. Social and economic pressures are building up which are making more and more persons to go in for research degrees and research projects. It is being realized that research in Library and Information Science has an important role to play in the educational process, creation of new knowledge in Library and Information Science, solution of problems faced by librarians/ documentalists / information scientists. It is considered that research programmes will enable the profession to achieve greater academic and professional respectability.

Socio-economic and technological changes have brought changes in the information environment. In the changing environment, information has a crucial role to play. This has led to need for highly trained personnel for providing information.

In order to utilize information effectively, national and international information networks are being set up. These require specialized manpower and research into information systems. For the advancement of Library and Information Science, strong research programmes are necessary. These can help to sharpen existing methods, techniques and tools and also enable designing of new ones.

Due to increase in the price of documents and salaries, scarcity of resources, librarians are faced with tremendous problems in the running of libraries; research can provide an answer to these problems. Research can help to

improve services to the users, lead to better utilization of documents, etc.

2.3 Barriers in Research

There is almost apathy on the part of our profession towards research. The profession has certainly not provided enough recognition or encouragement to research achievements. Not only is there a lack of interest in the research process but also a strong indifference to the results of research. Librarians themselves hardly care about the results of research. Besides disinterest, there is often distrust or hostility towards researchers as well as research process and results. Communication of research results is not satisfactory. There is scope for improvement in this context.

2.4 Types of Research

The basic types of research are as follows:

2.4.1 Descriptive vs. Analytical:

Descriptive research includes surveys and fact-finding enquiries of different kinds. The major purpose of descriptive research is description of the state of affairs as it exists at present. In social science and business research we quite often use the term *Ex post facto research* for descriptive research studies. The main characteristic of this method is that the researcher has no control over the variables; he can only report what has happened or what is happening. Most *ex post facto research* projects are used for descriptive studies in which the researcher seeks to measure such items as, for example, frequency of shopping, preferences of people, or similar data. *Ex post facto studies* also include attempts by researchers to discover causes even when they cannot control the variables. The methods of research utilized in descriptive research are survey methods of all kinds, including comparative and correlation methods. In *analytical research,* on the other hand, the researcher has to **use** facts or information already available, and analyze these to make a critical evaluation of the material.

2.4.2 Applied vs. Fundamental:

Research can either be applied (or action) research or fundamental (or

basic or pure) research. *Applied research* aims at finding a solution for an immediate problem facing a society or an industrial/business organization, whereas *fundamental research* is mainly concerned with generalizations and with the formulation of a theory. "Gathering knowledge for knowledge's sake is termed 'pure' of 'basic' research." Research concerning some natural phenomenon or relating to pure mathematics are examples of fundamental research. Similarly, research studies, concerning human behavior carried out with a view to make generalizations about human behavior, are also examples of fundamental research, but research aimed at certain conclusions (say, a solution) facing a concrete social or business problem is an example research. Research to identify social, economic or political trends that may affect a particular institution of applied or the marketing research or evaluation researches are examples of applied research. Thus, the central aim of applied research is to discover a solution for some pressing practical problem, whereas basic research is directed towards finding information that has a broad base of application and thus, adds to the already existing organized body of scientific knowledge.

2.4.3 Quantitative vs. Qualitative:

Quantitative research is based on the measurement of quantity or amount. It is applicable to phenomena that can be expressed in terms of quantity. Qualitative research, on the other hand, is concerned with qualitative phenomenon, i.e., phenomena relating to or involving quality or kind. For instance, when we are interested in investigating the reasons for human behavior (i.e., why people think or do certain things,), we quite often talk of 'Motivation Research', an important type of qualitative research. This type of research aims at discovering the under lying motives and desires, using in depth interviews for the purpose. Other techniques of such research are word association tests, sentence completion tests, story completion tests and similar other projective techniques. Attitude or opinion research i.e., research designed to find out how people feel or what they think about a particular subject or institution is also qualitative research. Qualitative research is especially important in the behavioral sciences where the aim is to discover the underlying motives of human behavior. Through such research we can analyze the various factors which motivate people to behave in a particular manner or which make people like or dislike a particular thing. It

may be stated, however, that to apply qualitative research in practice is relatively a difficult job and therefore, while doing such research, one should seek guidance from experimental psychologists

2.4.4 Conceptual vs. Empirical:

Conceptual research is that related to some abstract idea(s) or theory. It is generally used by philosophers and thinkers to develop new concepts or to reinterpret existing ones. On the other hand, empirical research relies on experience or observation alone, often without due regard for system and theory. It is data-based research, coming up with conclusions which are capable of being veered by observation or experiment. We can also call it as experimental type of research. In such a research it is necessary to get at facts firsthand, at their source, and actively to go about doing certain things to stimulate the production of desired information. In such a research, the researcher must first provide himself with a working hypothesis or guess as to the probable results. He then works to get enough facts (data) to prove or disprove his hypothesis. He then sets up experimental designs which he thinks will manipulate the persons or the materials concerned so as to bring forth the desired information. Such research is thus characterized by the experimenter's control over the variables under study and his deliberate manipulation of one of them to study its effects. Empirical research is appropriate when proof is sought that certain variables affect other variables in some way. Evidence gathered through experiments or empirical studies is today considered to be the most powerful support possible for a given hypothesis.

2.4.5 Survey Method Techniques – Questionnaires:

This method of data collection is quite popular, particularly in case of big enquiries. It is being adopted by private individuals, research workers, private and public organizations and even by governments. In this method a questionnaires is sent (usually by post) to the persons concerned with a request to answer the questions and return the questionnaire. A questionnaires consists of a number of questions printed or typed in a definite order on a form or set of forms. The questionnaire is mailed to respondents who are expected to read and understand the questions and write down the reply in the space meant for the purpose in the questionnaire itself. The respondents have to answer the questions

on their own.

The method of collecting data by mailing the questionnaires to respondents is most extensively employed in various economic and business surveys. The merits claimed on behalf of this method are as follows:

1. There is low cost even when the universe is large and is widely spread geographically.
2. It is free from the bias of the interviewer; answers are in respondents' own words.
3. Respondents have adequate time to give well thought out answers.
4. Respondents, who are not easily approachable, can also be reached conveniently.
5. Large samples can be made use of and thus the results can be made more dependable and reliable.

The main demerits of this system can also be listed here:

1. Low rate of return of the duty filled in questionnaires; bias due to no-response is often indeterminate.
2. It can be used only when respondents are educated and coopering.
3. The control over questionnaire may be lost once it is sent.
4. There is inbuilt inflexibility because of the difficulty of amending the approach once questionnaires have been dispatched.
5. There is also the possibility of ambiguous replies or omission of replies altogether to certain question; interpretation of omissions is difficult.
6. It is difficult to know whether willing respondents are truly representative.
7. This method is likely to be the slowest of all.

Before using this method, it is always advisable to conduct 'pilot study' (Pilot Survey) for testing the questionnaires. In a big enquiry the significance of pilot survey is felt very much. Pilot survey is infecting the replica and rehearsal of the main survey. Such a survey, being conducted by experts, brings to the light weaknesses (if any) of the questionnaires and also of the survey techniques. From the experience gained in this way, improvement can be effected.

2.4.5.1 Main aspects of a questionnaire:

Quite often questionnaire is considered as the heart of a survey

operation. Hence it should be very carefully constructed. If its not properly set up, than the survey is bound to fail. This fact requires us to study the main aspects of a questionnaire viz. the general from, question sequence and question formulation and wording.

2.4.5.2 Essentials of a good questionnaire:

To be successful, questionnaire should be comparatively short and simple i.e., the size of the questionnaire should be kept to the minimum. Questions should proceed in logical sequence moving from easy to more difficult questions. Personal and intimate questions should be left to the end. Technical terms and vague expressions capable of different interpretations should be avoided in a questionnaire. Questions may be dichotomous (yes or no answers), multiple choice (alternative answers listed) or open-ended. The latter types of questions are often difficult to analyze and hence should be avoided in a questionnaire to the extent possible. There should be some control questions in the questionnaire which indicate the reliability of the respondent. For instance, a question designed to determine the consumption of particular material may be asked first in terms of financial expenditure and later in terms of weight. The control questions, thus, introduce a cross-check to see whether the information collected is correct or not. Questions affecting the sentiments of respondents should be avoided. Adequate space for answers should be provided in the questionnaire to help editing and tabulation. There should always be provision for indications of uncertainty, e.g., "do not know," "no preference" and so on. Brief directions with regard to filling up the questionnaire should invariably be given in the questionnaire itself. Finally, the physical appearance of the questionnaire affects the cooperation the researcher receive from the recipients and as such an attractive looking questionnaire, particularly in mail surveys, is a plus point for enlisting cooperation. The quality of the paper, along with its colour, must be good so that it may attract the attention of recipients.

2.4.6 Some Other Types of Research:

All other types of research are variations of one or more of the above stated approaches, based on either the purpose of research, or the time required to accomplish research, or the environment in which research is done, or on the basis

of some other similar factor. From the point of view of time, we can think of research either as *one-time research or longitudinal research.* In the former case the research is confined to a single time-period, whereas in the latter case the research is carried on over several time-periods. Research can be *field-setting research or laboratory research or simulation research,* depending upon the environment in which it is to be carried out. Research can as well be understood as *clinical or diagnostic research.* Such research follows case-study methods or in-depth approaches to reach the basic causal relations. Such studies usually go deep into the causes of things or events that interest us, using very small samples and very deep probing data gathering devices. The research may be *exploratory* or it may be formalized. The objective of exploratory research is the development of hypotheses rather than their testing, whereas formalized research studies are those with substantial structure and with specific hypotheses to be tested. *Historical research* is that which utilizes historical sources like documents, remains, etc. to study events or ideas of the past, including the philosophy of persons and groups at any remote point of time. Research can also be classified as *conclusion-oriented* and decision-oriented. While doing conclusion-oriented research, a researcher is free to pick up a problem, redesign the enquiry as he proceeds and is prepared to conceptualize as he wishes. Decision-oriented research is always for the need of a decision-maker and the researcher in this case is not free to embark upon research according to his own inclination. Operations research is an example of decision oriented research since it is a scientific method of providing departments with a quantitative basis for decisions regarding operations under their control.

2.5 Social Science Research

In recent years, there is a noticeable rise in the number of studies based on refined research methods, using more sophisticated data analysis techniques. Many of these research methodologies have been borrowed from social sciences, inheriting the problems inherent in social-science research.

The range of subject matter covered by Library and Information Science research is quite wide. Researchers have drawn heavily from sociology, psychology, cybernetics, mathematics, statistics, management science etc. On

their part, librarians have contributed substantially to analytical bibliography, historical bibliography and textual criticism.

"All progress is born of inquiry. Doubt is often better than overconfidence, for it leads to inquiry, and inquiry leads to invention" is a famous "Hudson" maxim in context of which the significance of research can well be understood. Increased amounts of research make progress possible. Research inculcates scientific and inductive thinking and it promotes the development of logical habits of thinking and organization. The role of research in several fields of applied economics, whether related to business or to the economy as a whole, has greatly increased in modern times. Research provides the basis for nearly all government policies in our economic system. Research has its special significance in solving various operational and planning problems of business and industry. Research is equally important for social scientists in studying social relationships and in seeking answers to various social problems.

In Library and Information Science Research in human relations and social science research very important aspect, one naturally has to look in to the methods of research adopted in social science subjects. Research methods refer to the behavior and instruments used in selecting and constructing research techniques. The difference between methods and techniques of data collection can better be understood from the details given in the following table:

2.5.1 Types of Research

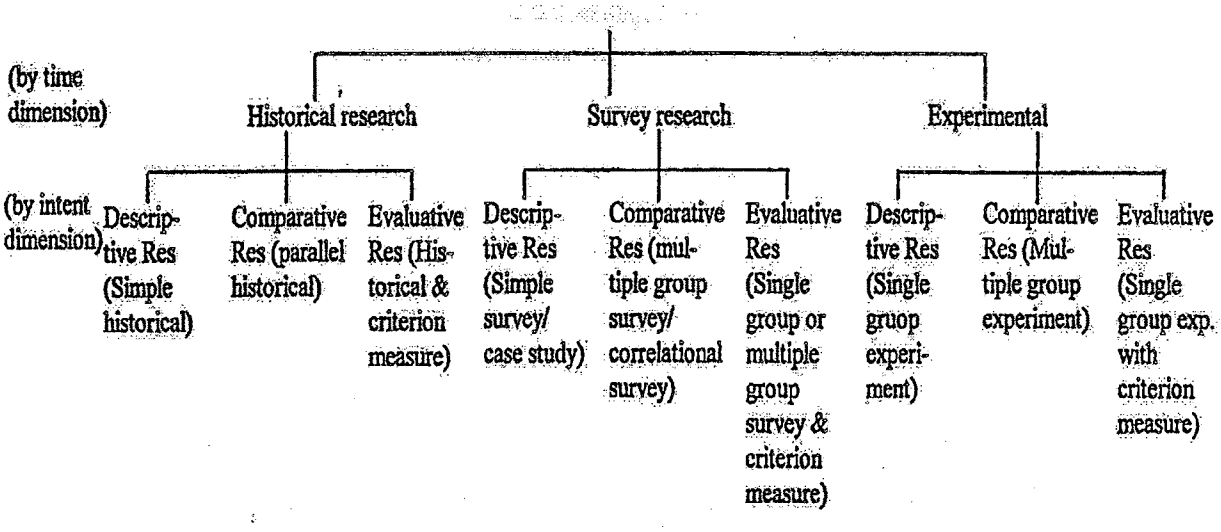
Type	Methods	Techniques
1.Library Research	(i) Analysis of historical records (ii)Analysis of documents	Recording of notes, Content analysis, tape and film listening and analysis. Statistical compilations and manipulations, reference and abstract guides, content analysis
2. Field Research	(i) Non participant direct observation (ii) Participant observation (iii) Mass observation (iv) Mail questionnaire (v) Opinionaire (vi) Personal interview (vii) Focused interview	Observation behavioral scales, use of score cards, etc. Interaction recording, possible use of tape recorders, photo graphic techniques. Recording mass behavior, interview using independent observers in public places. Identification of social and economic background of respondents. Use of attitude scales, projective techniques, use of socio-metric scales. Interviewer uses a detailed schedule with open and closed questions Interviewer focuses

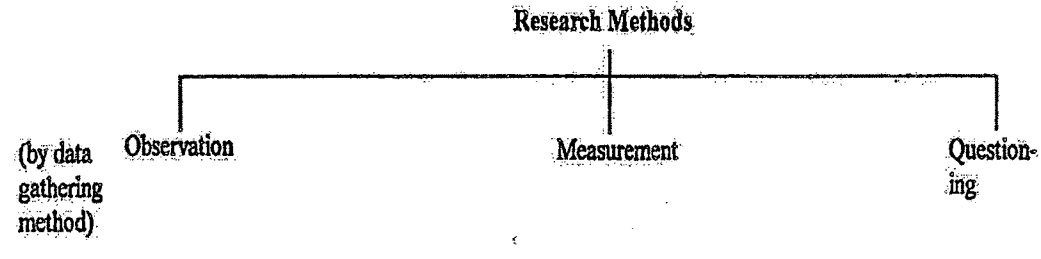
	(viii) Group interview (ix) Telephone survey (x) Case study and life history	attention upon a given experience and its effects. Small groups of respondents are interviewed simultaneously. Used as a survey technique for Information and for discerning opinion; may also be used as a follow up of questionnaire. Cross sectional collection of data for intensive analysis, longitudinal collection of data of intensive character.
3.Laboratory Research	Small group study of random behavior, play and role analysis	Use of audio-visual recording devices, use of observers, etc

From what has been stated above, we can say that methods are more general. It is the methods that generate techniques. However, in practice, the two terms are taken as interchangeable and when we talk of research methods we do, by implication, include research techniques within their compass.

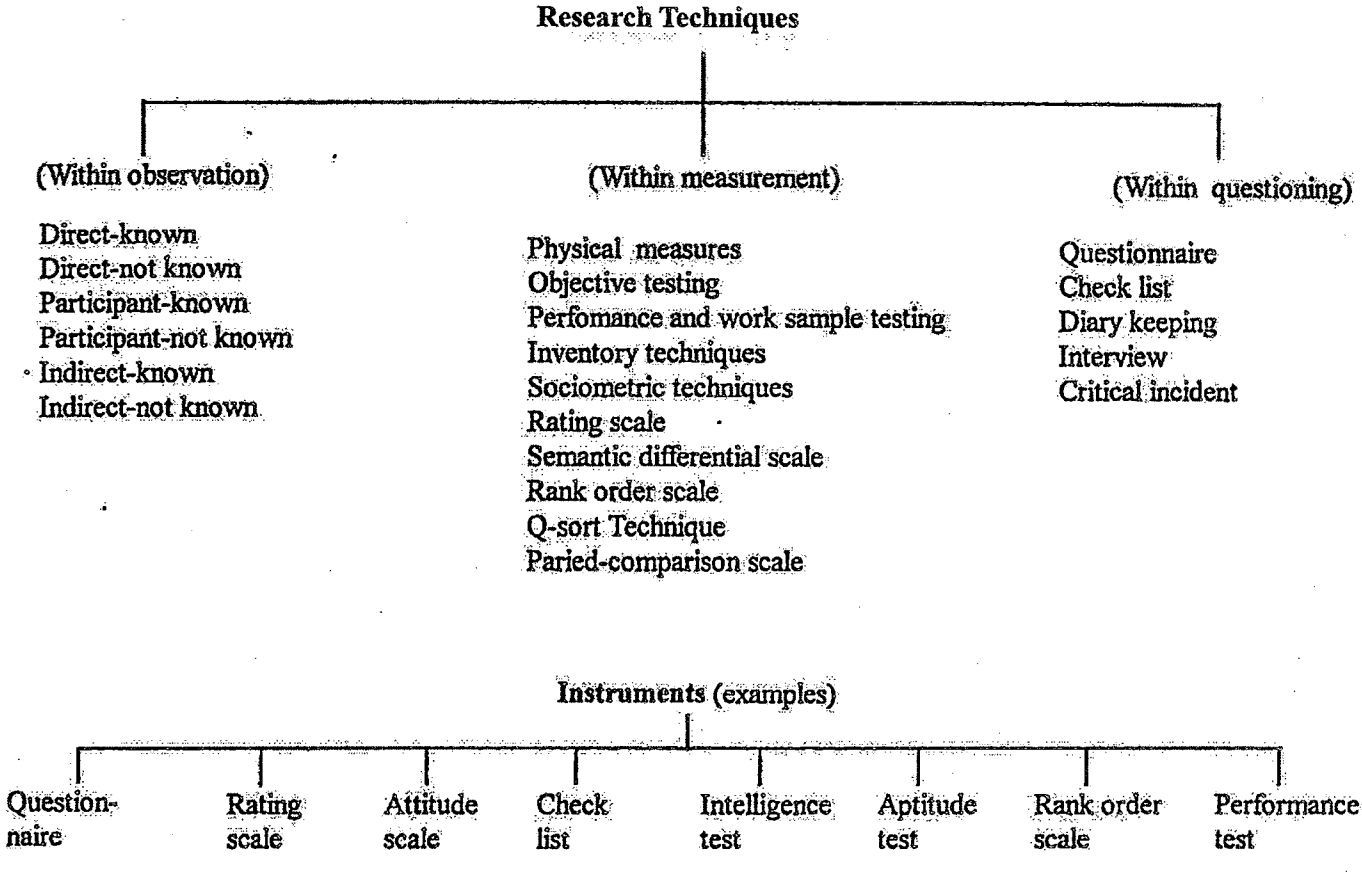
2.5.2 Approach and Methods

Research Approach





2.5.3 Research Techniques

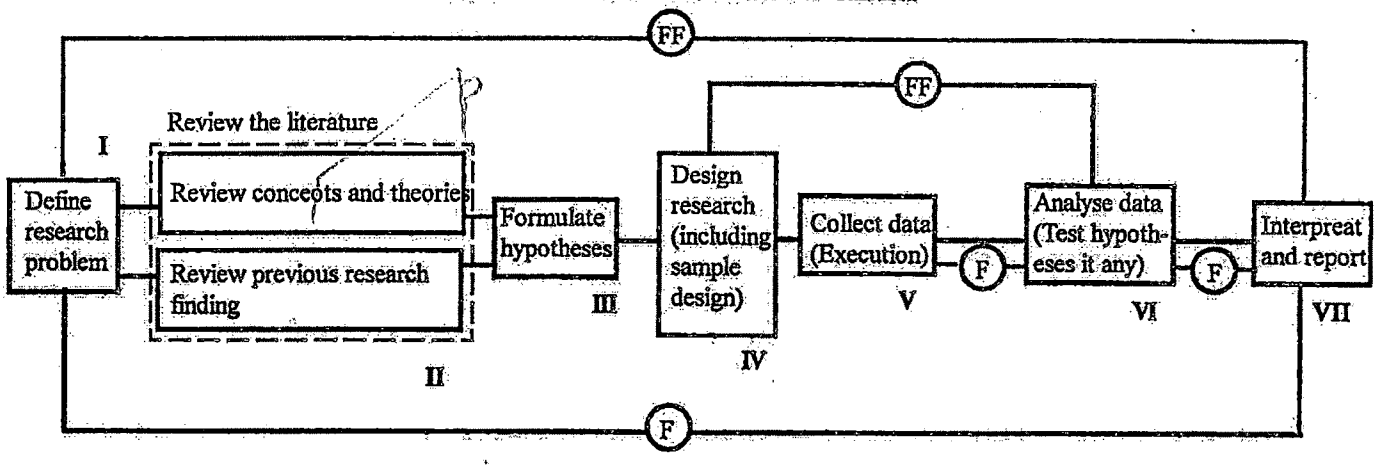


2.: Research Process

2.6 Research Process

Before embarking on the details of research methodology and techniques, it seems appropriate to present a brief overview of the research process. Research process consists of series of actions or steps necessary to effectively carry out research and the desired sequencing of these steps. The chart given as under:

RESEARCH PROCESS IN FLOW CHART



Where (F) = feed back (Helps in controlling the sub-system to which it is transmitted)

(FF) = feed forward (Serves the vital function of providing criteria for evaluation)

Regarding the research process:

The chart indicates that the research process consists of a number of closely relate activities, as shown through I to VII. But such activities overlap continuously rather than following a strictly prescribed sequence. At times, the first step determines the nature of the last step to be undertaken. If subsequent procedures have not been taken into account in the early stages, serious difficulties may arise which may involved in a research process are not mutually exclusive; nor are they separate and distinct. They do not necessarily follow each other in any specific order and the researcher has to be constantly anticipating at each step in the research process the requirement of the subsequent steps. However, the following order concerning various steps provides a useful procedural guideline regarding the research process:

1. formulating the research problem;
2. extensive literature survey;
3. developing the hypothesis testing;
4. preparing the research design;
5. determining sample design;
6. collecting the data;

7. execution of the process;
8. analysis of data;
9. hypothesis testing
10. generalizations and interpretation, and
11. Preparation of the report and presentation of the result, i.e., formal write-up of conclusions reached.

2.7 Research Design

The formidable problem that follows the task of defining the research problem is the preparation of the design of the research project, popularly known as the "research design". Decisions regarding what, where, when, how much, by what means concerning an inquiry or a research study constitute a research design. "A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure." In fact, the research design is the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. As such the design includes an outline of what the researcher will do from writing the hypothesis and its operational implications to the final analysis of data.

One may split the overall research design into the following parts:

2.7.1 Sampling design which deals with the method of selecting items to be observed for the given study;

2.7.2 Observational design which relates to the conditions under which the observations are to be made;

2.7.3 Statistical design which concerns with the question of how many items are to be observed and sampling, statistical and observational designs can be carried out.

From what has been stated above, we can state the important features of a research design as under:

(I) It is a plan that specifies the sources and types of information relevant to the research problems.

(II) It a strategy specifying which approach will be used for gathering and analyzing the data.

(III) It also includes the time and cost budgets since most studies are

done under these two constraints.

In brief, research design must, at least, contain-

(a) a clear statement of the research problem;

(b) procedures and techniques to be used for gathering information;

(c) the population to be studied; and

(d) methods to be used in processing and analyzing data.

Different research designs can be conveniently described, if we categorize them as:

(I) research design in case of exploratory research studies;

(II) research design in case of descriptive and diagnostic research studies, and

(III) research design in case of hypothesis-testing research studies.

The preparation of the research design, appropriate for a particular research problem, involves usually the consideration of the following:

(i) The means of obtaining the information.

(ii) The availability and skill of the researcher and his staff.

(iii) Explanation of the way in which selected means of obtaining information will be organized and the reasoning leading to the selection.

(iv) The time available for research.

(v) The cost factor relating to research.

In library and information science, human beings (both users and staff) are our major concern. By and large, the library offers many types of specialized serves to help in the advancement of research in society. Human beings appear to stand alone among the earth's creatures in their desire to better understand their existence and the world about them. The wants or needs can be partially satisfied by knowledge gained as a result of everyday occurrences, including trial and error; the formulation of generalizations based upon first-hand experience; and the use of logical reasoning. A more efficient and effective approach to expand knowledge, however, is the conduct of special, planned, and structured investigation- a process know as research. In its largest context research is "systematic quest for knowledge".

The method of research survey is used for discovering relevant impact and inter-relationship of social and psychological variables from given populations. Population

may be small or large and the survey research can work well by resorting to sampling practices. Survey research as a matter of facts has developed as research activities along with the development of sampling theory and its diverse procedures. Survey research is approached through the methods of personal interviews, questionnaires and personal discussion besides indirect oral investigation.

2.8 Methodology

The college libraries all over the world have their own place of Importance in the scheme of higher education. There is no doubt that where Libraries are ignored, the country as a whole suffers because the standards of study, teaching and research very heavily depend upon the qualitative and quantitative service rendered by the college libraries. So the history of library i.e. from ancient libraries to modern libraries is very significant, as there has been considerable growth and development of libraries at all levels like national, state, social, etc. There has been an exponent ional growing education institution in India.

It has been estimated that a number of colleges are added every year and new titles are added to the world's output of knowledge, adds thousands of new research dissertations, laths of research papers are being published every year, the strained financial position of libraries. Services even in the college libraries can not be rated as adequate, the use of information technology in the college libraries are not properly planned and hence it hampers library services. The study of all aspects of University & college Libraries of India was not done by any investigation before. Keeping in mind the changing scenario and need of the academic community it was decided to study the Engineering College Libraries in Gujarat.

A questionnaire method was used. A detailed questionnaire was circulated to all Engineering College Libraries in Gujarat. The questionnaire was sent to all the fifty five (55) Engineering College Libraries in Gujarat. 50 responded. The number of engineering colleges has increased from 1950-51 (i.e. 4 Engineering College) to 2008-2009 (i.e. 55 Engineering College) in Gujarat, and enrolment of students in Gujarat from 1950-51. i.e. 750 to about 18786 students in 2008- 2009, show the growth in engineering education. Hence the library also has to be well equipped to cater to the demands of users.

There was also a need for researcher to really find out what changes have taken

place with the use of new technology. i.e. computer and other such facilities, through grants/self finance .With the help of this programmed about 47 Engineering College Libraries in Gujarat till to day received grants/self finance for computerization or automation of libraries and library activities. So the researcher also examined this programe to get the idea about how much service were affected, what are the changes taken places due to this programe in the last decade. How the different types of services could be used by library users by sitting in remote areas. How the globalization has taken place with the help of Networks is examined in this survey. The researcher by collecting various historical data on development of Engineering College Libraries tried to find out the changes in print media, from ancient library to modern libraries. Lastly the use of information technology for the modernization of Engineering College Libraries in Gujarat is evaluated. The analysis is done on the basis of questionnaire sent to 55 Engineering College Libraries. Total respondents were 50 libraries. These data were analysed and presented in bar charts and pie chart with tables wherever necessary. After the analysis finally the conclusions and recommendations were made by researcher.

Hear the survey method was used because engineering colleges are wide spread in all parts of Gujarat. In the survey method Questionnaire technique is used, so that all the engineering college librarians fill up the questionnaire and which ever information supplies by there are correct of not, was verified by the researcher by visiting the colleges. Researcher visited more than 75% colleges personally.

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CHAPTER 3

Review of literature

Review of Literature & References

In the previous chapter, the researcher has discussed about the research method. In this chapter, the researcher discusses the literature review of Managerial Skills, Digital Environment and Technical Education. Literature survey has been conducted by the researcher to take stock of efforts put in by other researchers in the filed of Managerial Skills, Digital Environment, Technical Education and related areas. Literature search helps researcher to familiarize with previous similar research, determine the knowledge development relevant to the topic, literature relevance to current topic, research strategy, how others have approached to relevant literature means supporting researcher proposition. In addition, design a research based on learning from previous good or flawed research.

The researcher has refer so many books, journals, the past research thesis of different researcher and databases of different subjects as per under:

1. **Akeroyd (2002),** In order to provide an effective operational and coherent approach to electronic resources in a distributed library environment, the following technical developments will have to be achieved.

- Authorization and authentication, that is establishing that people are who they say they are so as to authorize access to licensed resources and to different material for different groups of users and so on.
- Authentication will need to get stronger if we want to move to more robust transactions in published material and we will need to understand far more about our users that their basic status if we want to better tailor services to their needs.
- We need to provide simple coherent ways of searching out and rendering resources, restating the point that the search model may well change given the changing context of delivery and the increasing use of linkages as a simplified approach to citation searching.
- We need to build tools and services which can allow users to navigate in collection which are both subject and institution specific and which can provide

the jumping off points to support browsing.

- We need to develop better filtering tools and push type systems thus saving user effort by alerting them to requirements as and when they need them. Push can be used to create and sustain virtual and real research groups, to monitor the output of specific annual conferences, to monitor training and similar opportunities, and to identify citations, particularly to your own research.

2. **Albritton and Thomas (1990),** Developed as a self- instructional tool for an internship program at the university of Missouri-Columbia libraries, this sourcebook contains readings, instruments, and exercises designed to help individuals improve their leadership potential and skills in the library profession. Intended for librarians at all levels of the organization, it contains articles and excerpts from a variety of disciplines, and is based on the idea that effective leadership depends on understanding of one's strengths, weaknesses, abilities, and motivations. Part one, "Leadership and organizations" defines leadership and focuses on theoretical implications of various leadership models and how they may be applied to library management. Part two, "Self awareness", focuses on how leaders may examine their self- concepts and understand themselves as leaders. Part three, "Self- Development", focuses on managerial aspects of leadership, such as improving communication skills, time management, stress management, goal-setting, problem-solving, listening, and ethics. Part 4, "professional Growth and Development", looks at career planning and development at different life stages, mentoring relationships, well-being, and motivation, as well as working with groups. Part four contains ten self-assessment instruments that allow readers to measure their own progress toward becoming effective leaders.

3. **Alexandras koulouris (2005),** made a study of 10 leading university digital libraries world wide relating to access and reproduction of digital collection. The factors such as the creation type of material, acquisition method, copyright ownership etc. The relationship of these factors is analyzed showing how acquisition methods And copyright ownership affect the access and reproduction policies of digital collections. The common practice on access and reproduction policies are extracted and conventional policies are changed into digital policies

4. **Ashcroft (2004),** Communication skills are also highly important, both in the

general sense of active listening and giving feedback (to both customers and colleagues), as well as more specifically around that core skill of librarians: information. Staff should be knowledgeable about services and should feed back comments from customers.

- Evaluation in a more technical sense, of strategies, tactics, services, etc., who also mentions obtaining usage statistics of journals.
- In an age of short-term contracts, promotion also needs to be applied to one self.
- User education is also key; users need educating about the technology but crucially about the resources themselves.
- In an electronic age, purchasing is not a matter of choosing the right books for the subject, but rather of getting good value from bundled e-journal deals with relevant information at a reasonable price.

5. **Ashcroft (2004), Malham (2006),** Libraries these days are in a competitive situation with other information sources, and need to rely on a whole range of promotional and marketing methods.
6. **Auret (2000),** viewed the electronic or digital library as a given and speculated on the ability of librarians to contribute effectively in such an environment.
7. **Baker (2006), Collier (2006), Demosey (2006), Lynch (2005),** Several substantial thematic analyses of digital library history, themes and trends and of the impact of digital libraries on academic library services have appeared recently. Common to several of these is the suggestion that within the digital environment academic libraries are becoming more deeply engaged in the creation and dissemination of knowledge, rather than simply acting as custodians, and are becoming essential collaborators in these activities.
8. **Baker (2006), Fox (2006a),** the challenges here covers emulation, migration, continual synchronization, backup, and security.
9. **Ball and Plott (2004) and Chandrakar (2006),** Provide overviews of the DOI system, which is defined as "a character string used to identify intellectual property in the digital environment. It provides a framework for linking users with content owners, facilitating electronic commerce, and enabling automatic

copyright management".

10. **Bawden and Vilar (2006),** Experiences of web searching often influence people's expectations of digital libraries, sometimes unconsciously. The problems and issues for digital library research are then perceived primarily in terms of search and access. However, as Lagoze (2005) remarks, "These functions are essential (and remain challenging) but they are just part of an information environment. Traditional libraries are much more than well-organized warehouses of books, maps, serials etc. In their full expression, they; are places where people meet to access, share and exchange knowledge".

11. **Bawden, et al. (2005),** examined the approach to the education and training of librarians in digital libraries and the competencies required for creating and managing digital libraries, and assessed these competencies vis-à-vis LIS education in the UK and Slovenia.

12. **Beall (2004); Yousefi and Yousefi (2007),** The digital environment presents particular challenges, particularly in relation to the diversity of formats and how digital objects may be related within a particular information context. With ever increasing number of digital objects to be managed, there are also problems of metadata generation, maintenance and quality control, which can affect the scalability of digital library systems.

13. **Benfu L. and Junlan Z (1996),** Presented the tentative ideas and practices of the library of the Chinese Academy of Social Sciences (CASS), Chinese People's Republic, in the field of digitization and networking as first step in the transition from traditional library to electronic library. Sets out the overall plan for digitization of library materials and identifies a model of information exchange for CASS which can be applied to the establishment of the CASS electronic network.

14. **Berners-Lee et al. (2001); Robu et al. (2006),** SRU/SRW is a promising successor to Z39.50 as a federated search protocol. The Resource Description Framework (RDF) provides a metadata framework for representing relationships between digital objects, and is a forerunner in efforts to implement Berners-Lee's vision of a "semantic web".

15. **Carol Tenopir (2003),** studied the online systems are designed to be used | independently but that may not always yield the best results. The role of

librarians as intermediaries to the search process is still necessary in a digital age.

16. **Caroselli,Marlene. (2000),** this book examines the characteristics and abilities that differentiate leaders from managers. Readers may use it to develop a plan to improve their abilities and assess themselves on different characteristics using questions and checklists throughout the book. Various leader ship roles are described, including being a visionary, problem- solver, team-builder, manager, communicator, power distributor, liaison (forming partnerships and strategic alliances), and planner. Skills and traits needed to be an effective leader are also discussed, such as courage to handle objections and criticism, the ability to instill Pride in one's followers, sincerity (Showing concern for others, the "personal touch"), adaptability to face opposing ideas and viewpoints, the ability to use I influence and not solely rely on one's authority to accomplish things, and ability to use communicate with various specialists in one's organizations.

17. **Castiglione (2007),** has commented that while library management remained almost unchallenged throughout the twentieth century, new developments with ICT mean that change is happening very fast in the twenty - first century. This article looks at the management skills required of libraries in the digital age, drawing mainly on articles in Emerald journals over the past four years.

18. **Cervone (2005),** Positive influencing skills are part of negotiating and provides useful advice here, helpfully pointing out that managing a digital project is as much about the personalities involved as it is about the technology. Particularly useful are his tips on dealing with resistance. If people ask for more time, ask them what the issues that are making them hesitate. If they fail to see the need, point out what would happen if the need isn't met. If they need more information, find out what they want and give it to them. If they appear to agree, but reluctantly, show them how the change will benefit them.

19. **Chan (2006),** in the twenty-first century library, with its empowered workforce and need to maximize resources, all must work to their maximum ability. Many authors mention the concept of performance management, and describes how rather than just confining it to the annual appraisal, some Canadian libraries are using it as a way of monitoring performance on a

continual basis. Performance management involves integrating individual and organizational goals, and providing any necessary training or coaching. It goes through a cycle of planning, when objectives are agreed, coaching in the necessary skills, with feedback, and review. Another approach to the full utilization of staff, which is used quite commonly in US libraries, is that of self-managed teams. These teams - with a membership of 10-20 employees - work within a particular occupational area with a minimum of supervision, decide which work methods to use and train one another, with a team leader.

- Describes a competence system adopted by Canadian public libraries, and how these were defined as communication skills, interpersonal skills, customer service and analytical skills.
- Describe how interpersonal skills – "relationships with others, including working cooperatively, sharing knowledge, and being respectful" – have become a core competence in some Canadian public libraries.
- Libraries need to be customer-oriented, responding to customers' needs, being polite and courteous and responsive to different cultures.
- Library managers require sound judgment in order to make wise decisions and weigh up often complex factors. Analysis, the ability to make decisions and know when to look for guidance, is listed as a core competence.

20. **Chowdhury et al. (2006),** the use of personalization services or web aggregators to gather, filter and present information relevant to the user has been suggested as possible solutions. This work has been comprehensively reviewed.

21. **Christine L. Borgman (2003)** identified four challenges faced by the digital libraries are: 1. invisible infrastructure, 2. content and collections, 3. preservation and access, and 4. institutional boundaries. Only with a better understanding of these challenges can libraries find their best fit in the information infrastructure of our networked world.

22. **Cihak, Helene, and Joan S. Howland (2002),** this book identifies and analyzes different leadership roles for librarian. Each chapter, written by a different author, is devoted to a specific role and may serve as a resource for librarians to turn to when encountering a certain situation. While written by law librarians, this book is applicable to librarians in all kinds of institutions. The leadership roles include : the leader as leader, the leader as builder (practical

advice on all stages of planning a new library building), leader as champion (using diversity as an example of how librarian can advocate cause and initiate changes, and includes step for developing and implementing a diversity plan), leader as coach (how leaders can inspire and motivate employ-employees to improve their productivity using formal and informal coaching techniques), leader as innovator, leader as liberator (how to create an environment where staff perceive it as a positive place to work and feel that they make a meaningful contribution), leader as manager, leader as marketer (how to increase use of the library and its stature in its parent organization, focusing on marketing techniques), leader as mediator (how to deal with conflict among employees with use of a case study), leader as mentor, leader as teacher, leader as transformer (how one can help bring about change in one's library), leader as visionary (using the adoption of new technology as an example), and leader as achiever. Computer Library center for online shared cataloging arid resources sharing and large computerized database by major indexing and abstracting publishers. Building on these, the following I technological advances have stimulated drastic changes every five to ten years.

23. **Cox and Yeates (2002),** Changes in the marketplace of scholarly publishing, information services and telecommunications provide opportunities for improved information access unimaginable just a decade ago. Librarians have become increasingly aware that the multiplication of electronic resources is a problem for end-users; users find it difficult to locate the most appropriate database or resources to search for information relevant to their needs. Even if they locate the right resources, since each service tends to have its own unique interface, they may struggle to search it effectively. A further obstacle to access is the need to remember and enter many different passwords to access the different databases. These problems may lie behind a perceived lack of use expensive electronic services.

24. **Cullen (2004),** describes research done on job adverts to ascertain requirements, and produces a list of skills of which the most important are administrative and organizational abilities, staff management and supervision, leadership and analytical skills /judgment. Most of the authors quoted cite leadership, flexibility and the management of change as the most important

issue, crucially for senior librarians but also for anyone who is responsible for motivating staff.

- The UK Government-appointed Council for Excellence in Management and Leadership skills as " ... those skills which relate to : creating a sense of vision in a fast-changing environment; motivating terms of people and leading them through change; and being innovative in products and services and ways of working".

25. **Currer et al. (2001); Secker (2004),** One particularly active area of research is the convergence of virtual learning environments (VLEs) and digital libraries (e.g. the INSPIRAL project).

26. **Cyriac Jiji, Deshmukh G.R. and Rajalakshmi D. (2002),** have discussed about the digital libraries and their benefits but also felt that there are some limitations of digital libraries as the high cost and the lack of appropriate copyright laws and felt that the co-existence of digital library and physical library is inevitable.

27. **Dabas K.C. and et.al.(2003),** have discussed the scope, objectives and methodology adopted for collection, presentation and analysis of data and also given a brief overview of library automation in historical perspectives in the selected libraries and focused on house keeping operations, i.e. acquisition, technical processing, circulation, serial managements, financial managements, services, library administration, CD-ROM and networking infrastructure. Also raises vital issues of concern and impediments in the way of library automation and tries to provide solution.

28. **Denial Greenstein (2000),** has revealed the key challenges confronted by libraries that are actively investing in online collections and services.

29. **Davis and Lafferty (2002),** the use of digital rights management technologies, for instance, creates difficulties for libraries in supporting fair use of access from multiple locations. In a digital environment in which libraries own less and less of the information they support and distribute, rights management issues assume considerable prominence.

30. **Deanna Marcum (2000),** Shares views, albeit lacking Carlson's pessimism, describing the library of the future as " less a place where information is stored than an 'information center' through which students and faculty gain access to

the vast information resources of the world.

31. **Dempsey L. (1999),** discussed the three main areas of its work: information services; research; and coordination and awareness. Notes its involvement in the Electronic Library Programme, its current research areas, and the range of its awareness activities.

32. **Evans, Edward, Ward and Rugaas (2000),** this chapter examines the concept of leadership and its application in the library setting, its assumptions and functions, and how to learn leadership styles. To learn to become leaders, the authors state that it is important to understand the task at hand, have the desire to become a leader, and have a vision. They believe that leadership traits are teachable, including job competence, ability to plan and organize, willingness to accept responsibilities, self-confidence, self-discipline, ability to communicate and listen, patience, a strong desire to achieve the goals and objectives of the library, and a genuine interest in the welfare of subordinates and peers. They describe the "acknowledge-create-empower" paradigm that lets managers coach their staff to empower them and foster creativity. In addition, the authors describe an organizational structure for employee-centered leadership that is flexible and open to change, and they discuss methods of giving orders and interacting with staff that foster a climate of cooperation.

33. **Friend (2002),** as organizations recognize the fact that former framework and decision-making strategies are inadequate, they search for new processes, new structures and relationships, while reeling from shrinking resources. In such an environment, organizations can no longer act independently. Within this chaotic and complex environment, organizations of all types scramble for information. Information is a natural resources and the lifeblood of national development. Access to information is seen to be the key to personal and national economic success. Students need to read in order to gain qualification and obtain better jobs. Countries need to keep abreast of scientific, technological and medical research if they are to move up the league from poor to wealthy nation. Both individuals and countries find barriers in the road to access; high prices, exchange rate disparities, restrictive licenses and 'take-it-or-leave-it' services.

34. **Gertzog, Alice, ed. (1989),** this is a collection of papers presented at a 1988 symposium at the Rutgers School of Communication, Information, and Library

Studies. The first paper discusses the results of two surveys of the types of leaders in different libraries and their qualities. The following essays cover ways library schools can nurture leaders, the need for women and minorities to establish themselves as leaders in the library profession, and the controversy surrounding the definition of leadership. There is also a panel discussion concerning ways to develop the next generation of library leaders and the problems of identifying them, and an annotated bibliography.

35. **Haravu L.J. (1993),** has emphasized over the development in library automation which he found that been concentrated in special libraries like R & D libraries funded by ICMR, CSIR, ICAR, DRDO and DSIR. The support by these institutions has been extended to sector information centers established under the auspices of NISSAT. NISSAT also funded several training programmes and software projects.

➢ Reviewed recent development in library automation and networking in India and raises issues believed to be of a basic nature to the contribution to the ongoing debate and discussion of the subject in the country.

36. **Harrell, Keith (2003),** This book profiles twenty-one successful business leaders from different industries who demonstrate principles of Harrell's "attitude of leadership", so that readers may learn from them and emulate their success. Each chapter is devoted to telling the story of how an individual leader became successful, as well as the person's style and views on leadership. Following each profile is a section called "keith's Attitude Check", where the author discusses the positive characteristics and behaviors that can be learned from the individual leader, offers advice, and poses questions in order to let readers assess themselves. An "attitude action plan" is also included at the end of each chapter, which lists questions readers may use to examine themselves in order to become more effective leaders and improve their relations with employees.

37. **Harvard Business Review (2001),** this is a collection of articles on the subject of leadership that previously appeared in the Harvard Business Review. It includes articles discussing the qualities of successful leaders, pitfalls and traps to be avoided for high-profile leaders that have gained recognition, six leadership styles identified by psychologist Daniel Goleman , ways to maintain

the attention of employees, and how to cope with leadership transitions.

38. **Hewitt J. A. and Bailey C. W. (1994),** reported that health care librarianship and information work. Collection of articles devoted to advances in computerization techniques in library cooperation and cooperative technical services.

39. **Hey and Hey (2006),** Libraries which manage digital repositories holding substantial research outputs, e.g. of eScience data, are increasingly themselves custodians of intellectual property.

40. **Hildreth Charles R. (1980),** discussed the reasons why the bibliographic utilities no longer dominate the North American library automation scene in quite the same way as before are summarized and their responses to the changing conditions and challenges brought about by microcomputers, integrated library systems and increased knowledge that libraries have about computers are discussed.

41. **Hildreth Charles R. (1987),** discussed the trends towards decentralized operation with turnkey integrated systems and towards local resources sharing and the growing computer awareness of librarians.

42. **Hillman (2004),** Schemes and standards for metadata (literally " data about data ") are fundamental to libraries of all kinds. Metadata is commonly categorized as descriptive (or intellectual), structural and administrative. Descriptive metadata describes the digital object itself, and corresponds to the library catalogue record of a printed resource. Structural metadata describes how an item is structured and organized, and administrative metadata describes such things as how the object was produced, its ownership, and who has accessed it. Dublin Core has been devised as a simple, flexible metadata standard for digital objects.

43. **Honnesdottir (2001),** the library has always been in a key position to serve the user in his or her search for the information they need and this has been so from the beginning of the recording of knowledge. Libraries have supported the transfer of knowledge from one generation to the next but we should also remember that it was not just the libraries; it was the librarians who made it all possible. Libraries were created when the amount of information was too much to be stored in the head of one person. Libraries became the storehouse of

organized knowledge where users could come and look for the information they needed and get help to find the desired items. Knowledge production has increased rapidly since the advent of printing, and consequently libraries have became larger and larger and their collections more and more complex. This in turn has called for advances in library organization and management. Larger and more diversified collections had to be organized, systematized and made available to more users with more diverse needs.

44. **Hudomalj and Jauk (2006),** Systems such as ATHENS (a centralized services provided by Eduserv, a not-for-profit organization) and Shibboleth (a devolved standers-based open source systems which can be managed within a consortium of institutions) are employed for user identification and authentication. Provide an informative overview of the authentication and authorization services used by academic libraries in Europe.

45. **Hussein Suleman & Edward A Fox (2001)** is of opinion that the digital libraries are to be interoperable at the levels of data exchange and service collaboration. Such interoperability requirements necessitated the development of standards such as the Dublin Core Metadata Element Set and the Open Archives Initiative's Protocol for Metadata Harvesting (OAI-PMH). These standards have achieved a degree of success in the DL community largely because of their generality and simplicity.

46. **Jain (2005), McKnight (2007), Stephens and Hamblin (2006),** Coaching is particularly important to ensure that staff have the skills to enable them to cope with changes in their role (Ashcroft, 2004) and is also mentioned as part of leadership.

- It is important to encourage cooperation in the workforce. Stress team building and networking.

47. **Jain (2005),** Motivation is key to getting a workforce to work to its maximum ability: a successful manager should understand what motivates their staff and use that to influence their behavior.

48. **Janakraj and Verma (2000),** co dueled a study of engineering college libraries in India in 1992. The major findings of study revealed that 50% of the respondents had a separate library building. The collection of the libraries was

between 5,000-70,000. Almost 67% of the libraries used Dewey decimal classification scheme to arrange the documents and almost similar number of libraries were using various editions of AACR for cataloguing. Almost 60% of the libraries have adopted open access system for their collection while nearly 56% of the libraries started computerization of their activities.

49. **Jange Suresh and et. al. (2003),** had advocated the use of MARC format for the purpose of standardization of bibliographical record exchange in the era of computerization and given complete overview of MARC format & justified the importance of MARC over CCF.

50. **Jeffcoate (2007),** the overseas library manager will him or her self be from a different culture, and need to take this into account in managing the workforce; staff may, for example, expect a more formal style than you are used to.

51. **Joint (2006a),** this category includes issues of collection development, digital publishing, and digital preservation; the latter, as described by presents acute problems related to the relative impermanence of digital information formats.

52. **Joint (2006b),** among the analysts and forecasters of digital library futures is perhaps the most radical. He suggests that contemporary digital library change represents not simply a change in technological processes, but a fundamental cultural shift. According to this" theory, the present- day digital library is an interim phenomenon, based on an outdated metaphor derived from traditional print libraries. In a postmodern information world, however, bibliographic description, collection management and digital preservation are inherently impossible; anarchic storage and distribution of electronic content will become the norm.

53. **Jones (2003),** stressed the importance of IT literacy for the professionals working in library and information centers.

54. **Jose A (1997).,** described the usefulness of LYBSYS; the fully integrated multi user library automation system produced by LYBSYS Corporation, India and designed to run on a wide spectrum of hardware and software platforms. The advantages of the software: simplicity in use; wide user base; regional applicability; networking capabilities; local support; and presence of continuing research to produce improved versions.

55. **Kannappanavar and Kumbargoudar (2005),** analyzed the management

skills in the light of ICT among LIS professionals in agricultural universities in India.

56. **Kanthale S. S., More V. B. and Gupta V. K. (1998),** carried out Automation of Libraries in Education and Research (CALIBER-98). The library of Shri Sant Gajanan Maharaja College of Engineering, Shegaon, has converted its reading materials to machine readable forms and developed a LAN for its users. Library work has been computerized in 5 levels: supervisory; circulation, reference and journal; ordering; and cataloguing.

57. **Klugkist A. C. (1994),** describe the electronic library and the ways that the partitions between libraries have become easier to overcome, thanks to improvements telecommunication networks and the ways in which this has opened new perspectives for library cooperation and library service. The organizational effects and consequence of the application of open library networks for interlibrary cooperation and for the improvement of library Services.

58. **Kotter (1990),** for example, suggests that the main function of management is the provision of organizational order and consistency, in contrast with the primary function of leaderships which he suggests is to produce change and movement. In essence, management is about seeking order and stability, while leadership seeks adaptive and constructive change. Management is typically associated with many specific functions, such as forecasting, planning, organizing, commanding, coordinating, controlling, and ' fire fighting'.... According to Bryson, 'Leadership defers from management in that management directs both human and non-human resources towards a goal, whereas leadership is concerned with creating a vision that people can aspire to (1999, p. 169)".

59. **Krishan Gopal (2003),** in his study suggests the introduction of digital technology into the process of production, distribution, and storage and retrieval of information along with the initiatives under taken to develop workable approaches.

60. **Kumaresan (2002),** projected the emerging scenario of LIS professionals in the Indian environment and emphasized the future challenges of the librarians with added knowledge of network and information retrieval systems.

61. **Kumbargoudar Praveen kumar (1999),** had pointed out that AI techniques had made information technology applications more users friendly and as a result the AI techniques such as Natural Language Processing, Information Retrieval from database etc. are more easy, systematic and simple.

62. **Kumbargoudar Praveen kumar and Mestri Mamta (2002),** has revealed from a study of ideals of modern library and the present situation of Indian libraries has shown that most of the academic and public libraries do not have basic infrastructure like computers, telephones and qualified manpower to create a digital library. However, few of the research libraries have initiated digitization. It is foreseen that both conventional and digital libraries in India will co-exist, as it is not possible and suitable for most of the Indian libraries to adopt digitization and convert to a complete digital library.

63. **Law (2004),** the beginning of the twenty-first century has been marked as the information and technology age throughout the world and has presented all nations with major challenges. It is commonly recognized that information and its associated technologies are playing more and more important roles in socio-economic development, and that a nation that does not keep pace with the latest advances in information and communications technologies will be left behind in the mainstream of world development. Information continues to grow at exponential rates and has become a valuable commodity throughout the globe. It is easy to forget how rapid the transition from a paper-based to a web-based world has been. In less than a decade a critical mass of teaching and learning material has been moved online, while the great majority of new material is created electronically and only published on paper as a secondary consideration.

64. **Lee (1998),** since the 1960s, many changes have taken place in libraries of all types throughout the world. The most significant forces accelerating the pace of change in libraries have been the revolution in computer, information and telecommunication technologies. In the 1960s, the development of several major applications of computer technology in libraries provided the foundation for subsequent development, including the MARC (Machine Readable Cataloguing) format by the Library of Congress; the Ohio College Library Center OCLC now renamed the Online.

65. **Lynch (1995),** What is know as deep semantic interoperability, the ability to

access, consistently and coherently, similar classes of digital objects and services across distributed information resources, with mediating software or "middleware" compensating for local variations, has been described as the "holy grail" or "grand challenge" of digital library research.

66. **M.Krishnamurthy (2002),** in his study the new Electronic world which is transforming not only libraries but also the organization that they serve makes the role of every information professional more complex; all of us now need additional knowledge and skills.

67. **Malham (2006),** Claims that in the increasingly corporate culture of Indian libraries, management skills are as important as professional ones. Point out that the librarian is now part of the teaching process; that "Quality filtering of enormous volume of information and trafficking the high quality information to work processes and information user communities of the university is in fact now a major challenge for university libraries".

68. **Maple A. and Henderson T. (2004),** described the experiences of Penn State University in the initial stages of creating a digital music library and offer suggestion and experiences that may assist others in planning, developing and evaluating a similar service. The benefits of digitizing the music collection include increased access and the potential for enhanced preservation. At Penn State, collection decisions are based on course-related needs.

69. **Marion (2001),** analyzed the online employment advertisements to determine current professional requirements for technologically oriented jobs

70. **McKnight (2007),** a library will thrive under a leadership that is democratic, that creates.

- Diversity in culture is common in both library staff and customers and the manager should be sensitive to cross-cultural issues, In fact, one benefit of the need to develop a whole range of management skills is that the librarian becomes highly employable, not only in his or her own country but abroad. Who describes her experience as an Australian taking a job in the UK claims that the more senior you are in your professions, the more you require management expertise rather than professional knowledge. The latter is less context specific, and academic libraries the world over tend to experience the same problems of need for cultural change etc.

- Librarians need good financial skills in order to be able to cope with the costliness of resources and the uncertainties of funding. They need to be able to maximize revenue and minimize costs.

71. **McKnight (2007), Stephens and Hamblin (2006),** Managing a library with any digital component involves negotiating over large database and systems, and with colleagues over different ways of doing things, so list ability to negotiate as a key skill.

72. **Mech, Terence F. and Gerard B. Macabe, eds (1998),** This is a collection of essays on the subject of leadership in academic librarians by various authors. In the first section, the history of the academic librarian in relation to American higher education is explored. In the second section, the role of the library director as a leader on university campuses is discussed, as well as the characteristics of effective leadership. In the third section, the ways that individual librarians can exercise a leadership role within academic libraries is discussed. In the fourth section, issues related to the advancement and career paths of academic librarian are explored. In the fifth section, leadership roles at the highest levels are discussed, including college president, chief information officer, dean, and roles in other academic settings. At the end, a bibliographic essay is presented on the characteristics of leaders, learning to lead, value systems, and leadership styles.

73. **Miller (2000),** Changes create new services opportunities and user needs drive the development of services. Many developments in library administration over the past century have enabled libraries to offer many user-friendly services. Electronic-based information, however, is not simply another new form, but perhaps the most important sources of information developed during the twentieth century. The historical significance of electronic publishing is akin to that of the printed book and will have profound effects on every facet of the future for librarians, vendors of information and information gatherers everywhere.

74. **Mischo (2002),** there are a number of vendors, libraries and information providers that are investigating systems for simultaneous search and retrieval over multiple resources. From the overarching design standpoint, there are several complementary approaches to simultaneous search implementation. One

approach, centered on the Open Archive Initiative (OAI) provider and harvesting technologies, typically employs central federated search services operating over harvested metadata from a number of provider sites. The other approach utilizes broadcast or asynchronous searching that centrally collects search results from distributed search services.

- We now have at our disposal a set of standards and best practices that allow us to create integrated digital libraries and address some of these classic problems of information retrieval. We have a standard retrieval environment (web) and interface/client (web browser), standard transport mechanisms to connect heterogeneous content (HTTP, OAI, SOAP, WebHTTP), standard met languages and tools for describing and transforming content and metadata (XML, DTDs and Schemas, XSLT, DC/DCQ, RDF, METS), standardized search/retrieval mechanisms (HTTP Post/Get, SQL, Z39.50), and standard linking tools and infrastructure (DOI, Open URL, CrossRef).

75. **Mohan Raj Pradhan (2004),** discusses the basics of developing a digital library and explains the new concepts underlying the digital library development procedures regarding technologies and managerial skills. Measures are needed to overcome the problems of computer viruses and also unauthorized use. Initial investment in digital libraries is high, as is maintenance; it is therefore essential the new sources of fund.

76. **Mullins and Lineham (2006),** however, the fact that the two can be distinguished does not mean that they are the province of distinctive levels of management: all managers should have leadership qualities.

- Quite a few authors distinguish between management and leadership. The former is seen as oversight and administration ensuring that library processes function efficiently - whereas the letter is about vision and managing change.
- Sum up the situation by saying that" now the spotlight is on leadership" which is the "Holy Grail of librarianship", virtually all the authors quoted in this article believe that leadership is an important attribute, if not the most important, at least for senior managers.
- An empowered workforce, that is "transformational" and inspires individuals to transcend self-interested motives as their needs and those of the organization are aligned.

77. **Nick Joint (2003),** stated that the skills required in the digital libraries are more heterogeneous, fluid, and fast changing. He emphasized the needs of different training philosophy with constructive approach to teaching and learning which digital library training might also include.

78. **Nikolaidou et al. (2005),** there appears to be little recent literature devoted specifically to digital collection management, although provide an interesting case study of managing multiple collections in a medical digital library.

79. **Nyamboga (2004),** also examined the training opportunities for library and information professionals in India and stressed the need for developing information skills and information literacy programmed.

80. **Nyamboga, et al. (2004),** surveyed the skills of professionals working in the university libraries in Kenya.

81. **Orenstein (2005),** there have been many technological advances that have altered the very basic function of a library - meeting the information needs of the user. The ways in which information is produced; delivered and accessed have changed dramatically. All these changes are for improved access to information in the least possible time. The first major wave of change came with the advent of digital storage technology and networks to move information from one area to another. In the early 1990s, public access terminals and new online public access catalogues became ubiquitous in libraries to share information regarding library holdings and for the management of library acquisitions. These first generation library systems were hard-wired LANs running, PC-based software. Access to holdings by the outside world was not widely shared. Dial-in access was limited to large institutions. Modern speeds at this time were no faster than 28.8 kbs CD-ROMs were introduced for the most part as a storage and research tool in libraries during the mid-1990s. These Cds held large amounts of data which were inserted into single-use PCs or were kept in CD towers for small LANs of up to six PCs to access information simultaneously. In the late 1990s, the Internet became the lifeblood of information sharing, not just for libraries, but also for commerce, education; government and the general public. High-speed networking availability created an efficient and fast way to move both text and graphics from on server to another in a matter of nanoseconds.

82. **Panda B.D. (1998),** presented at the Fifth National Convention for automation of libraries in Education and Research (CALIBER-98). Networking is a major concern for public library services in Orissa. Provides an action plan for a networking programme for the state, which would provide public libraries with network facilities using LAN and WAN technology.

83. **Pandian et al. (2002),** In order for organizations and nations to gain competitive advantage and to survive in the global market, it is important to get access to current information. Therefore the production, acquisitions, organization, retrieval and use of information should be seen as a national issue. It is equally important that the necessary and sufficient infrastructure to facilitate and enhance information use is put in place. However, the development of such an information infrastructure is not without serious challenges.

- Technological - as the system (hardware, software and interfaces) needs to be maintained, updated and upgraded due to the rapid change of technological tools required for digital libraries. The technology need to be maintained by professional who understand information needs and use.
- Economic - the cost of digitization is very high. The initial cost of setting up the hardware and software infrastructure is also high. These expenses will increase as we add new hardware and more licenses for software, and increase infrastructure, administration and training. And above all are the costs of the acquisition of digital materials and converting paper to digital resources.
- Organizational - libraries organize knowledge resources through subject analysis and cataloguing. Standards for organizing digital information for effective retrieval (metadata standards) are still in development.
- Legal - copyright is one of the major barriers to developing digital collections.

84. **Pandian and karisiddappa (2003),** in an ideal distributed library environment, the entry point for the patrons of each member library is through a single web-enable window system that is user-oriented and provides access to the entire collection of the member libraries. The systems at the user end should offer services like patron identification and authentication, comprehensive resource discovery systems (encompassing the entire online public access catalogue (OPAC) of member libraries and their holding). And access to the

entire e-journals collection and database. All this should be done through a single search. Which should facilitate locating all the resources that are available across the member libraries, no matter where the search results come from. The system should be capable of patron- initiated online requests of resources and inter-library loan facilities.

85. **Parekh Harsha (1999),** discussed the impact of internet on the work processes of library. She stressed that internet had supported traditional ways of conducting the services as well as provided new, different and more speedier and efficient ways of doing the old tasks.

86. **Pastine M. and Kacena C.(1994),**Used the costs for the library automation activities at Southern Methodist University, Texas, plus a review of the literature in automation costs and requirements, to illustrate some of the hidden as well as obvious budgetary requirements to meet the electronic library needs in small and medium sized university library today.

87. **Patel Chitra (1993),** had discussed how a computerized information and management system of stock shots was set up at the video library of DECU (Development and Education Communication Unit) of Indian Space Research Organization, Ahmedabad. This system allowed easy and fast retrieval on the access points - subject, cameraman, keywords and free terms, date of event, title and location.

88. **Patel Dharmista R. and Joshipura Smita D. (1997),** studied the computer based information storage and retrieval system of Space Application Centre Library of ISRO. Their study of SDI Service and Project literature search service provided by the library showed that it had considerably saved the time of the users and also the coverage accuracy, novelty and completeness of the database had increased.

89. **Payette and Rieger (1997),** Libraries have long been searching for methods of providing a 'one-stop' single point of access for local electronic resources. Presently, there is a different search interface for every electronic resource. With the coming of the Internet and the expectations surrounding instant and easy access, patrons are demanding such a 'one-stop' single point of access and searching. As librarians, it is natural for us to want to bring order to disparate information sources and to simplify the search process. Outline this desire when

they stated; 'there is great interest in library communities in designing and implementing digital library systems that conceal the complexities of an information landscape characterized by numerous, disparate information resources.

90. **Pearce et al. (2000),** we need an information environment that will enable services for our own users and provide integrated access to:

- The online with the physical;
- Collection with item;
- Whole with part;
- Commercial with free;
- Significant with transient;
- Local with remote.

91. **Pers (2005),** many authors report on the increase in management responsibilities faced by librarians. A Danish survey reported by Pers describes managers as being routinely involved in such managerial issues as strategic planning, benchmarking, image and branding.

92. **Prathiba Naran (2001),** has outlined the skills of the librarians, which make them suitable for a variety of positions in the diverse fields such as software, database and information area, publishing trade, and outsourcing opportunities.

93. **Rader (2001),** the developments in information technology also create new opportunities for librarians. For instance, librarians can now provide access to networked information sources that their libraries do not even own. The advances in information technology have had a profound effect on resource-sharing activities. A collection is no longer bound by the structure of four walls. This creates the opportunity and an environment for new services unlike any we had before. This doesn't mean that the traditional functions of libraries have changed. The library's primary task has always been - and will remain regardless of changes in technology -to select, stabilize, protect and provide access to relevant and representative information resources. The collection function, however, is expanding to include a connection function.

94. **Rajalakshmi (2004),** outlined the skills required by the LIS professionals in the 21st century in the context of ICT implications.

95. **Rajashekar (2001),** Libraries have traditionally played a key role by

facilitating access to relevant internal and external information sources. They have absorbed several enabling information technologies over the past several decades in an attempt to improve the quality and timelines of their information services. Digital information processing was, however, limited to bibliographic and catalogue data. The advent of the Internet has significantly intensified the pace of change since the mid-1990s. The rapid maturing of Internet and intranet technologies has given rise to all-round developments in publishing, communication and delivery and access to a multitude of digital information, both in commercial and academic domains. Web technology has emerged to be the converging point for all related processes, media, tools and techniques. This has in turn given impetus to the development of digital libraries and knowledge management solutions. The Changes these developments have brought about pose interesting challenges for the effective management of digital information in organizations.

96. **Ram Kumar and Ashok Kumar (1993),** discussed in brief about the features and importance of in-house databases being developed by various institutes in India. They emphasized the need for standardization in record 'format' and 'structure' by using international exchange formats like CCF. They stressed that it would enable merging / exchange of records among databases of specific subjects and help provide service to users at national as well as international level.

97. **Ramana V., Rajan N. and Burkhanuddin (1998),** has emphasized over the use of internet in India so that to tap the vast potential resources and the growing information technology and its application in the day to day research endeavors through novel technological innovations like INTERNET.

98. **Ramesh Babu and Subramaniyn (1999),** conducted a study in 1999 to find the self-financing engineering college libraries in Tamil Nadu. The study showed that about 66% of the colleges did not have separate library buildings. Almost 26% of the libraries had 15,000-20,000 volumes. Around 33% of the libraries were subscribing up to 25 journals. Most of the libraries had the provision of the book bank facility for students. There was no uniformity in the use of the scheme of classification and catalogue code but about 50% of the libraries maintained computerized catalogue.

99. **Rashid and Amin (1998),** conducted a study of Regional Engineering College (REC) libraries in India in 1998 and analyzed data received from 14 respondent libraries out of 17 libraries. The study concluded that REC libraries were better organized as compared to other types of libraries. All these colleges had separate library buildings and collection wise they were relatively rich. Regarding organization of collection there was no uniformity in the use of classification scheme and in the case of services most of the REC libraries were still traditional. The REC libraries situated in South has started computerization. There was no uniformity of pay scale and standards in staffing pattern.

100. **Riggs, Donald E., and Gordon A. Sabine (1988),** Features interviews with various recognized library leaders consisting of past ALA Presidents, deans of library schools, library directors, and heads of divisions within libraries. Although the interviews were conducted in 1988, may of the leaders' responses are still relevant today. Individual comments by different interviewees are listed in response to the following questions : "What made you a leaders?," What leadership techniques do you find best work for you?", "How does a newcomer in the library field best learn how to become a leader?"; How does a newcomer in the library field best learn how to become a leader?"; How can library associations encourage more leadership development?"; and, "Why is the field so late to concentrate on leadership?" The library leaders offer many characteristics and strategies that helped them become leaders and offer insight into important leadership skills, such as delegating tasks to others and allowing them to take risks, establishing credibility and trust among colleagues, listening and building consensus, being able to communicate clearly, and possessing inner strength. For new librarians, they offer advice on becoming leaders and suggest becoming involved in professional organizations and choosing an innovative library with good role models for one's first job.

101. **Ronald Jantz (2005),** is of opinion that developing preservation processes for a trusted digital repository will require the integration of new methods, policies, standards, and technologies. Digital repositories should be able to preserve electronic materials for periods at least comparable to existing preservation methods.

102. **Rowley (2005),** Quality is an issue which library managers need to be aware

of - as do all managers - and provides useful guidance including a checklist of points. She suggests devising systems to provide evidence for the plethora of initiatives, as well as recognition that quality extends beyond the organization to database suppliers and others who make up the information network which constitutes the service. While quality assurance is important to guarantee funding, quality enhancement is also important to ensure its effective use.

103. **Scott Carlson (2001),** Writes about a controversial corollary development: Widespread end - user searching made possible by these electronic resources will obviate the need for clients to come to the library.

104. **Seadle and Greifeneder (2007),** Views about trends in the development of digital libraries, and a fortiori concerning the future of libraries in general, are very much influenced by different understanding and definitions of the term "digital library ". It may be used in a reductive sense to denote a technical infrastructure supporting a collection of documents.

105. **Seetharaman M.N. (1986),** studied the project launched in National Aeronautical Ltd. In 1985 by the help of UNESCO and derived the conclusion that machine readable databases and on-line systems would not only provide easy access to information but would even change the way people shop, bank, work and communicate, since they would be able to do all these things without leaving their places.

106. **Sheldon, Brooke E. (1991),** This book presents the results of interviews with recognized leaders in the library profession, including deans of library schools, directors of major academic and public libraries, executive directors of major library organizations, and state librarians. Each chapter is devoted to a different theme that emerged during the interviews, including how leaders possess secure commitment to their visions, use communication to achieve results, establish trust, exhibit self-confidence by building on strengths and compensating for weaknesses, and how they benefited from mentors and role models (usually early in their careers). Comments from different librarian offer helpful insights on the process of becoming a leader, as they recount qualities, skills, and events that helped them. In the final chapter, ideas for developing future library leaders and the role library schools are discussed.

107. **Shiholo and Ocholla (2003),** outlined the changing trends of training needs

of informational professionals in Kenya and argued that core knowledge and skills for information providers have to be reviewed regularly.

108. **Singh Surya Nath and Garg B.S. (2002),** had discussed about a survey done during 1994-1995 to 1997-1998, which has concluded that there is an increased use of computer and communication facilities in mega cities but there is a less use of the same in small towns and libraries. Hence it was suggested that ICLs should be provided with more infrastructure facilities and administrative support. IT oriented professional library courses and refresher courses were recommended.

109. **Singley V. (1998),** described how Illinois community colleges are working to serve their users by expanding access to and effective use of new technology based information resources through cooperative partnerships among libraries throughout the state. This is done on several levels, including automation of library materials and networks such as Local Library System Automation Projects (LLSAPs) and the ILLINET online statewide system. Covers the status of community college resources, expenditures, automation, networking and the implications of technology needs for colleges and their library users.

110. **Soma Raju (1986),** established a central information system for defense was proposed to co-ordinate the activities of library and information centers attached to various defense units in order to maximize the use of available information sources and extend services to a wider reading community in the field. It was suggested that DESIDOC should serve as a national information system for defense in view of the fact that DESIDOC was planning to take up much wider and significant role in providing information support in the field of defense.

111. **Stephens and Hamblin (2006),** those entering the profession need to have customer care skills.

112. **Suleman et al. (2003),** The Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) is the most widely discussed and investigated standard for digital repository interoperability.

113. **Sung Y. (1994),** used The National Central Library (NCL) makes extensive use of computers in its internal external operation and has recently acquired 2 much needed Chinese bibliographic database on CD-ROM. Discusses the many Problems that still remain unresolved including the development of national

machine readable bibliographic standards, computer adoption of a Chinese character code and controversy over intellectual property rights of bibliographic records.

114. **Sure and Studer (2005),** Give an informative overview of recent semantic web technologies which can be used to enhance digital libraries.

115. **Tonta (2001),** It is as crucial for organizations, corporations and nations to gain competitive advantage as it is important to get access to current, up-to-the minute information to survive in the global market. As information becomes an indispensable resource and commodity in the 'knowledge era', providing information is of paramount importance to all types of organizations.

116. **Umesh Naik (2005),** described one of the foremost issues in the creation of a digital library is to prepare a list of high level requirements. The goals of digitization will determine what hardware, software, human resource, materials and other tools and technologies are needed for the successful completion of the project. A clear plan must be development of the library. Digital libraries play critical role in organizing, preserving and providing access to digital resource. Present libraries are using latest technology for creation, preservation and dissemination of digital information. The library assumes responsibility for preserving information, face technical, legal and organizational challenges in responding to the new demands of digital preservation.

117. **Vyas S.D. (2003),** in survey report has mentioned various aspects of library automation which are reading material, financial supports to library automation, hardware configuration in libraries, use of application software, initiation of library automation, status of house database, networking accessibility of libraries, problems in computerization and networking etc.

118. **Watson (1996),** the profession of librarianship has for the most part always welcomed information technology as an enabling technology, freeing many from time - consuming manual procedures. Software now handles tasks such as book acquisition and processing, loans and reservations in libraries of all sizes - tasks previously carried out manually. Bibliographic and cataloguing details to international standards can be easily obtained in electronic format - reducing the need for in house cataloguing. Databases offer the opportunity for librarians and library users to carry out literature searches in a fraction of the time than was

possible previously - time that was previously employed in trawling through printed abstracts and indexes to identify literature can now be spent on reading that literature. Online an CD-ROM databases offer access to a wealth of information not available locally - libraries can offer access to a collection far greater than that which is contained within its four walls, material which can be obtained either through inter-library loan or material which is increasingly accessible on CD-ROM or via the Internet.

119. **Winston,Mark D., ed. (2001),** This collection of articles about leadership in libraries aims to " provide thoughtful and well-documented analyses in consideration of this important area and to help further a discussion that will better define the issues and inform practice in a substantial way" (p.3). The authors consist of library and information science professors, university administrators, management consultants, an administrator at an information technology firm, and a reference librarian. Articles are included that address the theory of leadership, the concept of leadership, ways of leading in times of technological change, methods of recruiting and developing new leader in the library profession, how to evaluate leaders, how to become financial leaders, and leadership issues from a multicultural perspective. The chapter by Donald Riggs may particularly useful to new librarian wanting to become leaders, as he distinguishes leadership from management, and describes various qualities of effective leaders

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CHAPTER 4

Managerial Skills, Digital Environment & Technical Education

Chapter – 4 :

Managerial Skills, Digital Environment & Technical Education

4.1.0 Management

Management has been described as either an art or science, but it is really a combination of both. The managerial task includes the coordination of human, information, technical and financial resources toward accomplishing organizational goals and objectives. The scientific approach lies in decision-making, planning and in the appropriate use of the technology. The artistic approach to management can be found in the tasks of communicating, leadership and goal-setting.

The management of a library is accomplished by a combination of basic management function, roles and skills. Such functions and roles will differ in various types of libraries as each organization to which it belongs, its age, technology and corporate culture, and the attributes of its employees. Management functions and roles also differ according to the level of management, as they reflect the managerial responsibilities which are appropriate to each level.

Management skills are needed when dealing with all types of organized activities and in all kinds of organizations. Indeed, managing a library requires similar management skills to managing a football team or a large local government authority. Even a library professional working in a 'one-man-band' situation uses management skills to plan for new services, and to communicate with management and other individuals within the organization in order to achieve their library's goals.

4.1.1 Functions of Management

Traditionally it has been accepted that the managerial task comprises five basic functions: planning, organizing, controlling, coordinating and commanding. More recently, these have been extended to include more specific functions such as leading, staffing, budgeting and reporting. Whilst it is useful to be aware of these functions, they should not be considered as separate activities since managers rarely engage in one practice to the mutual exclusion of the others. They are all interrelated in the management process.

4.1.2 Management Role

The functions of management are enacted in the various management roles. Henry Mintzberg(1973:92-3), has studied a variety of managerial roles and has identified 10 interactive roles which are performed by managers. Mintzberg separated these into three groupings: interpersonal, informational and decisional. Each of these can be readily identified in libraries. (see table 4.1.2)

Table 4.1.2 Management roles in libraries

Role	Description	Identifiable activities in libraries
Interpersonal Figurehead	Symbolic head; obliged to perform a number of routine duties of a legal or social nature.	Attendance of the chief executive or chief librarian at a farewell functions for an employee.
Leader	Responsible for the motivation and activation of subordinates; responsible for staffing, training and associated duties.	Discussions with individuals or groups as to their career paths and training and professional development needs.
Liaison	Maintains self-developed network of outside contacts and informers who provide favors and information.	Serving as an office bearer in a professional association and attending meetings where professional issues are discussed.
Informational monitor	Seeks and receives wide variety of special information to develop thorough understanding of organization and environment; emerges as nerve centre of internal and external information of the organization.	Telephone conversations with officers of government agencies or departments, lunchtime meeting with suppliers of resources e.g. book suppliers.
Disseminator	Transmits information received from outsiders or from other subordinates to members of the organization; some information factual, some involving interpretation of diverse value positions of organizational influencers.	Holding staff meeting, personal conversations with selected subordinates.
Spokesperson	Transmits information to outsides on	Production of Annual Report,

	organization's plans, policies, results, etc.; serves as expert on organization's industry.	appointment to select committees in library.
Decisional Entrepreneur	Searches organization and its environment and initiates 'improvement projects' to bring about change; supervises design of certain projects as well.	Initiation of new services, implementing a user/non-user survey of library facilities and services, problem solving in an unorthodox or original manner.
Disturbance Handler	Responsible for corrective action when organization faces important, unexpected disturbances.	Responding to situations such as strikes, bankrupt suppliers etc. which cause resource schedules not to be met.
Resource Allocator	Responsible for the allocation of organizational resources of all kinds – in effect the making or approval of all significant organizational decisions.	Allocating funds, personnel, equipment and personal time to various departments. May or may not be involved in how resources are further split or car marked.
Negotiator	Responsible for representing the organization at major negotiations.	Bargaining with others to obtain additional funds for a special library project. Negotiating new award conditions for library staff with trade union representatives.

Source: Adapted from the Nature of Managerial Work, Henry Mintzberg, pp. 92-93, 1973,

Whilst these roles are described separately, they are in practice highly integrated, each role being dependent upon others. The relative importance of each role is influenced by the manager's personal leadership style, the type of organization, its external environment, subordinate attributes, technologies used and the organization's corporate culture.

4.1.3 LEVELS OF MANAGEMENT

Managers operate at different levels of an organization, and their activities and skills differ

according to their place in the hierarchy (Table 4.1.3). Generally managers are described as being either top-level, mid-level or first-line managers. The number of people at each level of the hierarchy traditionally decreases as one move towards the top. Non-managerial personnel from the bulk of any organization's employees, there are a smaller number of first-line managers, even fewer mid-level managers and there is only one chief executive at the top.

It is important to realize that there are often two hierarchies of management operating within libraries; that of the library, and that of the organization to which the library belongs. For example, within a university or local government authority, the chief librarian may be regarded as being top management within the library, but mid-level management within the infrastructure of the university or local authority.

Levels of Management	**Primary Management Task**	**Activities**	**positions**
Top Management (strategic)	Relate organization to environment. Strategic planning, Holistic approach to organization system	Environmental scanning. Long-term planning. Policy-making. Management of environmental relations. Lobbying.	Chief Executives, Directors of National Libraries.
Mid-level Management (tactical)	Coordinate internal activities of organization.	Translate policies into practices. Prepare reports. Act as a buffer between top and first-line managers.	Chief Librarians, Section Heads.
first-line Management (operational)	Technical operations, Accomplish objectives effectively and efficiently.	Meet short-term objectives. Supervise. Operational functions. Maintain quality control and standards. Handle staff grievances. Responsible for day-to-day activities.	Branch Librarians, Departmental Heads.

Table 4.1.3 levels of management and their associated tasks, activities and positions in libraries.

4.1.3.1 TOP MANAGEMENT

Top management is responsible for planning for the future and for scanning the external

environment in order to identify potential changes which may either threaten or provide opportunities for the organization. In libraries or information centre, top management performs a boundary spanning the role, interacting with external organizations in the tasks of lobbying or politics, and representing the library in community affairs, business deals and government negotiations. Managers at this level spend much of their time with their peers, counterparts from similar organizations, and to a lesser extent their subordinates.

In planning for the future, top managers take note of information received from their contacts in the external environment and from summarized information obtained in the from of reports from their subordinates (mid-level management) on the organization's internal environment. In establishing policies they take a holistic view-point, being responsible for overall control of the organization and, as part of this process, they identify the goals to be achieved by their subordinates,

4.1.3.2 MID-LEVEL MANAGEMENT

Mid-level managers receive broad strategies and policies from top management and translate these into specific action programmes which can be implemented by first-line managers. They also spend considerable time analyzing data, such as statistics provided by first-line managers, and summarize these in reports to top management. In acting as a buffer between top and first-line management, mid-level managers spend much of their time using high-level communication skills in talking on the telephone, attending meeting and preparing reports. Mid-level managers in libraries or information centre must have an in-depth knowledge of their particular department or branch and its relationship with other departments or branches in order to perform the necessary coordination function which is part of their role.

4.1.3.3 FIRST-LINE MANAGEMENT

`First-line managers are directly responsible for the day-to-day administration of resources in order to meet short-term objectives. Theirs is primarily a supervisory and grievance-handling task calling for strong technical and interpersonal skills. They spend little time with top management or managers from other organizations, dealing mainly with their subordinates and clientele. In libraries and information centre first-line managers lead hectic, interrupted work lives. They spend most of their time problem-solving and communicating with those in their immediate supervisory area, much of which is on a one-to-one basis. They are also charged with maintaining quality control or standards and, in libraries or information centre, this can mean ensuring that requests for information are answered correctly and as quickly as possible, that proper overdue procedures are carried out, or

ensuring that materials are shelved correctly.

An understanding of the levels of management is important in order to ensure each management level is performing is proper functions and tasks. It is false economy for top management to be involved in the day-to-day operation of the library at the expense of proper planning, whilst first-line management cannot be expected to have a holistic view of the total organization in order to make decisions affecting many areas.

4.1.4 SKILL: INTRODUCTION:

Skill has wide impact in our day to day life. It is required at home/Office/workshop/playground/ education/libraries etc. Skills are required for workers/engineers/doctors/managers/ teachers/ technologists and library professionals etc. Skill enables a person to plan and execute and action designed to achieve a goal, compare results, with intension and make adjustments in the plan of action. Changes i.e. social, political, economical, cultural, educational, are taking place at faster rate in general with particular reference to technological. These change an affecting human life and profession. Therefore, skills are necessary for professionals to face the challenges on account of following reasons.

(i) Economic reasons:

Libraries are considered non profit organizations and generally face shortage of funds to provide services to the clientele, employing additional staff, purchasing equipment, training of manpower etc. Libraries are facing problem of limited resources, increasing demands of clientele, and high cost of documents and services. In such situations only skilled personnel can cope with the situation effectively and efficiently.

(ii) Technological reasons:

Technology, especially information technology is changing at faster rate. Information technology such as computer, telecommunication media, reprographics, micrographic & online databases, library network affected the libraries at large scale. It is not easy to handle these technologies effectively and efficiently. Therefore, professionals should learn skills to handle IT in their respective fields at optimum level,

(iii) Social and cultural reasons:

Our society is moving from Agrarian to industrial and finally to information Society. Member

of the society are changing their life style, such as work style, food habits, information seeking pattern etc. In changing environment of the society, only skilled personnel may understand and adjust in a better way to achieve Social & cultural changes in the perfect way.

(iv) Other reasons:

It has been observed that professionals coming out from the library schools are not competent enough to face challenges of 21st century perhaps due to lack of good quality of teachings, infrastructure facilities, and skill based curriculum etc.

4.1.5 Concept of Skill:

The Websters Illustrated Contemporary Dictionary, defined skill as (i) 'Ability or proficiency in execution or performance' (ii) 'Specific art, craft, trade, or job also such as an art, craft etc. in which one has a learned competence'.

According to Concise Encyclopedia of Psychology : A skill is defined "As coordinated series of actions that serve to achieve some goal or accomplish a particular task". The goal or task may be academic, social mortar or a self-help or independent living task.

In short, skill means a person has an ability to perform any task successfully. A skilled person has following attributes i.e. purposive ness, efficiency, precision, flexible behaviors and effectiveness etc.

4.1.6 TYPES OF SKILLS

1. Communication Skills:

Communication skills have vital role in life. It is also important for the library and information science professionals. Both written and oral skills are required for the personnel, who perform several types of job in their respective fields for example. Librarian/Information Officer issues instructions to the subordinate staff, write letters to the authorities, sending order for the purchase of documents, equipment etc. maintains public relations, organize orientation programmes for users. Subordinate staff also highlights requirement/problem/measures of the section/division to the concerned authorities either in written/oral or in both ways.

2 .Management skills:

Management is core aspect of libraries and information centers. Therefore, management skills

are required to manage the library financially, personally, technologically by applying management techniques and skills i.e. supervisory, counseling, auditing, and planning, decision making, motivating etc. in general with particular reference to digital libraries.

3. Technological Skills:

The present 'Age' is considered as 'Age of Technology'. Skills are required to handle technology in general with particular reference to information technology i.e. computer operations, telecommunication medias, participation in library networks, use of reprographics and micrographics, creation of online databases, designing of websites, searching of information in internet, handling of audio visual materials/digital collection, with full confidence. Thus professionals may apply their minds in application of IT in the relevant context, keeping in view objectives of the organization.

4. Traditional skills:

There is a great role of traditional skills in the libraries and information centers. Traditional skills play a great role in maintaining historic & cultural character of the libraries. Traditional skills are acquisition, organization and Dissemination of information. The skills are necessary for classification & cataloguing of documents, method of indexing and abstracting, preservation and conservation of library materials, especially archives/manuscripts.

5. Research and Statistical Skills:

Research & Statistics skills are basically required for faculty members, research scholars in the library schools to analyze, synthesis, manipulate, consolidate, evaluate, and interpret result of the research/study as a scientific manner. These skills are also required for the staff in the libraries to fulfill various needs of research scholars/ faculty members. Staff of the library should aware latest trend of research so that they may perform that duty in the right manner.

6. Other skills:

There are large number of other skills i.e. navigation, advocacy, innovation etc. These skills help to professionals to take proper decision in the changing environment, relevant to their work, as per objectives of the organizations.

4.1.7 Human Needs and Libraries:

Human needs play an important role in life. Abraham H. Maslow, identified five categories of human needs

(i) Physiological: Life support materials

(ii) Safety: Security-protection, stability

(iii) Social: Love and affection, friendly contacts

(iv) Esteem or Ego: Prestige, self respects recognition etc. and

(v) Self actualization needs

Developing and use of one's own potential is in a hierarchical order. Professional manpower needs i.e. acquisition of knowledge, learning skills and psychological needs start from the third category and moves onward. When an employee/person wish/to develop professionally or achieve better position in the organization by utilizing his/her potential at maximum level. To reach at the top of profession person has to require competency through acquisition of knowledge i.e. traditional subjects, information technology, research methodology, foreign languages, preservation and conservation of library materials, collection development policies, organization & management of digital libraries and through learning skills i.e. communication, management, traditional, technological, research and statistical, advocacy, innovation, navigation etc. and finally having positive attitude through job satisfaction, recognition, motivation, esteem eteh etc.

4.1.8 Applications of skills in library & information science activities

There is wide application of knowledge and skills in many fields. In Library and information Centers, M.A. Gopinath observed that following type of knowledge and skills are required to perform day to day jobs.

(A) Essential for many posts in library information system: Such as

(i) Knowledge of library philosophy

(ii) Knowledge of library history

(iii) Knowledge of general reference materials

(iv) Knowledge of methods of organization of information

(v) Human relation skills

(vi) Knowledge of general bibliography

(vii) Managerial skills

(viii) Statistical skills

(ix) Knowledge of foreign languages.

(B) Important for specialist position in libraries:

in addition to the above, the following are essential for variety of jobs in the libraries.

(i) Knowledge of specialized materials
(ii) Specialized analytical skills and techniques
(iii) Knowledge collection development theories and practices
(iv) Knowledge of library automation theories and practices
(v) Online retrieval skills
(vi) Supervisory skills
(vii) counseling skills
(viii) Knowledge of policy making aspects
(ix) knowledge of cost effective and cost efficient techniques
(x) Knowledge of document reproduction technologies
(xi) Knowledge of binding policies methods and issues
(xii) Knowledge of conservation methods for library materials
(xiii) Knowledge of information consolidation techniques, and
(xiv) Knowledge of teaching and research skills.

4.1.9 Strategies to learn/develop skills:

The skills may be learned/ developed by adopting following strategies.

(i) To provide an opportunity to the professionals to participate in seminars/workshops/conferences etc.
(ii) To encourage professionals for writing papers.
(iii) To provide an opportunity to visit the libraries and information centers and interact with people.
(iv) To up-to date knowledge from time to time from various sources of information.
(v) To organize short term courses in skills by the Professional Associations/ institutions.
(vi) To design skills based curriculum by the library school.

4.1.10 MANAGERIAL SKILLS AND LEVELS OF MANAGEMENT

A skill can be described as the ability to translate knowledge into action that results in a desired performance. Traditionally it has been considered that managers use three skills in carrying out their tasks: technical, interpersonal and conceptual. To these may be added diagnostic and analytical skills. Not all of these skills are used in equal proportion. Managers at different levels in the organization need different kinds of skills, and libraries and information centre are no exception to this rule. As librarians or information personnel progress up the hierarchy of the organization, technical and interpersonal

skills diminish in importance compared to the conceptual, diagnostic and analytical skills.

TECHNICAL SKILLS

Technical skills comprise the skills needed to accomplish tasks. In libraries these include the knowledge and technical expertise required to use on-line information systems, trade and national bibliographies, computer terminals, video disk players or knowledge of the various bibliographical organization schemes. Technical skills are most used by first-line managers in libraries where training and supervision of staff in work activities is important. In order to answer questions and gain the respect of their subordinates they must be skilled and knowledgeable in the equipment, facilities, systems and techniques used in the library.

INTERPERSONAL SKILLS

Interpersonal skills are used by managers as they interact with people within and outside the organization, and they featured prominently in Mintzberg's 10 managerial roles. They are used to maintain the network of contacts and human relationships which are necessary in order for the goals of the organization to be achieved. Interpersonal skills are also used to communicate with, understand and motivate both individuals and groups.

Top management in libraries use interpersonal skills to obtain knowledge about the external environment in which the library organization operates, and in lobbying and dealing with the decision-makers, Mid-level managers use interpersonal skills in liaising between top and first-line management, in discussing needs and translating policies into actions. First-line managers rely heavily on interpersonal skills to create a work environment in which tasks are happily and effectively accomplished. A manager who has good interpersonal skills is likely to be more successful than a manager who is poor in this area.

CONCEPTUAL SKILLS

Conceptual skills can be defined as the ability to understand the relationships of individual parts to the whole, and the whole by breaking it into parts. It also requires an understanding of cause and effect relationships within and outside the organization. In libraries, conceptual skills require a holistic approach to understanding how the various departments' or services' goals and activities contribute to actual outcomes and the relationships and impact of external environment al forces upon these goals and activities. These skills allow top and mid-level management to take overall view and determine

whether individual department needs complement those of the organization, and react to potential problems appropriately.

DIAGNOSTIC SKILLS

Diagnostic skills provide the ability to acquire analyses and interpret information to determine the cause of changes in the inputs, outputs or transformation processes of the organization. In libraries such changes may be either symptoms of problems or favorable situations. For example, a high staff turnover in a technical services department may be a symptom of a human relations problem where the librarian-in-charges is lacking in interpersonal skills, or alternatively, a product of a monotonous work environment in which the solution may be found in job enrichment. A favorable situation can be detected when an increase in the issue rate of materials in the library is the favorable result of a change in the book selection policy.

ANALYTICAL SKILLS

Analytical skills allow the librarian or information professional to determine the cause of change and to either provide corrective action or take advantage of the situation. They complement diagnostic skills in that they provide the means to identify the key variables in a situation, to determine how they are interrelated and to decide which ones need attention. Various strategies for dealing with the issues at stake can be considered and the most appropriate one decided upon. Diagnostic skills enable managers to understand a situation; analytical skills enable them to determine the appropriate course of action.

In this age of information technology, there is growing of interdisciplinary subjects, continuous modernization/ improvement of techniques and changing needs of library users. To manage all these in the library, the library professionals must be able to perform various roles like Documentation Officer, Librarian, information Scientist, System Analyst and information Manager.

Goel stated "Every library grows in terms reading materials, equipment, space, staff, readers etc. in course of time. Also, there is a change in the specialized needs and interests of the readers, the kinds of services being expected and the speed at which the reading material and the information are being produced and circulated. All these have contributed to a change in the nature of the libraries, which becoming more and more complex and require rethinking, preplanning and reorganization. The larger the library, the more complex would be its organization and the consequential management problems. In order to meet all these pressures and to organize and manage a modem library in a manner that it comes unto the expectations of the users and continues to be effective, efficient and meaningful,

it needs a competent manager".

The competent managers here must be the Library Professionals. The present study is limited to the Library Professionals working in Engineering College Libraries in Gujarat.

Librarians in Engineering Colleges are overburdened with administrative, organizational and managerial functions. Major administrative, organizational and managerial functions are the leadership, human relations, builder of morale and motivation. Linking to work with the people is planning, organizing, directing, supervising, coordinating, evaluating etc. in personnel administration, resources organization and managements.

The varieties of Librarian's usual activities are formulating policies, aims and objectives. This involves planning, determining the organizational framework, making major decisions, supervising the middle level management and seeing that they carry out the duties and responsibilities delegated to them. It is the responsible work of the librarians to balance properly and co-ordinate all the subordinate workers and to look after the operations of the library and to evaluate them.

Rawtani and Yusuf emphasized that the "management skills are required to manage the library financially, personally, technologically by applying management techniques and skills, i.e., supervisory, counseling, auditing, planning, decision making, motivating, etc. in general with particular reference to digital libraries".

Hence, the managerial skills are essentially needed for all the library professionals, to manage the various sections and the library as a whole.

4.1.11 VARIOUS MANAGERIAL SKILLS:

The various Managerial Skills needed for the Library Professionals are explained as under:

1. Planning and Forecasting

In general planning and forecasting is the managerial process of determining, what to do, how to do, where to do, when to do, who have to do, what is required etc well in advance. In other words, planning and forecasting study the future course of action well in advance. It also studies about the action/process, the person who is responsible to complete the process, the time limit within which the work/process should be completed, problems to be tackled to complete the task etc. well in advance. In libraries, the library professionals have to mange the library resources as per the requirements of its users further; the changing information technology provided various techniques to the library. Under these circumstances, the professionals have to face the questions such as what to purchase? What are the present/future requirements of the users'? Whether the automation is useful etc. To prepare for such

problems, the library professionals have to know proper planning and forecasting skills.

2. Independent Decision Making Skills:

In day to day work, while managing the different sections and processes, the library professionals face many problems. To solve these problems the concerned professionals must have to take decision after analyzing the alternatives

To make good decisions regularly the persons should follow sequential set of steps, each one of which will make the following step more likely to be successful..

These steps are:

A. Recognizing a problem;
B. Diagnosing causes of problems;
C. Generating alternatives;
D. Selecting alternatives; and
E. Implementing decisions.

3. Leadership Skills

Encyclopedia of the Social Sciences defines "Leadership is the relation between an individual and a group around some common interest and behaving in a manner directed or determined by him". it involves the leader exerting his influence over the led (Subordinates) by means of proper communication to the group as to how he thinks about the people's work, their accomplishments and his expectations of theme

The important quality of a leader is not the ability to command but the ability to make the people he leads to behave voluntarily in a manner directed by him.

4. Self-Confidence and Supervision

Supervision is an art to guide the subordinates and to observe that everything is going according to the plan and the objectives of the organization. Supervision involves overseeing or watching with authority the work in progress of the performance of the subordinates by superiors. To supervise an action, Self-Confidence of the Supervisor is essential.

5. Time Management

Time is a valuable resource for all kinds of people. The Fourth Law of Library Science emphasizes to save the time of the users. In a library, to save the time of the users, the actions such as planning, utilizing library finance, ordering for documents, subscriptions to the periodicals and journals, processing work etc. should be made timely. For this purpose, Library Professionals must have to know the Time Management Skills.

6. Authority and Responsibility

Authority refers to certain administrative powers, privileges and rights possessed by a Superior Officer over his/her subordinates. Responsibility is an obligation to get the work done successfully. To supervise the subordinates, the supervisor the leader must have sufficient authority and is responsible for the success or failure of the work assigned to the leader.

7. Direction (Directing)

Directing is to point or aim; to print out proper course to; to guide; to order; to plan; and to supervise, counsel, command. The directing is expected is maximizing the use of human skill and human will to work with minimum resort to compulsion and external discipline. To manage the work in the library, every library professional must have the knowledge of Direction.

8. Interpersonal and Human Relation Skills

To run the library work smoothly, there needs cordial relationship among the library staffs. Proper communication is a better way to achieve cordial relationship among the library staffs. For this purpose, library professionals need to know about the interpersonal and Human Relation Skills.

9. Conflict Resolution Skills

Conflict occurs when two parties come into direct disagreement, as of ideas or interests. Conflict has been defined as all kinds of opposition or antagonistic interactions in or among individuals, groups and or organizations. A conflict is a dispute, difference or struggle between two parties that is indicated by open expression of hostility and/or intentional interference in the goal achievement of the opposing party.

In every organization (including library), in one or other way, there is Conflict between two parties (persons or sections). Conflicts always become obstacles to the work. Hence, there is necessary to solve these conflicts, as and when they arise in the libraries. For this purpose the library

professionals must have to know the ways and means to avoid the conflicts and resolve the same in the libraries.

10. Motivation

Motive is defined as an inner state of our mind that energizes, activates or moves and directs the people's behavior towards goals. A motive is an active form of a desire, craving or need. A motive is the mainspring of human action. Motivation is the process which influences people to work. Motivation arouses behavior, sustains behavior, and channels behavior into a specific course of action. Motivation is defined as the willingness to exert towards the accomplishment of some goal. As a Heads of different sections in the Library, library professionals must know about Motivational Skills. Because they have to persuade and influence their subordinates for getting the work from them.

11. Problem Solving Skills

In day today work, the problems arise in every library. The problem may be big or small, it must be solved Otherwise it may become obstacle for the smooth running of the library. Hence, it is necessary to solve the problems. The Library Professionals must have the knowledge and expertise in solving the problems.

12. Coordination (Co-Coordinating Skills)

To co-ordinate is to harmonize all the activities of a concern so as to facilitate its successful functioning. It is the orderly arrangement of group effort to provide unity of action in pursuit of a common purpose.

G.R. Terry defines Co-Ordination as "the orderly synchronization of efforts to provide the proper amount, timing and directing of execution resulting in harmonious and unified actions to a stated objective". As the library professionals are managing different groups and sections in the library, to conduct activities of their sections the. Coordination of different activities is needed.

13. Developing Team Spirit

As all the operations in the library required group work, the co-operation in groups and teams is necessary. For this purpose, the leaders or the library professionals must have to build and develop Team Spirit among the different kinds of Staff in the library. Hence the library professionals must know the team building and developing team spirit among the library staff.

14. Motivational Skills or Superiors

Whenever an achievement is done by subordinates, it is proved as the subordinate is having extraordinary skills and expertise in his profession. If the superiors such as Section Heads (Assistant Librarians and Deputy Librarians), Superior Officers (Librarians, Registrar of the University) and such other superiors appreciate the achievement and development of their employees, then it will be an encouragement for the subordinate staff to work hard in the library. Hence, in case of such development, the superiors must encourage their subordinates.

15. Job Recognition

A person work willingly only if he is satisfied and recognized with the nature of work, working conditions, rewards, Authority and such other factors. Hence to work effectively and efficiently the library professionals must be encouraged and recognized with their job.

It is fact that skills play a crucial role in fulfilling manpower needs of libraries. It is also true that manpower needs of the libraries may not be fulfilled unless professionals have adequate knowledge. If person has adequate knowledge, learned skills, but not positive attitude, still then one cannot successful in his/her goal in achieving objectives of the organization in a better way. Therefore, professionals should acquire adequate knowledge, learn skills and have positive attitude to fulfill objectives of the libraries.

4.2 Digital Environment

4.2.1 History, trends and growth

Libraries have gone through several generation of technology as they have evolved from print to electronic resources. Libraries are responding to the challenges of new technologies by taking the opportunity to redefine their fundamental role in the creation, distribution and provision of access to information.

There is general agreement that much of the early actual application of computers to information retrieval was stimulated by the prominent scientist Vannevar Bush (1945), who wrote about the 'memex', a mechanical device based on microfilm technology that anticipated the ideas of both hypertext and personal information retrieval systems. The first real-world application of computers to libraries began in the early 1950s when IBM applied punched cards to library technical services operations, and with the development of the MARC (Machine-Readable Cataloging) standard

for digitizing and communicating library catalogue information. Licklider (1965) coined the phrase 'library of the future' to refer to his vision of a fully computer-based library, and ten years later Lancaster (1978) wrote of the soon-to-come 'paperless library'. About the same time Nelson (1974) invented and named hypertext and hyperspace. Many other terms have been coined to refer to the concept of a digitized library, including 'electronic library', 'virtual library;, 'library without walls', 'bionic library', and others.

Digital libraries have a short yet turbulent and explosive history. A number of early visionaries, such as Licklider (1965), had a notion of libraries in the future being highly innovative and different in structure, processing and access through the heavy application of technology. But, besides visionary and futuristic discussions and highly scattered research and development experimentation, nothing much happened in the next two decades. By the end of the 1980s, digital libraries (under various names) were barely a part of the landscape of librarianship, information science or computer science. But just a decade later, by the end of the 1990s, research, practical developments and general interest in digital libraries exploded globally. The 1990s brought a revolution that made possible the extension of the automated library to a more enhanced electronic library or digital library. The accelerated growth of numerous and highly varied efforts related to digital libraries continues unabated in the 2000s.

4.2.2 Introduction

The term 'digital Environment' is used in a wider context to include all sources where the information is available in electronic formats and accessible with the help of computers. These sources include automated libraries, electronic libraries, virtual libraries, paperless libraries, networked libraries, libraries without walls and multimedia libraries, and all such terms are used interchangeably and synonymously. The term digital library has, however, become the preferred term due to growing interest and marries the missions, techniques and cultures of physical libraries with the capabilities and cultures of computing and telecommunications. The advantages of digital information are well established and understood - it can be delivered direct to the users, multiple simultaneous use is possible with no degradation through use and with minimal storage costs, sophisticated searching techniques are available and retrieval is fast.

The term 'digital library' has come to refer to any aspect of text, image or sound as it exists in digital form as opposed to a traditional format. Digital information presently exists in a variety of formats: OPACs, library networks, CD-ROMs, local database, online commercial database, gopher space, the World Wide Web, image libraries, audio libraries, digital video libraries and so forth (Lunch

and Garcia-Molina, 1995). One of the important characteristics of digital information resources is that the very nature of being electronic makes the information accessible and shareable regardless of times and space. While there are considerable efforts to create comprehensive digital libraries across the globe, it can be safely said that there is not a digital library without a print library. What we have today is more like a 'hybrid library'. Corcoran (2003), in his overview of the hybrid library, defines it as the library that contains a mix of print and electronic resources offered in a variety of formats and delivered either locally or remotely. It is neither a traditional, print-based library nor is it fully digital – it exists on a continuum somewhere between the two. He believes that the hybrid library is a very real model in and of it and will continue to exist as a very real working model for a number of reasons including:

- Libraries have made huge investments in print resources; these legacy resources are likely to remain outside the e-domain.
- Even where decisions are taken to digitize legacy materials, this is an expensive and labour - intensive activity. Furthermore permissions to digitize are not readily granted.
- Despite rapid technological developments, the technologies to truly deliver digital libraries are not yet available. We are still operating in a changing environment with transient and immature technologies.
- Until publishers/suppliers can guarantee access to archived electronic journals, libraries will continue to rely on a hybrid journal collection development policy.

As a corollary to the last statement, even if there is guaranteed access to archived electronic resources, print counterparts cannot be dumped. So, the hybrid library is here to stay. Of course, the scope of the hybrid library will include more and more digital resources. And what we discuss below is the digital library, i.e. the digital library. It can be safely declared that will not be a library without digital components in its information collections.

4.2.3 Definition of the digital library

Defining the digital library is an interesting but somewhat daunting task. There is no shortage of proposed definitions. One would think that there would be some commonly accepted and fairly straightforward standard definition, but there does not appear to be. Rather, there are many. And one common thread among all these definitions is a heavy emphasis on resources and an apparent lack of emphasis on librarians and the services they provide.

A review of the literature on digital libraries, written by scholars from a wide array of fields

including LIS and computer science, reveals that even in the professional environment a large number of definitions are in use. In the literature, the digital library may also be called the library without walls, the virtual library, the electronic library, the e-library, the desktop library, the online library, the future library, the library of the future, the logical library, the networked library, the hybrid library, the gateway library, the extended library or the information superhighway. Of these many terms, digital library, virtual library, electronic library and hybrid library are the most common.

Gapen (1992) provides a very comprehensive definition of a virtual library:

The virtual library has been defined as the concept of remote access to the contents and services of libraries and other information resources, combining an on-site collection of current and heavily used materials in both print and electronic form, with an electronic network which provides access to, and delivery from, external worldwide library and commercial information and knowledge sources. In essence the user is provided the effect of a library which is a synergy created by bringing together technologically the resources of many, many libraries and information resources.

The electronic library, however, is a somewhat different notion:

The electronic library will be realized as an aggregation of catalogs, lists and indexes of documents of every imaginable type, organized according to myriad schemes of classification and linked and cross-indexed for search, so that they come to behave as a single database in which the lines between individual collections and catalogs are blurred. (Nunberg, 1993)

According to Collier (1997), the electronic library is a:

Managed environment of multimedia materials in digital form, designed for the benefit of its user population, structured to facilitate access to its contents and equipped with aids to navigation of the global network.

In more understandable terms, digital libraries would ideally be able to store data at multiple sites and allow a user to search for information across these multiple repositories in a single step.

Collier (1997) says that a library becomes digital when the majority of its resources are held in electronic form. On the other hand, Sun Microsystems (2002) defines a digital library as the electronic extension of functions users typically perform and the resources they access in a traditional library. These information resources can be translated into digital form, stored in multimedia repositories and made available through web-based services. The emergence of the digital library mirrors the growth of e-learning (or distance learning) as the virtual alternative to traditional school attendance. As the student population increasingly turns to off-campus alternatives for lifelong, learning, the library must evolve to fit this new educational paradigm or become obsolete as students search for other ways to conveniently locate information resources anywhere, any time.

The Association of Research Libraries has defined a digital library as follows:

There are many definitions of a 'digital library.' Terms such as 'electronic library' and 'virtual library' are often used synonymously. The elements that have been identified as common to these definitions are the digital library is not a single entity; the digital library requires technology to link the resources of many; the linkages between the many digital libraries and information services are transparent to the end users; universal access to digital libraries and information services is a goal; digital library collection are not limited to document surrogates: they extend to digital artifacts that cannot be represented or distributed. (ARL, 1997)

ACM defined digital libraries as follows (Fox, 1995):

The phrase 'digital library' evokes a different impression in each reader. To some, it simply suggests computerization of traditional libraries. To others, who have studied library science, it calls for carrying out the functions of libraries in a new way, encompassing new types of information resources; new approaches to acquisition (especially with more sharing and subscription services); new methods of storage and preservation; new approaches to classification and cataloging, new modes of interaction with and for patrons; more reliance on electronic systems and network; and dramatic shifts in intellectual, organizational, and economic practices. To many computer professionals, a digital library is simply a distributed text based information system. A collection of distributed information services of a networked multimedia information systems. It may have materials that are mostly from outside the organization, that are generally of high value, and that have had special electronic services add to their quality during creation, collection, organization, and/or use. To modern day users of the WWW it suggests more of the same, with sure-to-come improvement in performance, organization, functionality, and usability. Those studying collaboration technologies see digital libraries as the space in which people communicate, share and produce new knowledge and knowledge products. Those working on education technology see digital libraries as support for learning, whether formal or informal.

The Digital Library Federations defines digital libraries as follows:

Digital libraries are organizations that provide the resources, including the specialized staff, to select structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collection of digital works so that they are readily and economically available for use by a defined community or set of communities. (Walters, 1998)

This definition involves three key components which constitute the theoretical framework underlying digital libraries, namely:

- People;

- Information resources; and
- Technology.

Cleveland (1998) provides a further working definition: digital libraries are libraries with the same purpose, functions and goals as traditional libraries – collection development and management, subject analysis, index creation, provision of access, reference work and preservation.

However, the definition by Lam et al. (1999) comes very close to the subject of this book. They define a digital library as a networked system environment that provides user communities with coherent, seamless and transparent access to large, organized and digitized information resources.

4.2.4 Global trends in electronic information

Libraries of all types and in all setting are developing a global vision of international networked collection and services. This model views libraries as both providers of worldwide knowledge resources and gateways for users to knowledge which is increasingly electronic in form. This transformation requires the recognition of important revolutionary changes which are transforming collections, information services and the working relationships among libraries (Neal, 1999):

- The personal computing revolution is at the core of individualized technology and the expanding power to access, analyse and control information.
- The electronic revolution is producing vast amounts of digital information in all media and intelligent software that enables effective search and retrieval.
- The network revolution is creating a vast telecommunications web and robust platforms for distributing an expanding volume of electronic resources.
- The push revolution is shifting radically the nature of network searching by narrowcasting automatically to users through customized packaging and delivery of information.
- The self-service revolution is encouraging fundamental rethinking of user service in an environment where user-initiated and controlled activities are becoming commonplace.
- The partnership revolution is promoting higher levels of cooperation and collaboration among organizations as a fundamental requirement for success and as a basis for consortia co-investment in electronic information.

- The authorship revolution is defining the facility and the creative possibilities of the network where anyone with a minimal investment can post information to millions of potential readers on a global scale.
- The intellectual property revolution is threatening fair use rights for digital information and creating extraordinary conflict between the interests of information providers and information consumers.
- The digital preservation revolution is energizing concern about the integrity and archiving for future use of the vast amount of electronic information being produced and lost.
- The information as commodity revolution is increasingly viewing data and its synthesized product, knowledge, as articles of commerce and sources of profit rather than property held in common for societal good.
- The knowledge management revolution is spawning a new relationship among researcher, librarian and information technologist which maximizes the usefulness of data gathering and information generation.

These trends illustrate dramatic new directions in the nature and role of library collections and services. In the early 1970s, libraries began to adopt software applications to allow them to perform specific functions more efficiently. The next phase of library automation combined several library activities into one integrated system, allowing librarians to perform almost all their functions online. Data entered once could be used in multiple ways, which increased efficiency and accuracy. The transition from large-scale computing technologies to microcomputers was well under way by the mind-1980s. This trend required re-education of the library and systems IT staff, which added significant costs to libraries. Three changes followed: different library application providers, more powerful technologies and software applications and networking configurations that were no longer developed in-house. Libraries of all types began utilizing new application systems to automate resource sharing. Union catalogues and inter-library loan modules were developed by library software vendors to allow cooperating institutions to combine their catalogues and allow patrons of one library to request and borrow materials from linked institutions (sun Microsystems, 2003).

As the 1980s ended, libraries and computing centre were tackling communications, relational databases and information distribution challenges. The 1990s saw greater use of campus communication infrastructures and commercial communication systems to create and store information and then deliver in from libraries to end-users.

Large databases from periodical, magazine and journal publishers became increasingly available in digital format – at first on CD-ROM, later via online services. Library services are transitioning from local traditional collections to global resources provided on demand via the most advanced networking technologies. Today, library collections are used by people on campus as well as by individuals who are not even located on the library's physical facilities. Thus individuals associated with a given institution and accessing resources from afar need new electronic interface tools. As a result, professional librarians must be computer literate and knowledgeable about Internet technologies to fully participate in the planning, design and implementation of future library services (Sun Microsystems, 2003)

4.2.5 Growth of electronic knowledge resources

Although information in electronic format was created with the advent of the computer in the 1950s, it was not until the early 1960s that the first database suitable for searching was developed. MDELARS was the first on-demand computer-based information retrieval service, and it was developed primarily for the medical profession. In 1971, MEDLINE, the online version of MEDLARS, was the first major online dial-up database search service. In the following year, DIALOG offered the first public online commercial database. With these first databases, there were no real acquisition decisions, as they were offered as access services to which libraries could subscribe. Actual searching of these databases produced charges that many libraries passed along to users. While the information revolution was clearly underway, it was not until after the introduction of the CD-ROM in the mid-1980s that electronic resources began to have a major impact on selection practices in libraries (Meadow, 1988).

Many of the first CD-ROM products offered to libraries were versions of larger online databases and were supplied on a subscription basis whit ownership of the data remaining with the publisher/producer. Initially, the price of the product included licensing of the content and possibly the purchase of a computer and CD-ROM player as well. Products were guaranteed to work only with specified CD-ROM players, as standards were not yet established. The purchase of this equipment as part of the cost of the information product was not always easy. Often equipment was not considered an appropriate use of the library's materials budget. Moreover, equipment budgets were not always large enough or flexible enough, initially, to accommodate this new demand. As with audiovisual materials, the unit price of these products was high and use was often limited to one individual at a time.

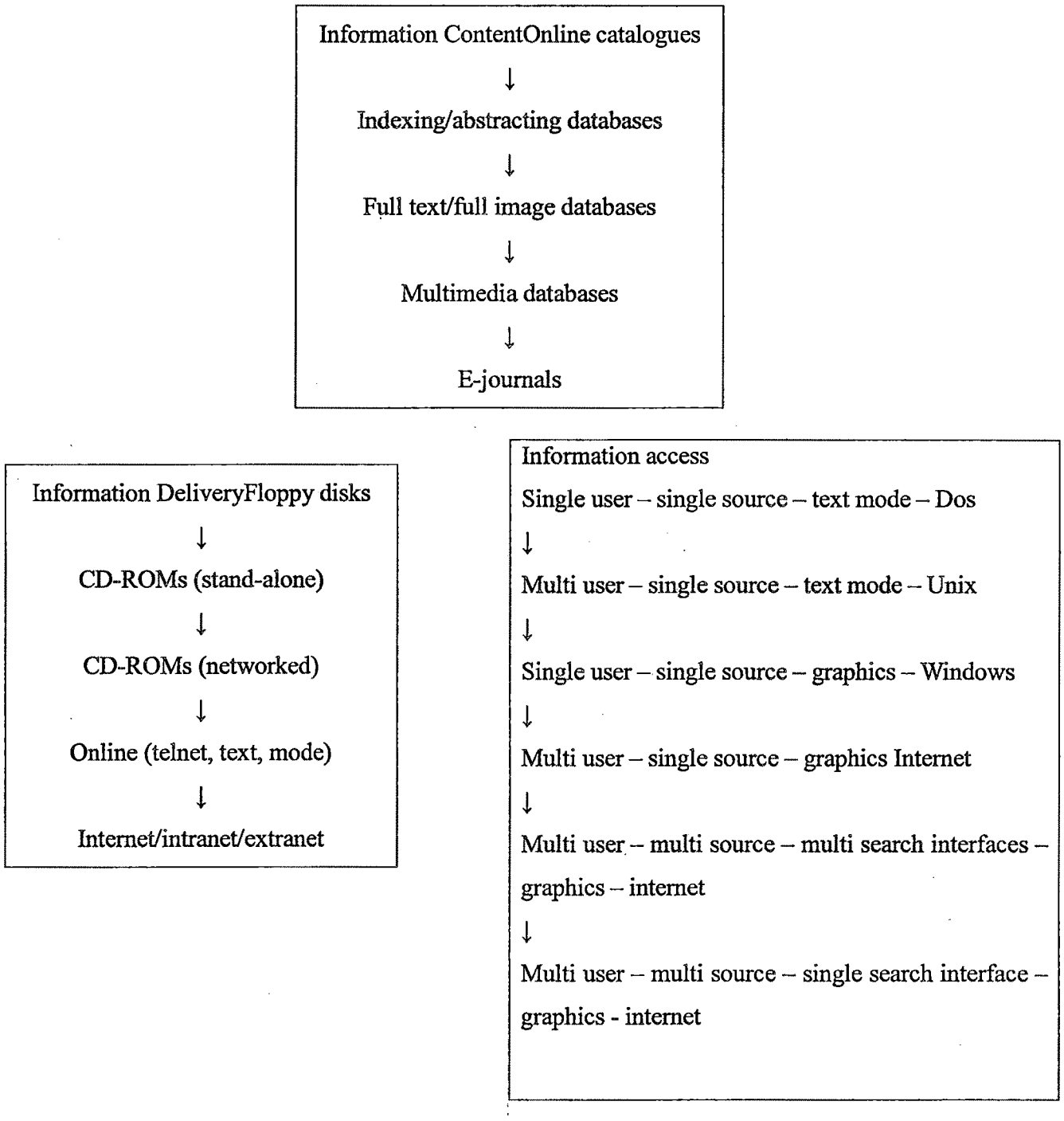
Although very expensive at first, CD-ROM products gradually became more affordable. As personal computers became widely available in most libraries, these products also became very

popular. Initially, only one person could use these CD-ROM databases at a time, a major drawback, especially considering their high cost. The alternative was to purchase the needed database on magnetic tape and mount in on the local computer system, which could provide simultaneous access to many users. This, however, was a very expensive solution and one that most libraries could not afford. Gradually, hardware and software solutions were found that allowed several users to access the same CD-ROM database simultaneously. Some libraries even found way to provide access to CD-ROM products at sites outside of the library (Thornton, 2000).

The World Wide Web permeates almost all aspects of computing. An ever-increasing array of information producers now relies on this media to distribute their products and services.

The development in electronic information, the development of networked access and the delivery of new library services has seen a radical transformation in the information chain (see Figure 4.2.5).

Figure 4.2.5 Growth of electronic information



Source: Pandian and Karisiddappa (2004).

4.2.6 Characteristics of the digital library

One of the early authors on the electronic library was Kenneth Dowlin who wrote a book entitled *The Electronic Library* in 1984. He defined the characteristics of the electronic library as follows (Dowlin, 1984).

- Management of resources with a computer
- The ability to link the information provider which the information seeker via electronic channels;
- The ability for staff to intervene in the electronic transaction when requested by the information seeker;
- The ability to store, organize and transmit information to the information seeker via electronic channels.

While there is considerable uncertainty about that the digital library means, it can be contrasted with conventional libraries in important respects. Differing from the traditional library, the digital library has its own characteristics and functions. It can be generalized into the following aspects (Baohua et al., 2002).

- The digitalization of the information resources;
- The Internet as a means of information transfer;
- The sharing of information;
- Knowledge of information supply;

The fictitious information object.

Digital libraries are distributed network system environment since many different types of information resources will be interlinked together to provide the user with value-added services. In this context, the digital library is not a single entity (Ram et al., 1999).

The digital library:

- Has an open architecture built on the collection of distributed information resources;
- Stores multiple formats;
- Contains both metadata and data;

- Provides integrated functions of searching and presenting;
- Allows seamless and transparent access to multiple heterogeneous information resources;
- Facilitates interoperability;
- Provides user-friendly interface and query facilities;
- Serves both information seekers and providers.

Chowdhury and Chowdhury (2003) have identified the following characteristics of digital libraries:

- They provide a variety of digital information resources.
- They reduce the need for physical space.
- Users may be remote from the library.
- Users may build their own personal collections through the facilities provided by the digital library.
- They provide access to distributed information resources.
- Many users can share the same information at the same time.
- They represent a paradigm shift both in use and ownership.
- Collection development can be based on potential usefulness and appropriate filtering mechanisms.
- They have the ability to handle multilingual content.
- They presuppose the absence of human intermediaries.
- They should provide better searching and retrieval facilities.
- Digital information can be used and viewed differently by different people.
- They break the time, space and language barriers.

Collier (1997) provides the following characteristics of digital libraries:

- Access to the digital library is not bounded in space or time. It can be accessed from anywhere at any time.
- Content in electronic form will steadily increase while content in printed form will decrease.

- Content is in textual, image and sound form.
- The usage of electronic information as proportion of total usage will steadily increase, and the usage of printed material as a proportion of total usage will decrease.
- Expenditure on electronic material will steadily increase and, relatively, expenditure on printed material will decrease.
- Expenditure on information will shift from ownership to subscription and licensing.
- Expenditure on equipment and infrastructure will increase.
- The usage of buildings will shift from stockholding to places for study and discussion.
- Jobs, training and recruitment will be reassessed.

4.2.7 Digital library development

Building a digital library is expensive and resource-intensive. Before embarking on such a venture, it is important to consider some of the basic principles underlying the design, implementation and maintenance of any digital library (McCray and Gallagher, 2001) :

- Expect change.
- Know you content.
- Involve the right people.
- Design usable systems.
- Ensure open access.
- Be (a) ware of data rights.
- Automate whenever possible.
- Adopt and adhere to standards.
- Ensure quality.
- Be concerned about persistence.

A digital library, however, should be more than simply a digitized library. It should be built according to principles that are not necessarily the same as those employed for paper collections, and it should be evaluated according to different measures which are not yet totally clear.

A digital library collection may include two types of information resource. One type comprises the 'digital original' resources, which are sometimes referred to as resources which are 'born digitally'. The other type comprises 'digital surrogates' which are created from traditional information resources through format conversion.

There are essentially three methods of building digital collections:

- Digitization, converting paper and other media in existing collections to digital form;
- Acquisition of original digital works created by publishers and scholars, for example electronic books, journals and datasets;
- Access to external materials not held in-house by providing pointers to websites, other library collections or publishers' servers.

The following points state the underlying beliefs and expectations regarding digitization (Washington State Library Council, 1999):

- The creation of digital files makes economic sense for reasons of creating access, not for reason of preservation of collections. Digitization can create more rather then less demand to use the original documents.
- The digitization pilot projects will be conducted using only documents that are in the public domain or have clear copyright and permissions documentation.
- Adherence to national and international standards and guidelines will be promoted.
- Collaboration among library organizations proposing digitization projects will be promoted.
- It is important to create methodologies useful to libraries for each phase of a digitization project; acquisition and organization of documents; preparation of documents; indexing and description of documents; scanning of documents; creation of delivery formats; public access of documents; storage/archiving of documents.
- Content and access costs should be considered separately from digitization charges.

4.2.8 The digital library and technology

Technology has revolutionized the concept of libraries. The advent of the computer has revolutionized the way conventional libraries are organized and operated. Networking and computing

technologies have now become sufficiently advanced to allow the design and deployment of large digital libraries which are not only capable of supporting conventional end-user functions but also provide networked access to printed and non-printed materials, including images as well as audio and video files.

Because of the 'digital' nature, information resources can be shared over the powerful network. With the innovative use of information technology and the integration of many tools and techniques developed thus far and in the foreseeable future, information provision can be more complete, faster and more broad-based. Information can be accessed anywhere anytime by anyone who needs it. Thus the potential should be great.

The development of the digital library (DL) requires the following technologies (Mukaiyama, 19997):

- *Contents processing technology.* Technology that provides effective creation, storage and retrieval of primary information and secondary information, including digital conversion from conventional, non-digital media.
- *Information access technology.* Technology that enables efficient access to myriad types of information without time or location limitations.
- *Human-friendly, intelligent interface.* User interface that brings, to diverse users, increased intellectual productivity and an improvement to the active cultural environment.
- *Scalability.* Technology that enables DL systems to handle increases in information and users.
- *Open system development.* Development using international and de facto standards, without loss of performance.
- *Highly flexible system development.* Technology that can adjust quickly to new information and related changes to social systems.

4.2.9 The digital library environment

The ARL (1992) through a major study identified a series of different activities considered essential to the formation of digital libraries (Von Wahlde and Schiller, 1993). These included:

- Use of or development of electronic document delivery services;
- Policies, services, or reallocations that emphasize access (to information) over ownership;

- Participation in cooperative development or purchase of electronic files;
- Participation in the development of a campus-wide information system;
- A written plan that states its goal as access to information from a single workstation;
- Enhancement of the online public access catalogue (OPAC) to include the holdings of other libraries besides those held locally;
- Providing a gateway from the OPAC to other databases or networks, such as the Internet;
- End-user access to online files from on or off campus;
- Connection with the Internet;
- Training faculty and students:
  - In the use of Internet sources; and
  - In end-user searching;
- Subscribing to electronic journals;
- Digitization of text for electronic storage, retrieval and/or dissemination;
- An e-mail front-end that allows users to initiate inter-library loan and document delivery requests, suggest purchases or ask reference questions from within the OPAC;
- Access to electronic full text.

Magnussen (2003) has grouped these activities into the categories listed in Table 4.2.9 the activities above may provide a conceptual framework for 'functional and operational' digital libraries. In order to have more 'functional' and 'operational' digital libraries, we need to do much more by integrating technology, content and users. The *Report of the DELOS-NSF Working*

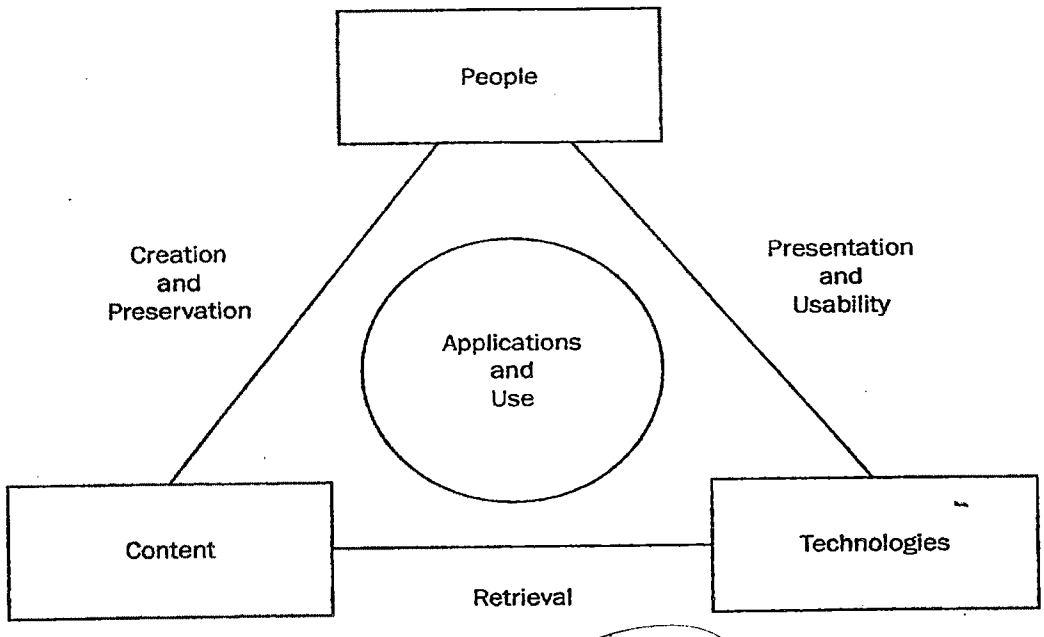
Table 4.2.9 Digital library environment

The internet and intranets	• Development of library internet and/or intranet sites • Internet connection
Integrated access to resources	• Single workstation access to resources • Use of OPAC as a gateway • Inclusion of external holdings on local OPAC
Digitization of materials	• Digitization projects

Electronic publications	• Electronic journals • Electronic full-text
Electronic document delivery	• Commercial and library-to-library electronic document delivery
Resources sharing	• Access to resources over ownership
Cooperative activities	• Cooperative purchasing or development of resources
End-user services	• End-user access to online resources • Internet training for clients • Search training for clients • End-user electronic requesting

Group on Digital Imagery of Significant Cultural and Historical Materials (Chen and Kiernan, 2002) provided a conceptual framework for digital libraries as shown in Figure 4.2.9.1. This conceptual model attempts to illustrate the relationship among people, content and technologies in developing the research agenda.

Figure 4.2.9.1 Conceptual framework for digital libraries.



Source : Adapted from Chen and Kiernan (2002). Ref 2.

4.2.10 Digitization

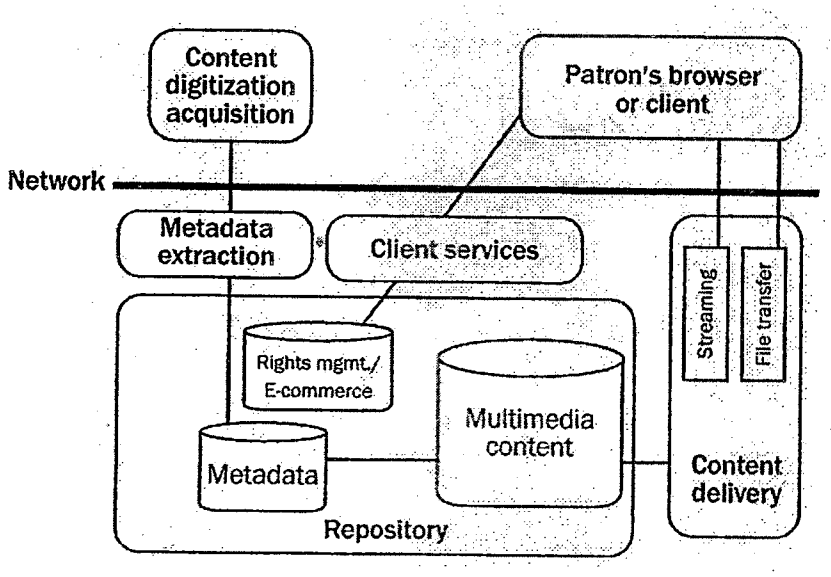
The term 'digitization' refers to the electronic process of converting a document in a non-digital medium into digital form for storage, retrieval and transmission. Although digitization is an important first step in making materials available, it should be ascertained that the need for digitization exists within a user community and that the digitization efforts will actually be able to serve that community. Surveying existing technologies and practices of digitization can only lead to the conclusion that prudence and a certain amount of conservatism in choosing projects and technologies should be encouraged.

4.2.11 Digital library components

As shown in Figure 4.2.9, a fully developed digital library environment involves the following elements (Sun Microsystems, 2002):

- Initial conversion of content from physical to digital form.
- The extraction or creation of metadata of indexing information describing the content to facilitate searching and discovery, as well as administrative and structural metadata to assist in object viewings, management and preservation.
- Storage of digital content and metadata in an appropriate multimedia repository. The repository will include rights management capabilities to enforce intellectual property rights, if required. E-commerce functionality may also be present if needed to handle accounting and billing.
- Client services for the browser, including repository querying and workflow.
- Content delivery via file transfer or streaming media.
- Patron access through a browser or dedicated client.
- A private or public network.

Figure 4.2.11. Functional components of a digital library



Source: Adapted from Sun Microsystems (2002).

A digital library includes five component parts (see Dennis):

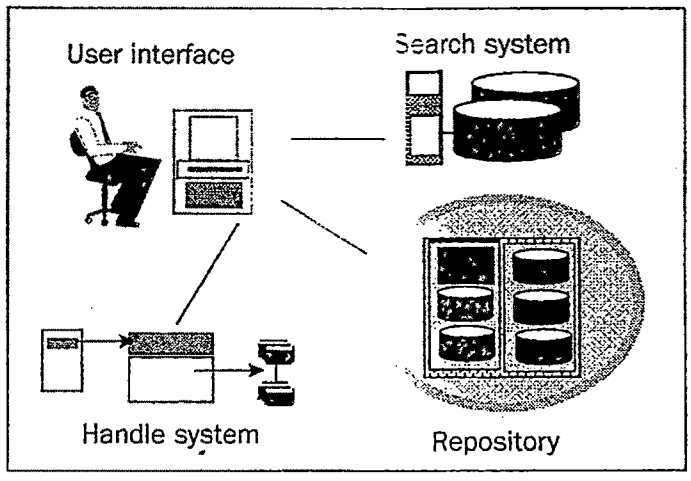
- The host computer system – or server – where data is stored;
- System and application software that facilitates the organization, searching, display and maintenance of the digital objects;
- End-user desktop workstation where the digital collections are displayed and manipulated;
- The network that delivers digital objects from the host server to the end-user;
- The creation and conversion of data.

It is the interactions of these component parts which determine the success of a digital library implementation.

4.2.12 the digital library access system

A digital library access system is defined as 'anything which gets digital content to the user or the user to the content.' The digital library framework permits many different computer systems to coexist. The key components are shown in Figure 4.2.12 they run on a variety of computer systems connected by a computer network, such as the Internet (Arms, 1997).

Figure 4.2.12 Major system components of a digital library



Source: Adapted from Arms (1997).

The digital library (DL) system should satisfy the access, browsing, search, storage, rights management and publishing needs of a broad range of users. Each group will have different needs and use the system in different ways. The DL system should be flexible enough to accommodate the different knowledge bases of each group of user as they seek to use the system. In addition, the system must provide sufficient management tools for library staff to maintain the quality and integrity of the information resources and administer the system on a daily basis. It should seamlessly integrate all library information resources.

4.2.13 Digital library issues

Just as the literature identifies a number of activities that together make up digital libraries, so too does it show that the development of digital libraries is heavily dependent on a number of interrelated enabling (or hindering) factors.

Harter (1997) has identified the following problems and issues related to information resources (IRs) in the digital library:

- How can we establish and control the currency, accuracy and integrity of information sources? (*quality problem*)
- What can be done to provide intellectual access to IRs ? (*organizational problem*)

- How can we maintain the data and intellectual integrity of IRs ? (*authority control problem*)
- How can we recognize different versions of the same IRs. (*fluidity problem*)
- How can we establish object surrogates, metadata and corresponding fine-grained search tools so that we can find those objects that we are seeking?
- How can we address the issue of transient IRs ? (*preservation problem*)
- How can we preserve the concept of authorship?
- How can copyright laws for IRs be observed (*legal problem*)
- Will access to some IRs be limited to some classes of users? (*political problem*)
- What services, if any, should be offered by the digital library?
- Should digital libraries be integrated into traditional libraries? If so, how can this are accomplished?
- Does a digital library have librarians? If so, what do they do?
- Does a digital library have well-defined classes of users?
- Who will have access to which services and at what price? Will our digital libraries of the future only be for the use of the 'haves'?

Amanda Magnussen (2003) has grouped the above into the following categories of issues in the digital library environment:

Ref ?

- Legal issues:
- Copyright
- Contracts
- privacy
- Financial issues:
- financial resources
- changes to funding allocation.
- Client issues:
- client needs
- client attitudes
- Resistance to introduction of new technologies.
- Personnel issue:
- staff commitment to new systems and service

- changed staff training and competencies
- Effect of automation on staff skilling and professional station.

- Organizational issues:

  - need for new organizational structures
  - reorganization of hierarchies and work divisions
  - organization size
  - balance between professional and paraprofessional staff
  - Appropriate position levels.

- Management issues:

  - strategic planning
  - need for new or different performance measures
  - organization support and leadership
  - need for champions within the organization
  - Appropriate statistical measurement.

- Technological issues:

  - security
  - infrastructure development
  - use of appropriate technologies
  - Standards.

- Collaboration issues:

  - resource sharing
  - cooperative purchasing of information resources
  - Cooperative purchase or development of hardware and infrastructure.

- Subject discipline issue:

  - availability of content for different disciplines
  - Appropriateness of delivery method.

4.2.14 Conclusion

A digital library is less about its collection than it is about its ability to be opportunistic. In a time when information is much cheaper to produce and transport, every effort will be made to take advantage of increased access to it. Similarly, the increased computing power that can be brought to bear on information stores such as data mining will be employed for a variety of purposes, subject to the needs of a digital library and an information community. Given the model of the role of digital libraries in information communities presented in this book, a digital library may achieve what Ranganathan called a growing organism. But through its activities, a digital library may also become a 'learning organism'. This ability to learn comes from the technological advancements of the last forty years, particularly from the coupling of computing and telecommunications technology. Digital libraries are a natural extension of the evolution in which libraries have been involved for centuries. They represent a fundamental leap forward in the provision of services for, and the partnership with, information communities.

4.3 Development of Technical Education in India with Special Reference to Gujarat:

4.3.1 INTRODUCTION

True professional education is socio-economic in nature and evolves continuously in response to the demands of the environment and the new challenges that emerge from time to time. Technology has always been a handmaiden of human beings in every phase of the evolution of the civilizations. Primitive men used it for securing food and security: only with continuously increasing use of technology human beings continuously separated themselves from other animals. Level of sophistication of technology has always been the index of the advancement and economic prosperity of any society.

Modern and developed societies are technology based and the quality of life of the people is directly related to the quality and level of technical education in vogue. Technology is a term which is used now a day in almost all walks of life from the making of a pin to the manufacture of an artificial satellite. In this fast changing world, technology is the pivot round which the human needs and services revolve.

Technical education is a basic and essential input for national development and for strengthening of the industry, economy and ultimately improving the quality of life of the people. It has

made a significant contribution to India's economic development. The programmes which have advanced to the country and diversified and augmented its production since independence all largely, its because of the manpower produced by technical institutions of the country. Skilled workforce is the best resource of the nation.

In India, initially technical education was based on the British model and emphasized the importance of engineering professional practice. After independence it has been constantly influenced by American educational system in its contents.

The 20th century witnessed tremendous progress and incredible developments took place in the field of technical education. Technical education system is to produce trained manpower in adequate numbers for the economic and technological development of the country and to run its industry. It plays an important role for the economic and industrial growth, national developments and international competitiveness. It imparts technical knowledge, study, research and facilitates technology transfer.

4.3.2 OBJECTIVES OF THE TECHNICAL EDUCATION:

1. To develop a Technical Education System which is responsive to the new innovations in technologies, contemporary industrial culture, globally competitive market and liberalized economic environments. The output of such system must cater to the actual need, requirement and expectations of the local as well as global industry.
2. The Technical education system should be demand driven market based self sustaining system.
3. Instead of creating new institutions, more attention needs to be paid on the consolidation of the existing infrastructure.
4. To develop mechanism for up-gradation of skills of existing technical and skilled industrial manpower at all levels through Continuing Education Programmes specially designed for industry.
5. To bring about improvements in Technical Education System by strengthening, re-organizing and reorienting the existing administrative structure, and establishing facilities for internal maintenance of equipment machinery and buildings.
6. To undertake industry institute interaction Programmes and carry out industry sponsored R&D projects.
7. To reduce subsidies in professional education in a phased manner during next five years through fee revision, while introducing an elaborate system of liberal merit scholarship and soft educational loan schemes for financially weaker sections of society.

8. To make the Technical Education System self supporting and self financing to the maximum extent.
9. To encourage private sector participation in Technical Education on a self sustaining basis without Government support.
10. To impart superior and improved skills to gujarati youth through practice based industry oriented teaching as per the present day requirement of industry for better employment opportunities in the National and international job market.
11. To take steps for providing entrepreneurship and business oriented technical education for ensuring gainful self-employment in preference to the wage employment to the trainees.
12. To take steps for constant faculty development and upgrade their skill levels.
13. To provide vocational training through non-formal programmes to help persons having specific technical skills for better self employment and job employment opportunities and contributing to the overall development of the State particularly in the Rural Sector.

In India, technical education at degree level is provided basically by three categories of institutions.

1: Central Government Funded Institutions.

2: State Government funded institutions.

3: Self financed institutions.

Table 4.3.2.1: Central Government Funded Institutions in India

1	Indian Institute of Technology: (IITs)*	15
2	Indian Institute of Management: (IIMs) Ahmedabad, Lucknow, Indore, Bangalore, Shillong, Calutta, Kozhikode	7
3	Indian Institute of Science: (IISc) Bangalore	1
4	Indian Institute of Science Education & Research: (IISERs) Bhopal, Kolkata, Mohali, Pune, Thiruvanantpuram	5
5	National Institute of technology: (NITs)**	20
6	Indian Institute of Information Technology: (IIITs) Hyderabad, Allahabad, Bhubneshwar, New Delhi	4
7	National Institute of Technical Teachers Training & Research: (NITTTRs) Chandigarh, Bhopal, Kolkata, Chennai	4
8	School of Planning & Architecture: (SPA) New Delhi	1

9	Indian School of Mines University: (ISMU) Dhanbad	1
10	North Eastern Regional Institute of Science & Technology: (NERIST) Nirjul (Andhra Pradesh)	1
11	Sant Longowal Institute of Engineering & Technology: (SLIET) Longowal (Punjab)	1
12	National Institute of Industrial Engineering: (NITIE) Mumbai	1
13	National Institute of Foundry & Forge Technology: (NIFFT) Ranchi	1

Source: http://www.education.nic.in/tech/tech overview. asp

[Accessed on 30.11.10]

- Locations mentioned in **Table 4.3.2.2**, ** Locations mentioned in **Table 4.3.2.3 and Table 4.3.2.4**

4.3.3 PRE INDEPENDENCE ERA

Prior to independence, the country had handful of engineering colleges. On an average, only few province had one or two, where only graduate level education leading to the award of Bachelor degree was imparted in the fields of civil, mechanical and electrical engineering.

Engineering education in India started during the British era and focused mainly on civil engineering. With the establishment of Govt. College of Engineering at Guindy (Tamilnadu) in 1794, engineering education began in India. Thomson Engineering College at Roorkee (1847), Poona Civil Engineering College at Pune (1854), Bengal Engineering College at Shibpur (1856), Banaras Hindu University (1916), Harcourt Butler Technological Institute at Kanpur (1920) were some of the earliest engineering colleges established in the pre-independence era.

4.3.4 POST INDEPENDENCE ERA

The first three years, until 1950, were the years of planning and thereafter, the country entered into an era of establishment of national, state or regional and divisional level engineering institutions mainly for graduate courses. Slowly over a decade, transformation for post graduate engineering education set in.

After independence the government of India implemented many plants and schemes by which the country could develop in every sector and without proper emphasis on education it was not possible. Especially in development of industrial sector, there was a need to develop sound technical education systems. After achieving independence of developing engineering education in the country to ultimately build its infrastructure like industries, roads, dams, communication systems, power and energy etc.

So the Indian Government took step in this direction by establishing technical institutions, this resulted, so many technical institutions established in India. This was the foundation for improvement of overall quality of life of people and to raise the living standard of nation. The establishment and growth of these institutions is described as follows:

4.3.5 THE DAWN OF IITS

In 1947, there were only around 38 engineering colleges with a total intake of 1850 students. In post independence era, engineering education in India gained impetus with the establishment of the five Indian Institutes of Technology (IITs) in different part of the country. In 1945, the Sarkar Committee was appointed to suggest options for advanced technical education in India. The Committee recommended the establishment of higher technical institutes based on the Massachusetts Institute of Technology in the four regions of India. This resulted in the setting up of the five IITs.

The first Indian Institutes of Technology was born in 1951 in Kharagpur, West Bengal at the site of Hijli Detention Campus. Four other campuses were subsequently founded at Bombay (1958), Madras (1959), Kanpur (1959) and Delhi (1963). In 1994 a sixth campus at Guwahati was added and in 2001 a seventh campus was established by upgrading Roorkee University, one of India's oldest engineering institution, into IIT. Even Bombay is now know as Mumbai, the name of IIT Bombay remains unchanged and likewise although Madras is knows as Chennai, the name IIT Madras remains unchanged.

Few new IITs have been approved by the Govt. of India in 2008. The Government has approved setting up eight new IITs in Bihar, Andhra Pradesh, Rajasthan, Orissa, Gujarat, Punjab, Himachal Pradesh and Indore (Madhya Pradesh) at a total cost of Rs. 6080 crores @ Rs. 760 crore per IIT.

Some of the new IITs have taken undergraduate admission in 2008 but the students are housed on the campuses of other IITs. The IIT of Andhra Pradesh (Hyderabad), Bihar (Patna) and Gujarat (Gandhinagar) have commenced their session through IITs of Madras, Guwahati and Bombay respectively. The four IITs of Rajasthan, Punjab (Ropar), Indore and Orissa (Bhubaneswar) have commenced their classes in the campus of their mentor IITs at IIT Kanpur, IIT Delhi, IIT Bombay and IIT Kharagpur respectively. The IIT mandi in Himachal Pradesh are likely to commence their session from 2009-10 in the campus of IIT Roorkee.

The mode of teaching in these institutions has been predominantly oriented towards the 'chalk and talk' method or the 'lecture mode' in direct face to face classroom teaching. Today, IIT offers undergraduate, integrated postgraduate and postgraduate degrees in over 25 different engineering and

technology disciplines.

A brief summary of IITs establishment and their mentor body is showing in **Table 4.3.2.2**

S.No.	Name of IIT	Establishment Year	Mentor Body
1	IIT Kharagpur	1950; as IIT 1951	IIT Kharagpur
2	IIT Bombay	1958	IIT Bombay
3	IIT Madras	1959	IIT Madras
4	IIT Kanpur	1959	IIT Kanpur
5	IIT Delhi	1961; as IIT 1963	IIT Delhi
6	IIT Guwahati	1994	IIT Guwahati
7	IIT Roorkee	1847; as IIT 2001	IIT Roorkee
8	IIT Rajasthan	2008	IIT Kanpur
9	IIT Gandhinagar	2008	IIT Bombay
10	IIT Punjab (Ropar)	2008	IIT Delhi
11	IIT Hyderabad	2008	IIT Madras
12	IIT Patna	2008	IIT Guwahati
13	IIT Bhubaneswar	2008	IIT Kharagpur
14	IIT Indore	2009	IIT Bombay
15	IIT Mandi	2009	IIT Roorkee

Source: http://iit.org/ [accessed on 29.01.10]

http:en.wikipedia.org/wiki/Indian Institues of Technology [accessed on 29.01.10]

4.3.6 THE RISING OF RECS (REGIONAL ENGINEERING COLLEGES)

During the second five year plan (1956-60) in India, a number of industrial projects were contemplated, to ensure enough supply of trained personnel to meet the demand for these projects, the decision was taken to start Regional Engineering Colleges (RECs) at the rate of one per each of the major state, which can churn out graduates with good engineering merit.

On the recommendations of the Engineering Personnel Committee (1955) Regional Engineering Colleges were established from 1959 onwards in each of the major states. Each college was a joint and cooperative enterprise of the central government and the concerned state government. **Table 4.3.2.3** is screening year wise establishment of RECs in the different places of India.

Table 4.3.2.3: Year wise establishment of RECs in different parts of India

Sr. No.	State	City	Year
1	Andhra Pradesh	Warangal	1959
2	Mayore (now Karnataka)	Surathkal	1960
3	Maharashtra	Nagpur	1960
4	Madhya Pradesh	Bhopal	1960
5	West Bengal	Durgapur	1960
6	Bihar (now Jharkhand)	Jamshedpur	1960
7	Jammu & Kashmir	Srinagar	1960
8	Uttar Pradesh	Allahabad	1961
9	Orrissa	Rourkela	1961
10	Kerala	Kozhikode (Calicut)	1961
11	Gujarat	Surat	1962
12	Rajasthan	Jaipur	1963
13	Haryana	Kurukshetra	1963
14	Tamilnadu	Tiruchirapalli	1964
15	Assam	Silchar	1973
16	Punjab	Jalandhar	1987
17	Himachal Pradesh	Hamirpur	1987

Source: http:en.wikipedia.org/wiki/National Institutes of Technology

[Accessed on 29.01.2010]

Due to bifurcation of the states and to provide an REC to every major state the following RECs established after rechristening the erstwhile Bihar College of Engineering (Patna), Govt. Engineering college (Raipur) and Tripura Engineering College (Tripura) respectively as shown in **Table 4.3.2.4**

Table 4.3.2.4: New NITs after bifurcation of the states

Sr. No.	State	City	Year
18	Bihar	Patna	2004
19	Chhattisgarh	Rajpur	2005
20	Tripura	Agartala	2006

Source: http:en.wikipedia.org/wiki/National Institutes of Technology

[Accessed on 29.01.2010]

REC system served well but as time passed some state governments shown lack of responsibility to take them in right direction. Following the long standing demand for more IITs, it was decided to upgrade the RECs to National Institute of Technology (NIT). In 2003, all RECs were upgraded to NITs and central government took control to run these Institutes. Now, NITs are autonomous institutes. In June 2007, the passing of National Institute of Technology Act, declared all NITs as Institutions of National Importance.

The eleventh 5- year plan envisages establishing ten more NITs, bringing the current total NITs to 30. Based on the request of respective state government and feasibility, future NITs shall be either conferred from the existing government institutes or can be setup as brand -new NIT.

4.3.7 The Indian Institute of Science (IISc) Bangalore

The Indian Institute of Science was conceived as a 'Research Institute' or 'University of Research' by J.N.Tata in the twilight years of 19th century. A long period of almost thirteen years was to elapse from on May 27, 1909. IISc is truly the first example of a public-private partnership in this country; an institution, whose evolution over a century is testimony to the robustness of its foundations.

The IISc began with only two departments: General and Applied chemistry and Electro technology. Department of Physics came into 1933. IISc has grown to become India's premier centre for research and postgraduate education in science and engineering. The evolution of othe institute over the past one hundred years has mirrored the development of science and technology in India. As the institute has grown, several new areas of research have been established, many of othem for the first time in India. The institute's departments in fields ranging from Biochemistry to Aerospace Engineering have served to nucleate research and development in both the public and private sectors.

The Institutes offer a variety of Master's Degree and Ph.D. Programs in engineering and science as follows:-

- Research program [Ph.D./ M.Sc. (Engineering)]
- M.E. / M.Tech. / M.Des
- Integrated Ph.D. Programs

Engineering Colleges of India (other than IITs, NITs & IISc)

The engineering college in India can be classified as

1. Affiliated Colleges
2. Autonomous Colleges
3. Deemed Universities

In the case of affiliated colleges, the institution is affiliated to a university, which is the degree granting body. The college has no flexibility or powers related to curriculum or evaluation. The college has no flexibility or powers related to curriculum or evaluation. The academic powers rest with the university. In the case of autonomous colleges, the institutions have academic flexibility viz they can make curriculum changes and conduct examination and evaluation. However, they are notionally under the university and have relatively less financial autonomy. Institutions that have acquired deemed university status have maximum academic and financial autonomy. In India most of the colleges are affiliated.

In India, apart from IITs, NITs and IISc there are several other state government run engineering colleges that have an established reputation. These colleges are affiliated with different universities. Besides, there are a huge number of private engineering colleges in India and about seventy five percent engineering graduates are taught in the private engineering colleges. At present more than 3500 engineering colleges are running various disciplines of engineering with modern equipped facilities and curriculum.

4.3.8 Admission Criterion

Eligibility for admission to the Bachelor of Engineering/Bachelor of Technology (B.E./B. Tech.) Course is 10+2 or equivalent examination, with Physics, Chemistry and Mathematics. Most of the selections are done through entrance exams. There are three types of entrance examination:

- Joint Entrance Examination / JEE for the IITs
- All India Engineering Entrance examination (AIEEE)
- State Level Engineering Entrance Examination

Examination comprises of multiple choice/objective type questions in physics, Chemistry and Mathematics.

4.3.9 Status of Engineering Colleges

At present in India, there are 15 IITs, 20 NITs, 1 IISc and more than 3500 degree engineering colleges. Out of these, 20-25% is government engineering colleges and rest of the colleges are managed by private sector. At the initial stage up to 1970, the number of engineering students was near about eighteen thousand and now it has reached up to more than nine lacks. The growth of engineering colleges in India is reflected in **4.3.9.1**

Table 4.3.9.1 : Growth of Engineering Colleges in India

Sr. No.	Year	Engineering College
1	1950	50
2	1960	110
3	1970	145
4	1980	158
5	1990	337
6	2000	778
7	2003	1208
8	2007	1668
9	2008	2582
10	2009	3575

(Source AICTE, National Knowledge commission)

Table 4.3.9.2: Growth of Engineering Colleges in India (State wise) 2002-2003

: NUMBER OF APPROVED INSTITUTIONS AND TOTAL INTAKE CAPACITY IN ENGINEERING AND TECHNOLOGY AT UNDER GRADUATE DEGREE LEVEL UP TO 2002-2003 IN INDIA

Region	State/Union Territory	ENGINEERING	
		NOI	Intake
Central	1. Madhya Pradesh	45	12970
	2. Chhattisgarh	12	3385
	3. Gujarat	24	9559
	Total ----->	**81**	**25914**
Eastern	1. Mizoram	1	120
	2. Sikkim	1	420
	3. West Bengal	45	10709
	4. Tripura	1	160
	5. Meghalaya	1	135
	6. Arunachal Pradesh	1	210
	7. Andaman&Nicobar	-	-
	8. Assam	3	720
	9. Manipur	1	150
	10. Nagaland	-	-
	11. Orissa	38	9505
	12. Jharkhand	7	1890
	Total ----->	**114**	**24019**
North	1. Bihar	7	1575
	2. Uttar Pradesh	83	22491
	3. Uttranchal	9	2290
	Total ----->	**99**	**26356**
North-West	1. Chandigarh	3	580
	2. Haryana	33	9385
	3. Himachal Pradesh	3	610
	4. Jammu& Kashmir	5	1245
	5. New Delhi	13	3540
	6. Punjab	33	8875
	7. Rajasthan	29	7807
	Total ----->	**119**	**32042**
South	1. Andhra Pradesh	215	64300
	2. Pondicherry	6	1950
	3. Tamil Nadu	250	79122
	Total ----->	**471**	**145372**
South-West	1. Karnataka	111	40385
	2. Kerala	73	17858
	Total ----->	**184**	**58243**
West	1. Maharashtra	151	47035
	2. Goa	3	740
	3.Daman & D,Dadar,N.H.	-	-
	Total ----->	**154**	**47775**
	Grand Total	**1207**	**350721**

Table 4.3.9.3: Growth of Engineering Colleges in India (State wise) 2004-2005

NUMBER OF APPROVED INSTITUTIONS AND TOTAL INTAKE CAPACITY IN ENGINEERING AND TECHNOLOGY AT UNDER GRADUATE DEGREE LEVEL UP TO 2004-2005 IN INDIA

Region	State/Union Territory	ENGINEERING	
		NOI	Intake
Central	1. Madhya Pradesh	61	20210
	2. Chhattisgarh	14	4020
	3. Gujarat	37	12965
	Total ----->	**112**	**37195**
Eastern	1. Mizoram	1	120
	2. Sikkim	1	525
	3. West Bengal	54	15477
	4. Tripura	1	180
	5. Meghalaya	1	240
	6. Arunachal Pradesh	1	210
	7. Andaman&Nicobar	-	-
	8. Assam	3	750
	9. Manipur	1	115
	10. Nagaland	-	-
	11. Orissa	41	13014
	12. Jharkhand	10	3385
	Total ----->	**114**	**34016**
North	1. Bihar	8	1905
	2. Uttar Pradesh	89	28953
	3. Uttranchal	9	1440
	Total ----->	**106**	**32298**
North-West	1. Chandigarh	5	800
	2. Haryana	38	12785
	3. Himachal Pradesh	5	1260
	4. Jammu& Kashmir	5	1545
	5. New Delhi	14	4330
	6. Punjab	45	14880
	7. Rajasthan	41	15045
	Total ----->	**153**	**50645**
South	1. Andhra Pradesh	236	82970
	2. Pondicherry	6	2370
	3. Tamil Nadu	254	80417
	Total ----->	**496**	165757
South-West	1. Karnataka	118	46375
	2. Kerala	89	24413
	Total ----->	**207**	**70788**
West	1. Maharashtra	155	48250

	2. Goa	3	740
	3.Daman & D,Dadar,N.H.	-	-
	Total ----->	**158**	**48990**
	Grand Total	**1346**	**439689**

4.3.10 Apex Advisory Body of engineering Institutions in India

Technical education in India contributes a major share to the overall education system and plays a vital role in the social and economic development of our nation. In India, technical education is imparted at various levels such as: craftsmanship, diploma, degree, postgraduate and research in specialized fields, catering to various aspects of technological development and economic progress.

The beginning of formal technical education in India can be dated back to the mid 19th century. The major policy initiatives in the pre-independence period included appointment of the Indian Universities commission in 1902, issue of the Indian Education policy resolution in 1904, and the Governor General's policy statement of 1913 stressing the importance of technical education, the establishment of IISc in Bangalore and industrial schools in several provinces.

There has been a significant increase in the number of engineering institutions and in student output. Engineering is a preferred career choice for a large number of students at the 10+2 level in India. Many of reputed engineering colleges (IITs & NITs) are highly selective in their admission process with the number of available seats being only 2-3 % of the number applying. A large number of private engineering colleges have been set up. Though there is a mechanism for accreditation (National Board of Accreditation) and an umbrella agency, the All India Council of Technical Education (AICTE) set up to monitor and control engineering education in India.

All India Council of Technical Education (AICTE) was set up in November 1988 as a national level Apex Advisory Body to conduct survey on the facilities on technical education and to promote development in the country in a coordinated and integrated manner. And to insure the same, as stipulated in, the National policy of Education (1986), AICTE be vested with statutory authority for planning, formulation and maintenance of norms and standards, quality assurance through accreditation funding in priority areas, monitoring and evaluation, maintaining parity of certification and awards and ensuring coordinated and integrated development and management of technical education in the country.

The government of India (Ministry of HRD) also constituted a National working group to look into the role of AICTE in the context of proliferation of technical institutions, maintenance of standards

and other related matters. The National working group recommended that AICTE be vested with the necessary statutory authority for making it more effective, which would consequently require restructuring and strengthening with necessary infrastructure and operating mechanisms.

The statutory AICTE was established on 12th May 1988 with a view to proper planning and coordinated development of technical education system throughout the country, the promotion of qualitative improvement of such education in relation to planned quantitative growth and the regulation and proper maintenance of norms and standards in the technical education and for matters connected therewith.

The purview of AICTE covers programmes of technical education including training and research in Engineering, Technology, Architecture, Town planning, Management, Pharmacy, Applied Arts and Crafts, Hotel Management and Catering Technology etc. at different levels. AICTE has set up various norms for technical educational institutes. The norms cover so many areal like building and other infrastructure, faculty and other staff, library, furniture and equipment and many more.

To analysis and improvement in technical education, many committees were set up. Some major committees and their recommendations are given in Table **4.3.10. 1**

Table 4.3.10.1 Summary of Major Committees and Recommendations

Committee	Title	Year	Recommendations
Sarkar Committe	Higher Technical Institutions for the post -war Industrial Development	1945	Setting up of Indian Institutes of Technology
Thacker Committee	Postgraduate Engineering Education and Research	1959-61	Funding for 100 Ph.Ds annually
Nayudamma Committee	Postgraduate Education in Engineering & Technology	1979-80	*PG Minimum Qualifications for Industry, R & D, etc.
Nayudamma Committee	IIT Review	1986	*Greater flexibility in Academic Pragramme, *Focus on Engineering Research, *Faculty Mobility
P.Rama Rao Committee	Reshaping Postgraduate Education in Engineering &	1995	*21 months M. Tech, *Increased Scholarship Amount,

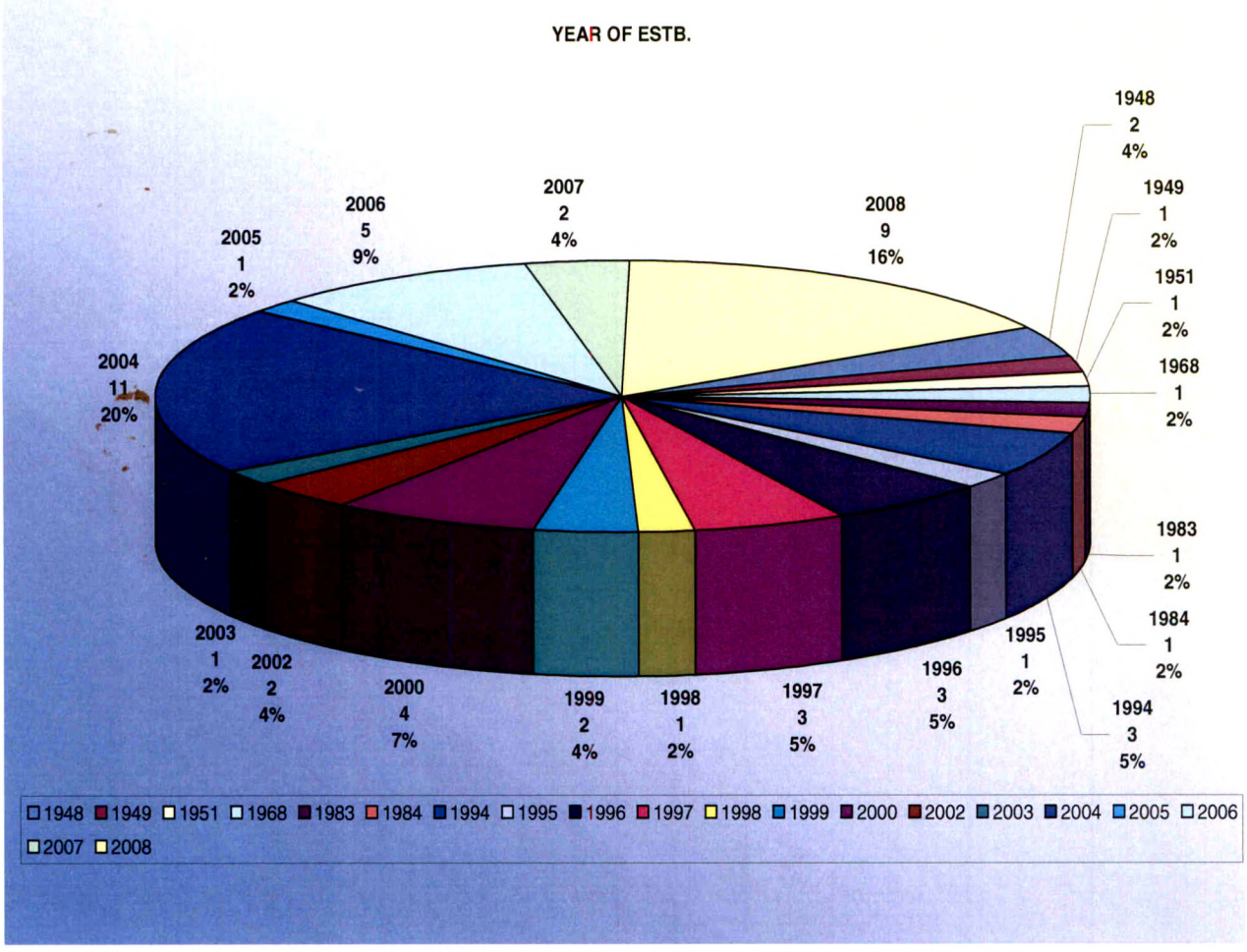
	Technology		*Assured Employment for M. Techs
R.A. Mashelkar Committee	Strategic Road Map for Academic Excellence of Future RECs	1998	*Conversion of RECs in NITs with the status of a Deemed to be University and structural changes in governance
U.R. Rao Committee	Revitalizing the Technical Education	2003	*Regional Inequity to be removed *Faculty shortage to be addressed, *Need for planning and coordination in the working of AICTE
P.Rama Rao Committee	IIT Review	2004	*Increase UG output of IITs, *Fund infrastructure increase, *Add new IITs but Maintain quality

(Source: Engineering education in India: Draft final report, 2007, IIT Bombay)

4.3.11 DEVELOPMENT OF TECHNICAL EDUCATION IN GUJARAT

SR.NO.	YEAR OF ESTB.	NO.OF COLLEGE	CONTI.TOTAL NO.
1	1948	2	2
2	1949	1	3
3	1951	1	4
4	1968	1	5
5	1983	1	6
6	1984	1	7
7	1994	3	10
8	1995	1	11
9	1996	3	14
10	1997	3	17
11	1998	1	18
12	1999	2	20
13	2000	4	24
14	2002	2	26
15	2003	1	27
16	2004	11	38
17	2005	1	39
18	2006	5	44
19	2007	2	46
20	2008	9	55

Table 4.3.11 DEVELOPMENT OF TECHNICAL EDUCATION IN GUJARAT



In 1948-1968, only 5 engineering institutes are in Gujarat at Degree level. Up to 200-2001 in there were 24 engineering institute in Gujarat 4.8 times increase. Up to 2008-2009 there were 55 engineering institute in Gujarat 11 times increase.

4.3.12 List of Engineering Institutes in Gujarat

ACTUAL LIST OF INSTITUTES WITH DETAILS FOR 2008-2009							
NO.	INSTITUTES	EST	GOV GIA SF	COURSE	INT	TOTAL INTAKE	FEE
1	BIRLA VISHVAKARMA MAHA VIDHYALAYA, VALLABHVIDYANAGAR TA. & DIST. ANAND - 388120 Ph. 02692-230104, Fax. 02692-230762 www.bvmengineering.ac.in	1948	GIA	CIVIL ENGINEERING	120	435	1500
				COMPUTER ENGINEERING	60		
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS	75		
				MECHNICAL ENGINEERING	90		
				PRODUCTION ENGINEERING	30		
2	FACULTY OF TECHNOLOGY & ENGINEERING, MSU VADODARA - 390001 Ph. 0265-2434188 Fax. 0265-2423898 www.msubaroda.ac.in	1949	GIA	CHEMICAL ENGINEERING	30	540	1500
				CIVIL ENGINEERING	110		
				COMPUTER ENGINEERING	60		
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS ENGINEERING	30		
				MECHANICAL ENGINEERING	90		
				METALLURGY	40		
				TEXTILE ENGINEERING	30		
				TEXTILE TECHNOLOGY	30		
				WATER MANAGEMENT	30		
				INDUSTRIAL ENGINEERING	30		
3	FACULTY OF TECHNOLOGY DHARMSINH DESAI UNIVERSITY NADIAD - 387001 Ph. 0268-2520502 Fax.0268-2520501 www.ddu.ac.in	1968	GIA	CHEMICAL ENGINEERING	54	249	1500
				CIVIL ENGINEERING	60		
				COMPUTER ENGINEERING	45		
				ELECTRONICS & COMMUNICATION	45		
				INSTRUMENTATION & CONTROL	45		

4	GOVERNMENT ENGINEERING COLLEGE BHARUCH - 392002 Ph. 02642 - 227054 Fax. 02642 - 227054 www.gecbharuch.com	2004	GOVT	ELECTRICAL ENGINEERING	60	180	1500
				ELECTRONICS & COMMUNICATION	60		
				MECHANICAL ENGINEERING	60		
5	GOVERNMENT ENGINEERING COLLEGE BHAVNAGAR Ph. 0278 - 2525354 Fax. 0278 - 2525354 www.gecbhav.org	2004	GOVT	ELECTRONICS & COMMUNICATION	120	300	1500
				MECHANICAL ENGINEERING	60		
				PRODUCTION ENGINEERING	120		
6	GOVERNMENT ENGINEERING COLLEGE BHUJ (KUTCH) Ph. 02832 - 299169 Fax. 02832 - 250153 www.gecbhuj.gujarat.gov.in	1994	GOVT	CHEMICAL ENGINEERING	60	353	1500
				CIVIL ENGINEERING	60		
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				MECHANICAL ENGINEERING	53		
				MINING ENGINEERING	60		
7	GOVERNMENT ENGINEERING COLLEGE DAHOD Ph. 02673 - 243780 Fax. 02673 - 243780 www.gecdahod.org	2004	GOVT	CIVIL ENGINEERING	60	240	1500
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				MECHANICAL ENGINEERING	60		
8	GOVERNMENT ENGINEERING COLLEGE MODASA - 383315 Ph. 02774 -242633 Fax. 02774 - 242634 www.modasa.org	1984	GOVT	AUTOMOBILE ENGINEERING	60	480	1500
				CIVIL ENGINEERING	60		
				COMPUTER ENGINEERING	60		
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	120		

9	GOVERNMENT ENGINEERING COLLEGE PATAN - 384265 Ph. 02766 - 291560 Fax. 02766 - 291561 www.gecpatan.org	2004	GOVT	COMPUTER SCIENCE & ENGG.	60	180	1500
				ELECTRONICS & COMMUNICATION	60		
				MECHANICAL ENGINEERING	60		
10	GOVERNMENT ENGINEERING COLLEGE RAJKOT Ph. 0281 - 2924062 www.gecrajkot.org	2004	GOVT	COMPUTER ENGINEERING	60	180	1500
				ELECTRONICS & COMMUNICATION	60		
				INSTRUMENTATION & CONTROL	60		
11	GOVERNMENT ENGINEERING COLLEGE GANDHINAGAR - 382028 Ph. 079 - 23253546 Fax. 079 - 29289540 www.gecgnr26.ac.in	2004	GOVT	BIO-MEDICAL ENGINEERING	60	360	1500
				COMPUTER ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				INSTRUMENTATION & CONTROL	60		
				METALLURGY ENGINEERING	60		
				MINING ENGINEERING	60		
12	GOVERNMENT ENGINEERING COLLEGE SURAT Ph. 0261 - 2653139 Fax. 0261 - 2656077 www.gecsurat.org	2004	GOVT	CIVIL ENGINEERING	60	240	1500
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				MECHANICAL ENGINEERING	60		
13	GOVERNMENT ENGINEERING COLLEGE VALSAD - 369001 Ph. 02632 - 241960 Fax. 02632 - 241960 www.gecvalsad.org	2004	GOVT	CHEMICAL ENGINEERING	60	120	1500
				MECHANICAL ENGINEERING	60		

14	L.D.ENGINEERING COLLEGE AHMEDABAD - 380015 Ph. 079 - 26306752 Fax. 079 - 26304118 www.ldceahd.org	1948	GOVT	AUTOMOBILE ENGINEERING	30	650	1500
				BIO-MEDICAL ENGINEERING	30		
				CHEMICAL ENGINEERING	30		
				CIVIL ENGINEERING	120		
				COMPUTER ENGINEERING	45		
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				ENVIRONMENT ENGINEERING	30		
				INFORMATION TECHNOLOGY	60		
				INSTRUMENTATION & CONTROL	45		
				MECHANICAL ENGINEERING	90		
				PLASTIC TECHNOLOGY	10		
				RUBBER TECHNOLOGY	10		
				TEXTILE TECHNOLOGY	30		
15	LAKHDHIRJI ENGINEERING COLLEGE MORBI - 363642 Ph. 02822 - 240743 Fax. 02822 - 240645 www.lecollege.org	1951	GOVT	CHEMICAL ENGINEERING	60	360	1500
				CIVIL ENGINEERING	60		
				ELECTRICAL ENGINEERING	60		
				INDUSTRIAL ENGINEERING	30		
				INFORMATION TECHNOLOGY	30		
				MECHANICAL ENGINEERING	60		
				POWER ELECTRONICS	30		
				PRODUCTION ENGINEERING	30		
16	SHANTILAL SHAH ENGINEERING COLLEGE BHAVNAGAR - 364060 Ph. 0278 - 2445509, 2445767 Fax. 0278 - 2445509 www.myssec.com	1983	GOVT	CIVIL ENGINEERING	60	450	1500
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	60		
				INSTRUMENTATION & CONTROL	30		
				MARINE ENGINEERING	60		
				MECHANICAL ENGINEERING	60		
				PRODUCTION ENGINEERING	60		

17	VISHWAKARMA GOVERNMENT ENGINEERING COLLEGE CHANDKHEDA - 382424 Ph. 079 - 29099903 Fax. 079 - 23238331 www.vgecg.ac.in	1994	GOVT	CHEMICAL ENGINEERING	60	540	1500
				CIVIL ENGINEERING	60		
				COMPUTER ENGINEERING	60		
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	60		
				INSTRUMENTATION & CONTROL	60		
				MECHANICAL ENGINEERING	60		
				POWER ELECTRONICS	60		
18	A.D.PATEL INSTITUTE OF TECHNOLOGY KARAMSAD NEW V.V.NAGAR - 388121 Ph. 02692 - 233680 Fax. 02692 - 238180 www.adit.ac.in	2000	SF	AUTOMOBILE ENGINEERING	60	420	47000
				COMPUTER ENGINEERING	60		
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				FOOD PROCESSING & TECH.	60		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	60		
19	AHMEDABAD INSTITUTE OF TECHNOLOGY AHMEDABAD Ph. 02717 - 241132, 241133 Fax. 02717 - 241132 www.aitindia.in	2004	SF	COMPUTER ENGINEERING	90	330	30000
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	60		
20	ATMIYA INSTITUTE OF TECHNOLOGY & SCIENCE RAJKOT - 360005 Ph. 0281 - 2563445 Fax. 0281 - 2563766 www.aits.edu.in	2000	SF	COMPUTER ENGINEERING	120	420	36000
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	120		
				INFORMATION TECHNOLOGY	30		
				INSTRUMENTATION & CONTROL	60		
				MECHANICAL ENGINEERING	30		

21	B.H.GARDI COLLEGE OF ENGINEERING & TECHNOLOGY ANANDPUR, RAJKOT Ph. 02894 - 274471, 9377886161 Fax. 02894-274470, 0281-2563538 www.gardividyapith.in	2008	SF	COMPUTER SCIENCE & ENGG. ELECTRONICS & COMMUNICATION INFORMATION TECHNOLOGY MECHANICAL ENGINEERING	60 60 60 60	240	40000
22	BABARIA INSTITUTE OF			COMPUTER SCIENCE & ENGG.	120		
	TECHNOLOGY			ELECTRICAL ENGINEERING	60		
	VARNAMA, VADODARA			ELECTRONICS & COMMUNICATION	120		
	Ph. 0265 - 6599991/2/3	2004	SF	MECHANICAL ENGINEERING	60	360	45000
	Fax. 0265 - 2356350						
	www.bitcampus.org.in						
23	BHAWAN MAHAVIR COLLEGE			COMPUTER SCIENCE & ENGG.	60		
	OF ENGINEERING & TECH.			ELECTRONICS & COMMUNICATION	60		
	SURAT			ELECTRONIC ENGINEERING	60		
	Ph. 0261 - 2268083	2008	SF	MECHANICAL ENGINEERING	60	240	38000
	Fax. 0261 - 2255299						
	www.bmefcolleges.com						
24	BIRLA VISHVAKARMA MAHA			ELECTRONICS & COMMUNICATION	60		
	VIDHYALAYA,			INFORMATION TECHNOLOGY	60		
	VALLABHVIDYANAGAR						
	Ph. 02692 - 230104	2000	SF			120	43000
	Fax. 02692 - 230762						
	www.bvmengineering.ac.in						
25	C.K.PITHAWALA COLLEGE OF			CIVIL ENGINEERING	60		
	ENGINEERING & TECHNOLOGY			COMPUTER ENGINEERING	60		
	SURAT - 395007			ELECTRICAL ENGINEERING	60		
	Ph. 0261 - 6542507	1998	SF	ELECTRONICS & COMMUNICATION	90	360	36000
	Fax. 0261 - 2723999			MECHANICAL ENGINEERING	90		
	www.ckpect.ac.in						

26	C.U.SHAH COLLEGE OF ENGINEERING & TECHNOLOGY WADHVAN - 363030 Ph. 02752 - 247711 Fax. 02752 - 247712 www.ccetvbt.org	1997	SF	BIO-MEDICAL ENGINEERING	60	420	40000
				COMPUTER ENGINEERING	90		
				ELECTRICAL & ELECTRONICS ENGG	60		
				ELECTRONICS & COMMUNICATION	90		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	60		
27	CHAROTAR INSTITUTE OF TECHNOLOGY CHANGA, DIST. ANAND Ph.02697 - 247500 Fax. 02697 - 247100 www.ecchanga.ac.in	2000	SF	CIVIL ENGINEERING	60	600	50000
				COMPUTER ENGINEERING	120		
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	120		
				INFORMATION TECHNOLOGY	120		
				MECHANICAL ENGINEERING	120		
28	FACULTY OF TECHNOLOGY DHARMSINH DESAI UNIVERSITY NADIAD - 387001 Ph. 0268-2520502 Fax. 0268-2520501 www.ddu.ac.in	1999	SF	COMPUTER ENGINEERING	75	285	50000
				ELECTRONICS & COMMUNICATION	75		
				INFORMATION TECHNOLOGY	120		
				INSTRUMENTATION & CONTROL	15		
29	G.H.PATEL COLLEGE OF ENGINEERING & TECHNOLOGY VALLABHVIDYANAGAR Ph. 02692 - 231651 Fax. 02692 - 236896 www.gcet.ac.in	1996	SF	CHEMICAL ENGINEERING	60	419	43000
				COMPUTER ENGINEERING	60		
				ELECTRICAL ENGINEERING	59		
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	60		
				MECHATRONICS ENGINEERING	60		

30	GANDHINAGAR INSTITUTE OF TECHNOLOGY GANDHINAGAR Ph. 02764 - 281860/61 Fax. 02764 - 281862 www.git.org.in	2006	SF	COMPUTER ENGINEERING	120	300	33000
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	60		
31	HASMUKH GOSWAMI COLLEGE OF ENGINEERING AT.& PO.VAHELAL,AHMEDABAD Ph. 02718 - 24725 Fax. 02718 - 24731 www.hgce.org	2007	SF	COMPUTER ENGINEERING	90	270	33000
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	60		
32	INDUS INSTITUTE OF TECHNOLOGY & ENGINEERING RANCHARDA, AHMEDABAD Ph. 02764 - 260277, 260278 Fax. 02764 - 260279 www.iite.in	2006	SF	AUTOMOBILE ENGINEERING	60	360	35000
				COMPUTER ENGINEERING	60		
				ELECTRICAL & ELECTRONICS ENGG	60		
				ELECTRONICS & COMMUNICATION	60		
				MECHANICAL ENGINEERING	60		
				METALLURGICAL ENGINEERING	60		
33	INSTITUTE OF TECHNOLOGY NIRMA UNIVERSITY AHMEDABAD - 382481 Ph. 02717 - 241911 - 15 Fax. 02717 - 241917 www.nirmauni.ac.in	1995	SF	CHEMICAL ENGINEERING	60	600	60000
				CIVIL ENGINEERING	60		
				COMPUTER SCIENCE & ENGG.	120		
				ELECTRONICS & COMMUNICATION	120		
				ELECTRICAL ENGINEERING	60		
				INFORMATION TECHNOLOGY	60		
				INSTRUMENTATION & CONTROL	60		
				MECHANICAL ENGINEERING	60		

34	KALOL INSTITUTE OF TECHNO- LOGY & RESEARCH CENTRE KALOL Ph. 02764 - 222603 Fax. 02764 - 222605 www.kirc-kalol.org	2006	SF	COMPUTER ENGINEERING	60	300	36000
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	60		
35	KANKESHWARI DEVI INSTITUTE OF TECHNOLOGY JAMANAGAR Ph. 0288 - 2888080/81 Fax. 0288 - 2888081 www.kit.org.in	2008	SF	CHEMICAL ENGINEERING	60	240	33000
				COMPUTER SCIENCE & ENGG.	60		
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
36	L.D.R.P.INSTITUTE OF TECHNOLOGY & RESEARCH GANDHINAGAR - 15 Ph. 079 - 23241492 - 494 Fax. 079 - 23241495 www.ldrp.ac.in	2005	SF	COMPUTER ENGINEERING	120	420	50000
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	120		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	60		
37	L.J.INSTITUTE OF ENGINEERING & TECHNOLOGY AHMEDABAD Ph. 079 - 26890383 Fax. 079 - 26890383 www.ljinstitutes.org	2007	SF	CIVIL ENGINEERING	60	300	36000
				COMPUTER ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	60		
38	LALJIBHAI CHATURBHAI INSTITUTE OF TECHNOLOGY BHANDU - 384120 Ph. 02765 - 287145 Fax. 02765 - 287945 www.lcit.org	2002	SF	COMPUTER ENGINEERING	60	300	38000
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	120		
				MECHANICAL ENGINEERING	60		

39	MAHATMA GANDHI INSTITUTE OF TECHNICAL EDU. & RES. NAVSARI Ph. 02637 - 228072 Fax. 02637 - 228272 www.npvgiter.org	2004	SF	COMPUTER SCIENCE & ENGG	60	240	36000
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				MECHANICAL ENGINEERING	60		
40	NARNARAYAN SHASTRI INSTITUTE OF TECHNOLOGY JETALPUR Ph. 02718 - 233701 Fax. 02718 - 233208 www.nsitgurukul.com	2008	SF	COMPUTER SCIENCE & ENGG	60	240	36000
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				MECHANICAL ENGINEERING	60		
41	NOBLE ENGINEERING COLLEGE PARTH VATIKA JUNAGADH Ph. 0285 - 2680244 Fax. 0285 - 2680255 www.necvbt.org	2008	SF	COMPUTER SCIENCE & ENGG	60	240	33000
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	60		
42	OM SHANTI ENGINEERING COLLEGE BEDI, RAJKOT Ph. 0281 - 2786500 Fax. 0281 - 2786260 www.omshantiengg.org	2008	SF	COMPUTER SCIENCE & ENGG	60	240	33000
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	60		
43	PARUL INSTITUTE OF ENGINEERING & TECHNOLOGY LIMDA, VAGHODIA Ph. 02668 - 263355 Fax. 02668 - 262327 www.parul.ac.in	2003	SF	CIVIL ENGINEERING	30	420	36000
				COMPUTER SCIENCE & ENGG	60		
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	120		
				INFORMATION TECHNOLOGY	30		
				MECHANICAL ENGINEERING	120		

44	R.K.COLLEGE OF ENGINEERING & TECHNOLOGY RAJKOT Ph. 0281 - 2785116 Fax. 0281 - 2785115 www.rkcollege.com	2006	SF	COMPUTER ENGINEERING	60	300	37000
				ELECTRONICS & COMMUNICATION	90		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	90		
45	S.P.B.PATEL ENGINEERING COLLEGE (SAFFRONY) LINCH, MAHESHANA Ph. 02762 - 285721 Fax. 02762 - 285720 www.saffrony.ac.in	2006	SF	CIVIL ENGINEERING	60	330	36000
				COMPUTER ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	90		
46	SAKALCHAND PATEL COLLEGE OF ENGINEERING VISNAGAR Ph. 02765 - 232008 Fax. 02765 - 224982 www.spcevng.ac.in	1999	SF	CIVIL ENGINEERING	30	420	38000
				COMPUTER ENGINEERING	90		
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	120		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	60		
47	SARDAR VALLABHBHAI PATEL INSTITUTE OF TECHNOLOGY VASAD Ph. 02692 - 274766 Fax. 02692 - 274489 www.svitvasad.ac.in	1997	SF	AERONAUTICAL ENGINEERING	60	570	38000
				CIVIL ENGINEERING	60		
				COMPUTER ENGINEERING	90		
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	90		
				INFORMATION TECHNOLOGY	90		
				INSTRUMENTATION & CONTROL	60		
				MECHANICAL ENGINEERING	60		

48	SARVJANIK COLLEGE OF ENGINEERING & TECHNOLOGY SURAT Ph. 0261 - 2240146 Fax. 0261 - 2240145 www.scet.ac.in	1994	SF	CHEMICAL ENGINEERING	60	390	40000
				COMPUTER ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				ELECTRICAL ENGINEERING	60		
				INFORMATION TECHNOLOGY	60		
				INSTRUMENTATION & CONTROL	40		
				TEXTILE TECHNOLOGY	30		
				TEXTILE ENGINEERING	20		
49	SHRI SADVIDHYAMANDAL INSTITUTE OF TECHNOLOGY BHARUCH - 392001 Ph. 02642 - 245864 Fax. 02642 - 249601 www.svmit.ac.in	1996	SF	CHEMICAL ENGINEERING	30	315	36000
				COMPUTER SCIENCE & ENGG	60		
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	45		
				MECHANICAL ENGINEERING	60		
50	SIGMA INSTITUTE OF ENGINEERING BAKROL,WAGHODIA Ph. 9909926832 Fax. 02668 - 241358 www.sigmainstitute.org	2008	SF	COMPUTER ENGINEERING	60	240	35000
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	60		
51	U.V.PATEL ENGINEERING COLLEGE, GANPAT UNIVERSITY MEHSANA - 382711 Ph. 02762 - 286805 Fax. 02762 - 286650 www.uvpce.ac.in	1997	SF	BIO-MEDICAL & INSTRUMENTAION	60	540	55000
				CIVIL ENGINEERING	60		
				COMPUTER ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	120		
				INFORMATION TECHNOLOGY	60		
				MECHATRONICS ENGINEERING	120		
				MECHANICAL ENGINEERING	60		

52	UNIVERSAL COLLEGE OF ENGINEERING & TECHNOLOGY MOTI BHOYAN, KALOL Ph. 02764 - 292267 Fax. 02764 - 292267 www.ucet.in	2008	SF	COMPUTER ENGINEERING	60	240	33000
				ELECTRONICS & COMMUNICATION	60		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	60		
53	V.V.P.ENGINEERING COLLEGE RAJKOT - 360005 Ph. 0281 - 2783394 Fax. 0281 - 2783487 www.vvpedulink.ac.in	1996	SF	BIO-TECHNOLOGY ENGINEERING	30	420	47000
				CHEMICAL ENGINEERING	30		
				COMPUTER ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	120		
				ELECTRICAL ENGINEERING	60		
				INFORMATION TECHNOLOGY	60		
				MECHANICAL ENGINEERING	60		
54	VALIA INSTITUTE OF TECHNOLOGY VALIA, BHARUCH Ph. 02643 - 270700 Fax.02643 - 270390 www.nctvit.org	2002	SF	COMPUTER ENGINEERING	60	240	28000
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				MECHANICAL ENGINEERING	60		
55	VIDYABHARTI TRUST INSTITUTE OF TECH.& RESEARCH CENTRE UMARAKH, BARDOLI Ph. 02622 - 224581 Fax. 02622 - 227481 www.vidyabhartitrust.org	2008	SF	COMPUTER SCIENCE & ENGG	60	240	36000
				ELECTRICAL ENGINEERING	60		
				ELECTRONICS & COMMUNICATION	60		
				MECHANICAL ENGINEERING	60		
	TOTAL DEGREE ENGINEERING SEATS FOR GOVT/GIA COLLEGES				5827		
	TOTAL DEGREE ENGINEERING SEATS FOR SFI COLLEGES				12959		
	TOTAL DEGREE ENGINEERING SEATS FOR GOVT,GIA & SFI COLLEGES				18786		

Total 55 Institutes in Gujarat, 17 Institute GIA/Govt. and 38 Institutes Self Finance. It means 31% (17) institutes GIA/Govt. and 69% (38) Institutes Self Finance.

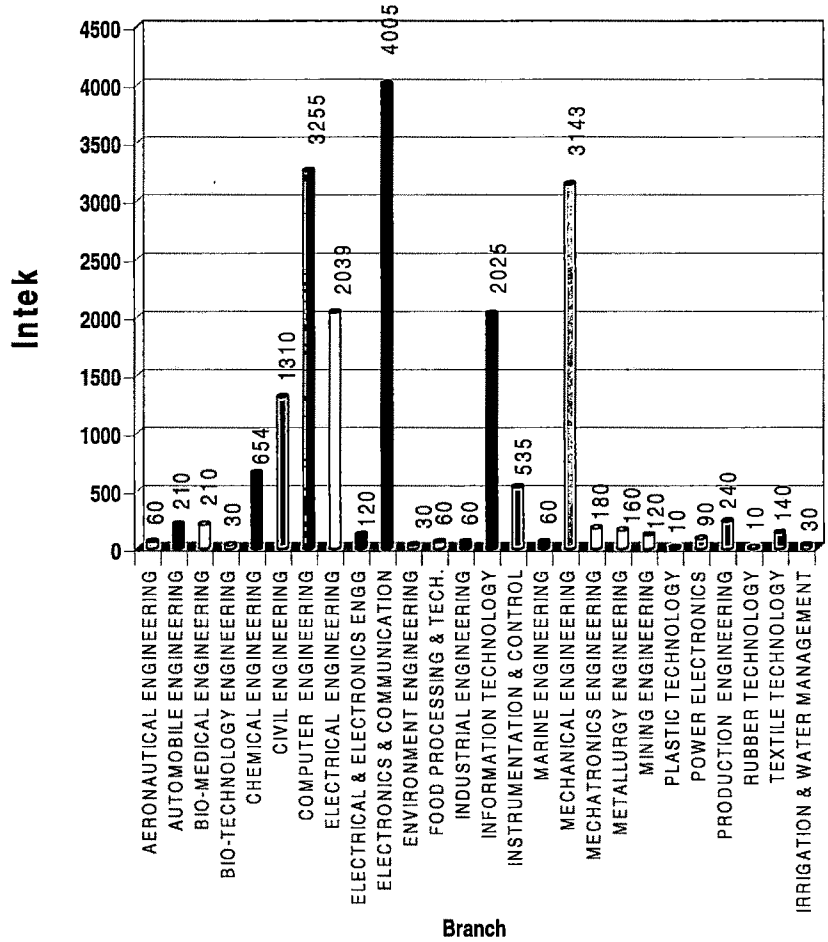
Total 18786 seats in engineering are available in Gujarat. From them 5827 seats are in GIA/Govt. and 12959 seats are in Self Finance. It means 31% (5827) seats GIA/Govt. and 69% (12959) seats Self Finance.

4.3.12.1 BRANCH/COURSE WISE INTAKE IN GUJARAT

	BRANCH/COURSE WISE INTAKE & COURSE OFFER NO. OF INSTITUTE			
NO.	BRANCH	INTAKE	%	COURSE OFFER NO.OF INSTITUES
1	AERONAUTICAL ENGINEERING	60	0.32	1
2	AUTOMOBILE ENGINEERING	210	1.12	4
3	BIO-MEDICAL ENGINEERING	210	1.12	4
4	BIO-TECHNOLOGY ENGINEERING	30	0.16	1
5	CHEMICAL ENGINEERING	654	3.48	13
6	CIVIL ENGINEERING	1310	6.97	20
7	COMPUTER ENGINEERING	3255	17.33	46
8	ELECTRICAL ENGINEERING	2039	10.85	34
9	ELECTRICAL & ELECTRONICS ENGG	120	0.64	2
10	ELECTRONICS & COMMUNICATION	4005	21.32	53
11	ENVIRONMENT ENGINEERING	30	0.16	1
12	FOOD PROCESSING & TECH.	60	0.32	1
13	INDUSTRIAL ENGINEERING	60	0.32	2
14	INFORMATION TECHNOLOGY	2025	10.78	33
15	INSTRUMENTATION & CONTROL	535	2.85	11
16	MARINE ENGINEERING	60	0.32	1
17	MECHANICAL ENGINEERING	3143	16.73	47
18	MECHATRONICS ENGINEERING	180	0.96	2

19	METALLURGY ENGINEERING	160	0.85	3
20	MINING ENGINEERING	120	0.64	2
21	PLASTIC TECHNOLOGY	10	0.05	1
22	POWER ELECTRONICS	90	0.48	2
23	PRODUCTION ENGINEERING	240	1.28	4
24	RUBBER TECHNOLOGY	10	0.05	1
25	TEXTILE TECHNOLOGY	140	0.74	3
26	IRRIGATION & WATER MANAG	30	0.16	1
	TOTAL INTAKE	18786	100	

BRANCH/COURSE WISE INTAKE & COURSE OFFER NO. OF INSTITUTE



Total 18786 seats are available in 26 various branch/course in 55 institutes. Highest seats are available in Electronics and Communication 4005 (21.32%), Computer Engineering 3255(17.33%) and Mechanical Engineering 3143 (16.73). In Rubber Technology & Plastic Technology, only 10 (0.05%) seats are available.

In short 15777 (84%) seats available only six courses – Electronics & communication, Computer, Mechanical, Electrical, Information Technology and Civil Engineering. 3009 (16%) seats available in other 20 courses.

4.3.13 Conclusion

Since the early eighties, due to rapid industrialization and economic growth, engineering and technical education in India have been developing faster than anywhere else in the world, and now India has a huge number of engineering students in the world. In a recent assessment by the United Nations, the Indian economy was rated in top ten in the world and it is expected to move on higher rank in near future.

India, the largest democracy in the world, is very much proud of its rich traditional cultural heritage and technically skilled man-power. Recent Indian scientific industrial and technological developments, particularly in space, nuclear and missile technology, computer engineering and information science have earned India world recognition as an emerging global power.

Since technical education determines the development and socio-economic condition of a nation, there is a greater need for high quality technical education to produce technically skilled man-power in India. The study itself shows the magnificent growth of engineering education in India. There are a large number of engineering colleges and technical institutions which are supported by the central and state governments. Besides, there are also a huge number of private engineering colleges. Government expenditure in technical education has increased by almost 400 times from the First Five Year Plan. Maximum states such as Andhra Pradesh, Tamil Nadu, Maharashtra, Gujarat, Rajasthan etc. have experienced phenomenal growth both in numbers of students and engineering institutions over the two decades.

The scope and future in engineering field is very bright. With rapid increase in infrastructure in the four growth centers of the world, namely, Brazil, Russia, India and China, civil engineering and electrical engineering offered enormous opportunities. Power plant construction as well as highway, airport and seaport construction would see considerable investment and job opportunities in India; even the growing I.T. Industry needs heavy investment in physical facilities, the traditional strength of civil and electrical engineers. Apart from that, with global warming around the corner, increased awareness of pollution and tighter emission control from vehicles, there will be ample opportunities for environmental engineers. The I.T. Revolution is sweeping the world; this industry has become a trillion dollar opportunity. Naturally, the opportunities for electronic engineers

are massive. The automobile industry in India is on boom so opportunities for automobile and mechanical engineering are in great demand. With stunning growth in aircraft design, the growth in aeronautical and aerospace engineering is also to be wonderful. The biotech sector I India growing rapidly, engineers trained in biochemical engineering would be in great demand. With the growth the semiconductor industry and embedded systems, the electronic engineers will have a higher job potential.

Engineering as a subject covers altogether 25 branches catering to industries, technology and business. Engineering from each branch acquire knowledge that can be applied in many fields: computer, medical, power distribution, missile guidance and other business areas. They also pursue engineering management and sales, which facilities them for marketing process and planning for installation. They also opt for post-graduate programs, Ph.D. And business management after obtaining their basic degree, which helped them occupy senior position in both government and private sector as a consultant or a planner.

The number of engineering colleges in India increased from 158 in 1980 to 3575 in 2009. Most of them produce quality engineers capable of working in world environment.

India has some very bright spots of excellence in its technical education sector. The IITs and their alumni commanded great respect in the global market. NITs and some other engineering institutes are also well regarded. The present study on India engineering and technical education reveals that the leading institutions (IITs, NITs, IISc) and almost all other engineering colleges have adopted standard competitive research and object originated engineering study programmes. These programmes are innovative in nature and offer tremendous advantage to students, universities and industries. The main benefits of the engineering studies to the students can be summarized as: gaining confidence in decision making, relating theory with practice, increased job opportunities, realization of responsibilities, opportunities to know one's weakness and strengths, and opportunities to work with modern equipments and on problems of current importance. Finally, it can be concluded that universities should adopt more job and object oriented engineering education curriculum linked with industries and research organizations to meet the present and future challenges of rapid technological changes and industrial development in India.

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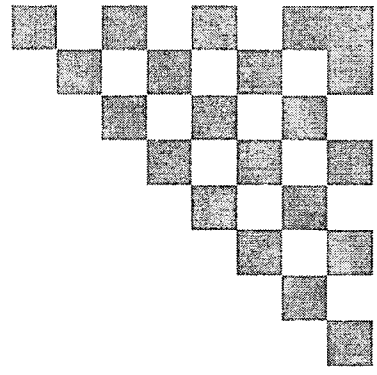
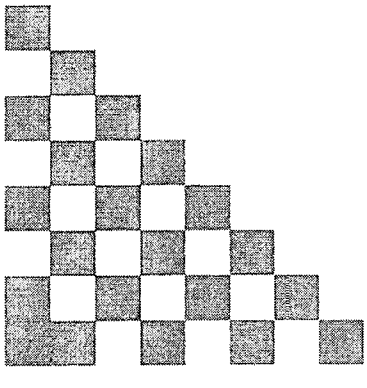


CHAPTER 5

Analysis of Data



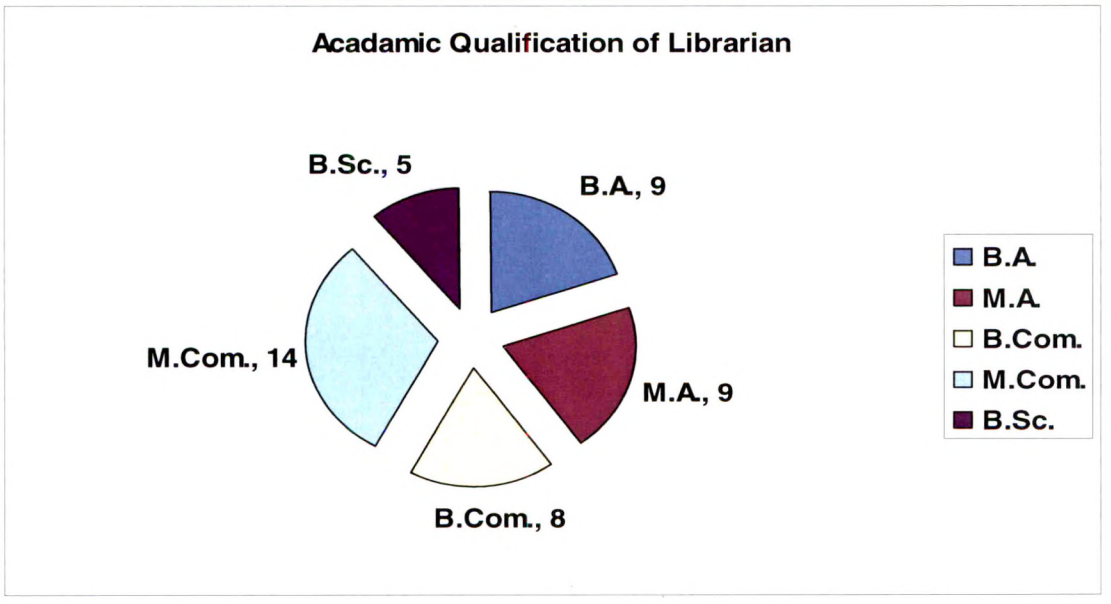
Chapter – 5: Analysis of Data

Analysis of Data

In any scientific research, the collection of data and its analysis appear to be very significant. Because the entire gamut of research depends on the data type and its analysis so as to determine the results appropriate for the study. After the collection data, these are processed and analyzed in accordance with the outline specified of the purpose. Data obtained through the questionnaire are analyzed and interpreted in the succeeding table. MS – Excel used to feed and tabulate the data.

5.1 Academic Qualification of Librarian

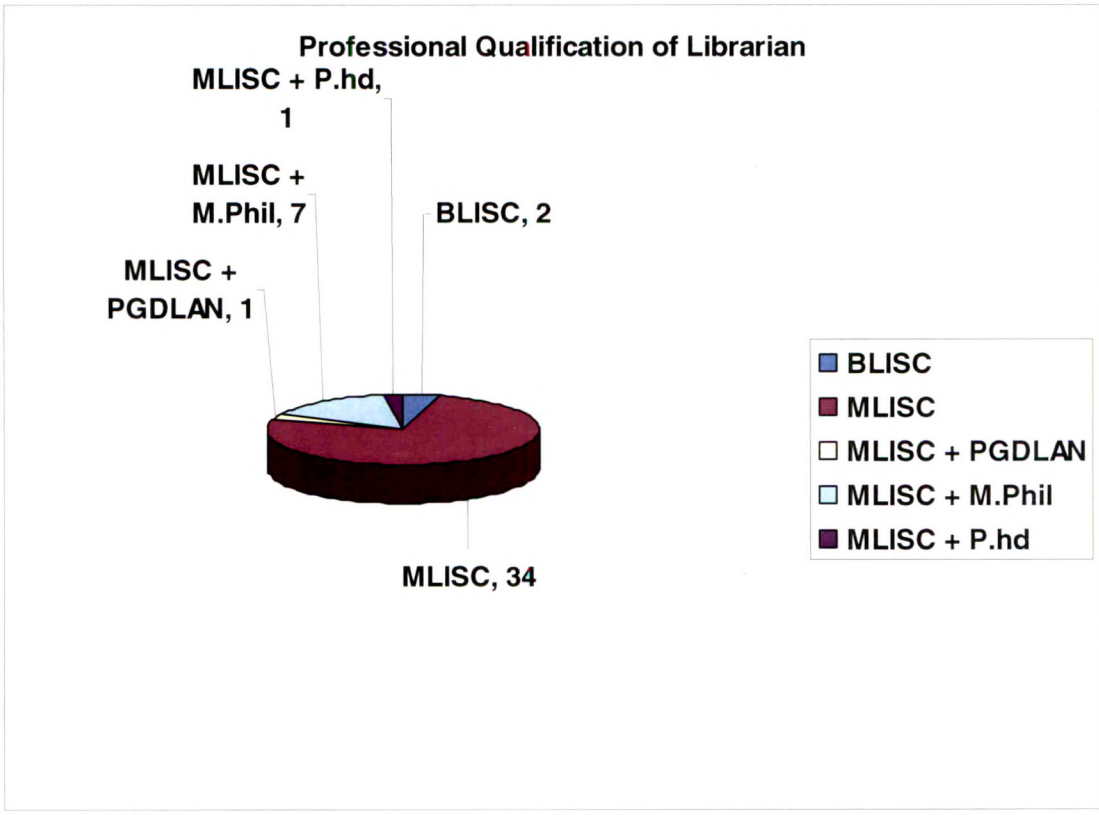
Qualification	Frequency	Percentage
B.A.	9	20
M.A.	9	20
B.Com.	8	17.78
M.Com.	14	31.11
B.Sc.	5	11.11
Total	45	100



It is found from the above table that maximum numbers of librarians have higher degree & few persons have science degree.

5.1.1 Professional Qualification of Librarian

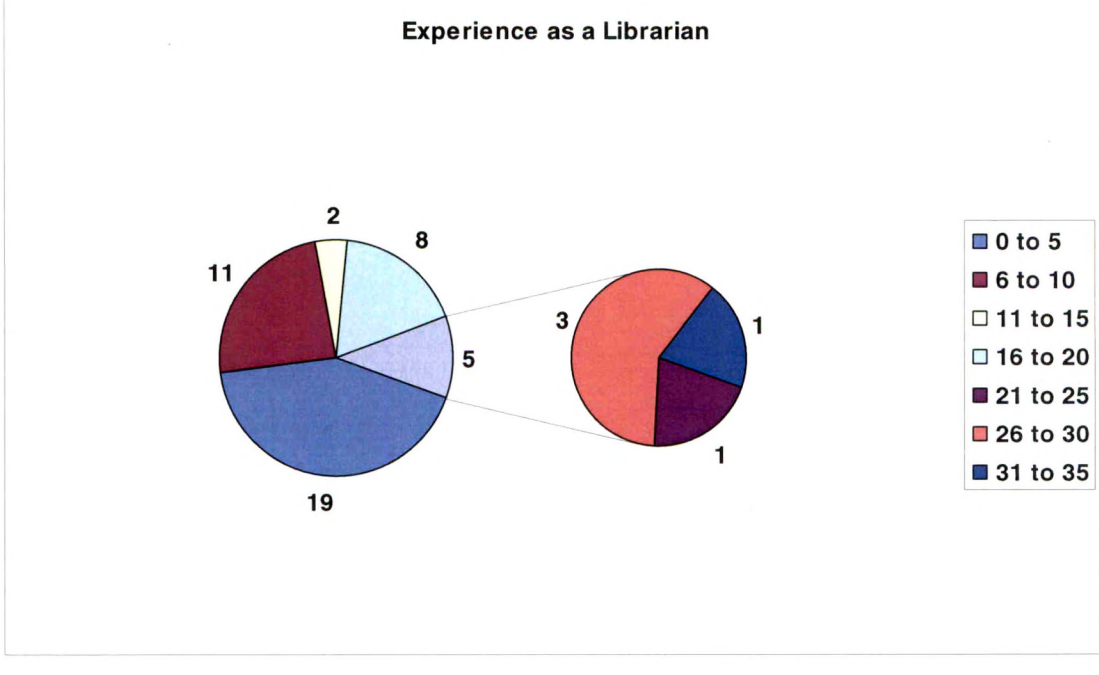
Qualification	Frequency	Percentage
BLISC	2	4.44
MLISC	34	75.56
MLISC + PGDLAN	1	2.22
MLISC + M.Phil	7	15.56
MLISC + P.hd	1	2.22
Total	45	100



The qualifications in the field researcher found that more than 95% have master degree & higher degree; hardly 5% have only bachelor degree so it reveals that the librarians are having adequate training as well as well versed with the field.

5.1.2 Experience as a Librarian

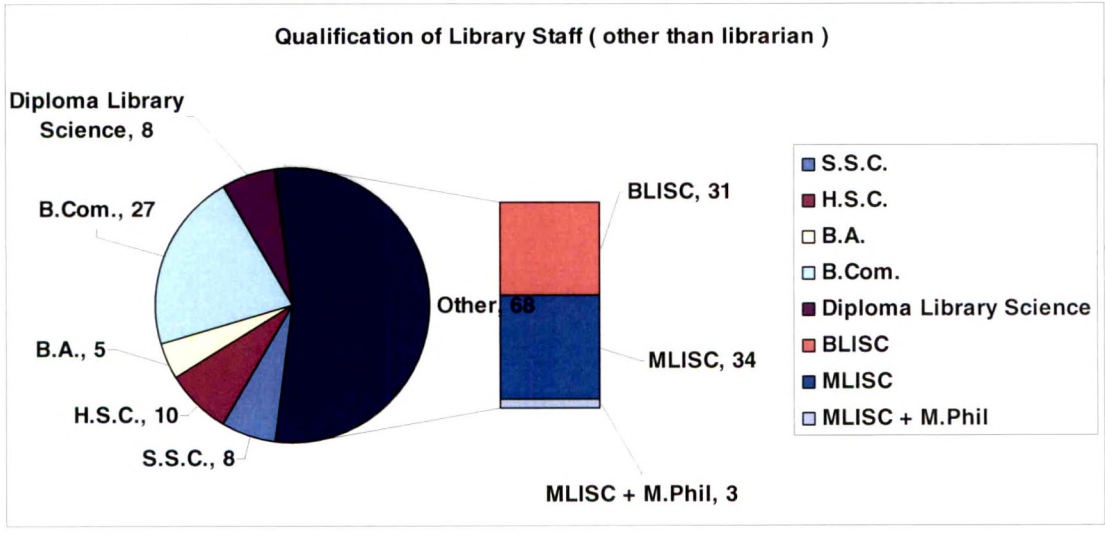
Year	Frequency	Percentage
0 to 5	19	42.22
6 to 10	11	24.44
11 to 15	2	4.45
16 to 20	8	17.78
21 to 25	1	2.22
26 to 30	3	6.67
31 to 35	1	2.22
Total	45	100



It is found from the above table that more number of librarians has less experience but 30% librarians have more than 10 years of experience.

5.1.3 Qualification of Library Staff (other than librarian)

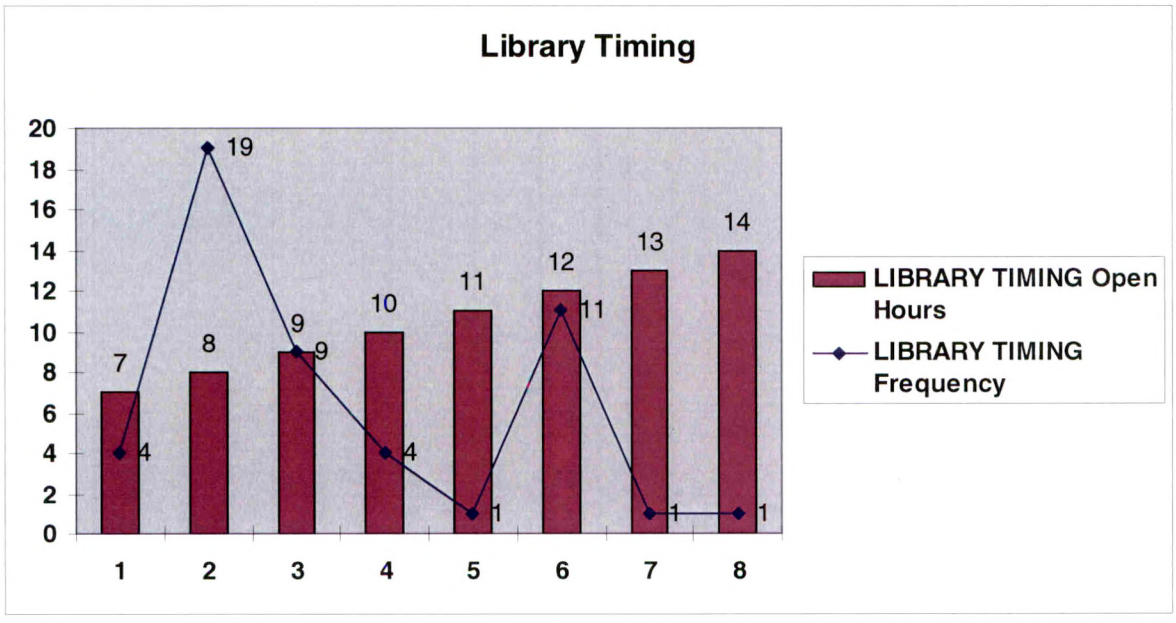
Qualification	Frequency	Percentage
S.S.C.	8	6.35
H.S.C.	10	7.95
B.A.	5	3.97
B.Com.	27	21.45
Diploma Library Science	8	6.35
BLISC	31	24.6
MLISC	34	26.95
MLISC + M.Phil	3	2.38
Total	126	100



It shows that library staffs are also qualified i.e. master degree & more in the field that is about 58%, while the commerce graduates are about 22%.

5.1.4 LIBRARY TIMING

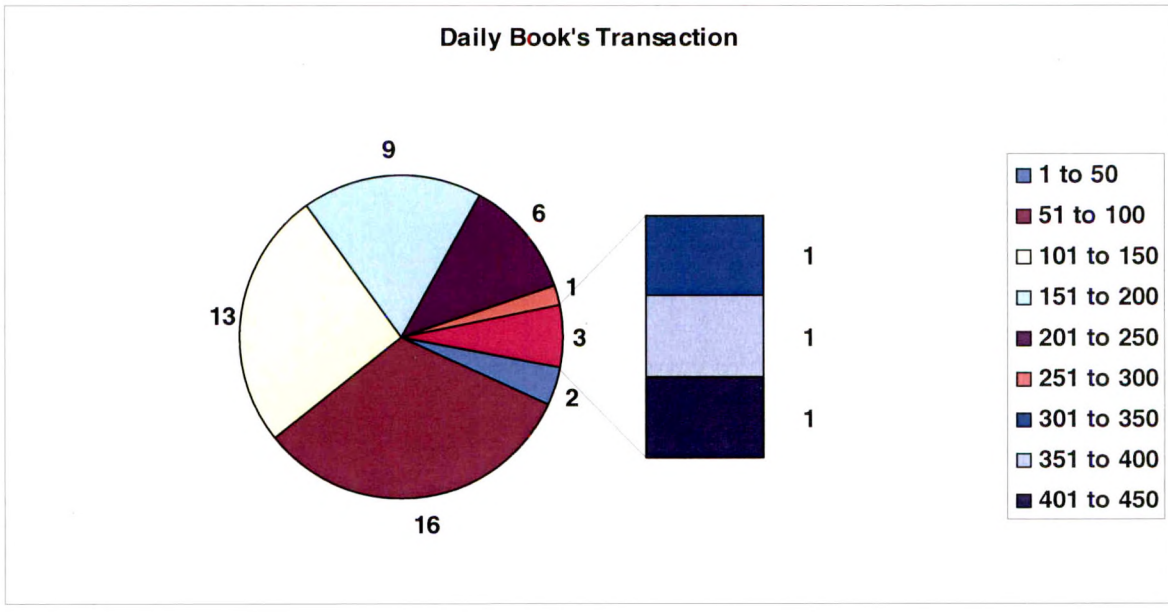
Open Hours	Frequency	percentage
7	4	8
8	19	38
9	9	18
10	4	8
11	1	2
12	11	22
13	1	2
14	1	2
Total	50	100



It is surprised to know that 64% libraries are open not more than 9 hours per day. Hardly libraries are open for more than 12 hours.

5.1.5 Daily Book's Transaction

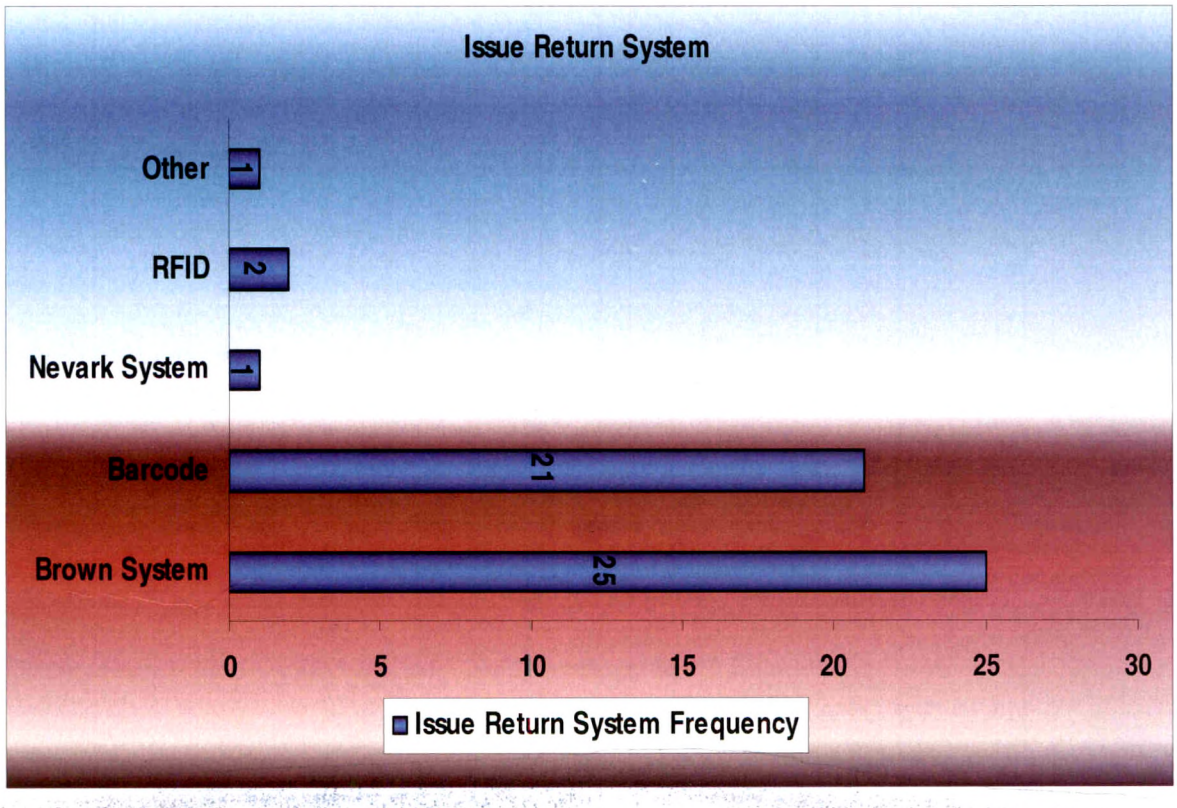
	Frequency	Percentage
1 to 50	2	4
51 to 100	16	32
101 to 150	13	26
151 to 200	9	18
201 to 250	6	12
251 to 300	1	2
301 to 350	1	2
351 to 400	1	2
401 to 450	1	2
Total	50	100



By seeing the book transaction record, more number of users are using library.

5.1.6 Issue Return System

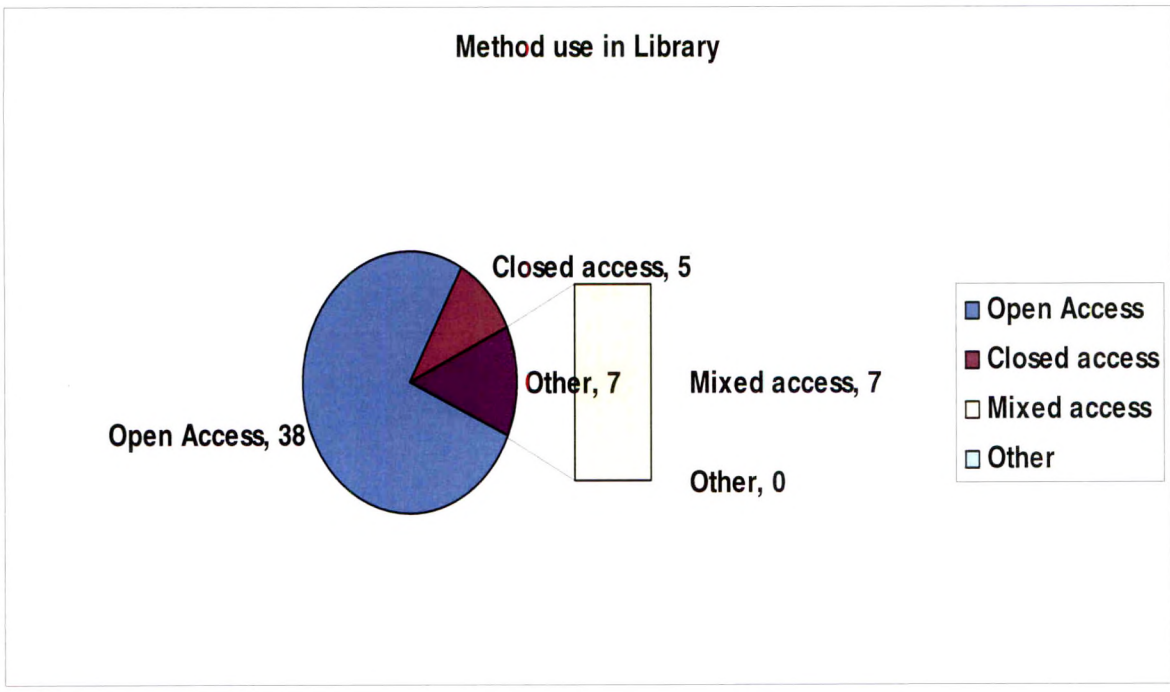
System	Frequency	percentage
Brown System	25	50
Barcode	21	42
Nevark System	1	2
RFID	2	4
Other	1	2
Total	50	100



It is found from the above table that maximum number of libraries are using Brown System & Barcode System, only 2(4%) libraries use RFID system.

5.1.7 Method use in Library

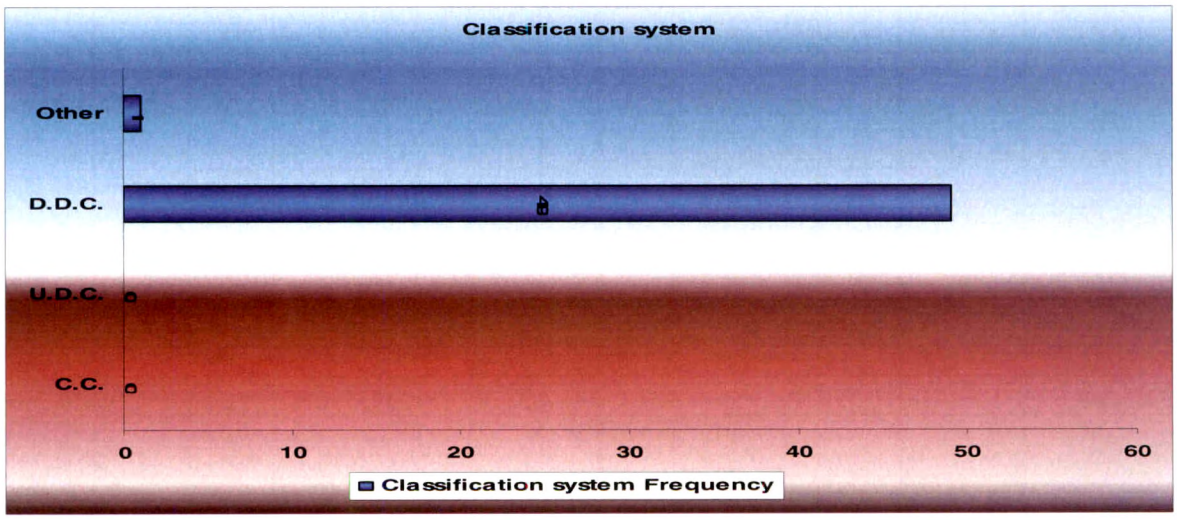
Method	Frequency	percentage
Open Access	38	76
Closed access	5	10
Mixed access	7	14
Other	0	0
Total	50	100



It is good that open access is adopted by maximum libraries. This will help to users to the see all the books which are available on the same field in the library.

5.1.8 Classification system

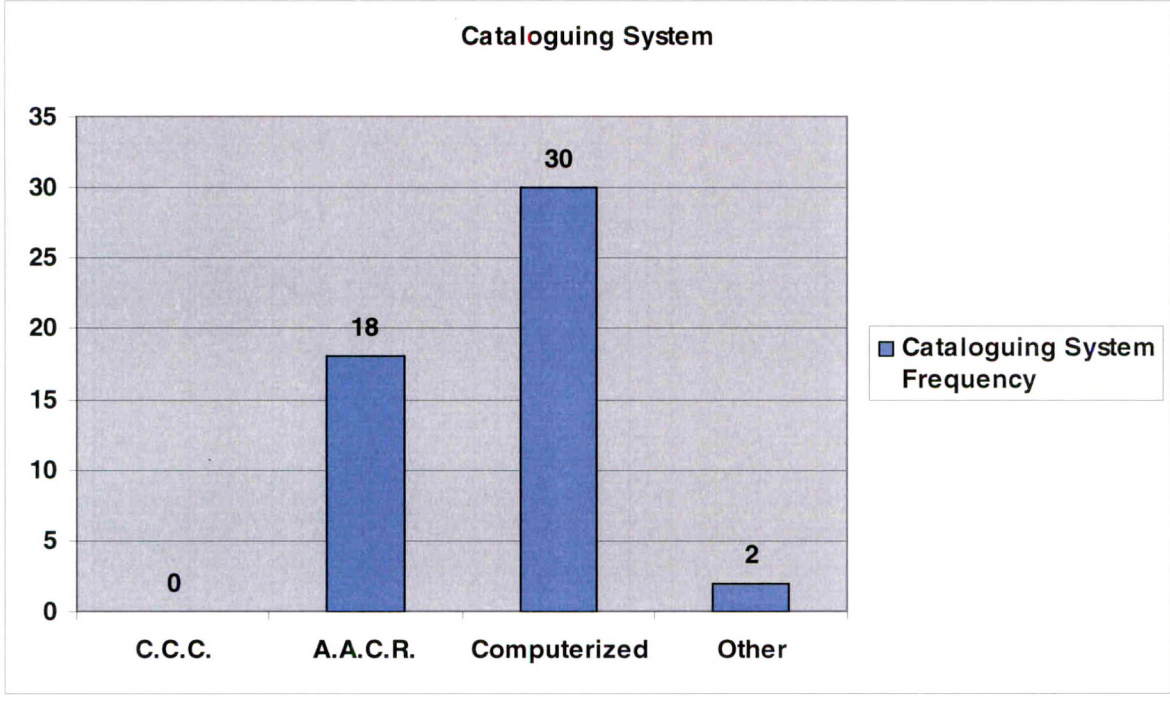
	Frequency	percentage
C.C.	0	0
U.D.C.	0	0
D.D.C.	49	98
Other	1	2
Total	50	100



It is found from the above table that maximum number of libraries use Dewey Decimal Classification (DDC) Systems. Because users are well understand this system.

5.1.9 Cataloguing System

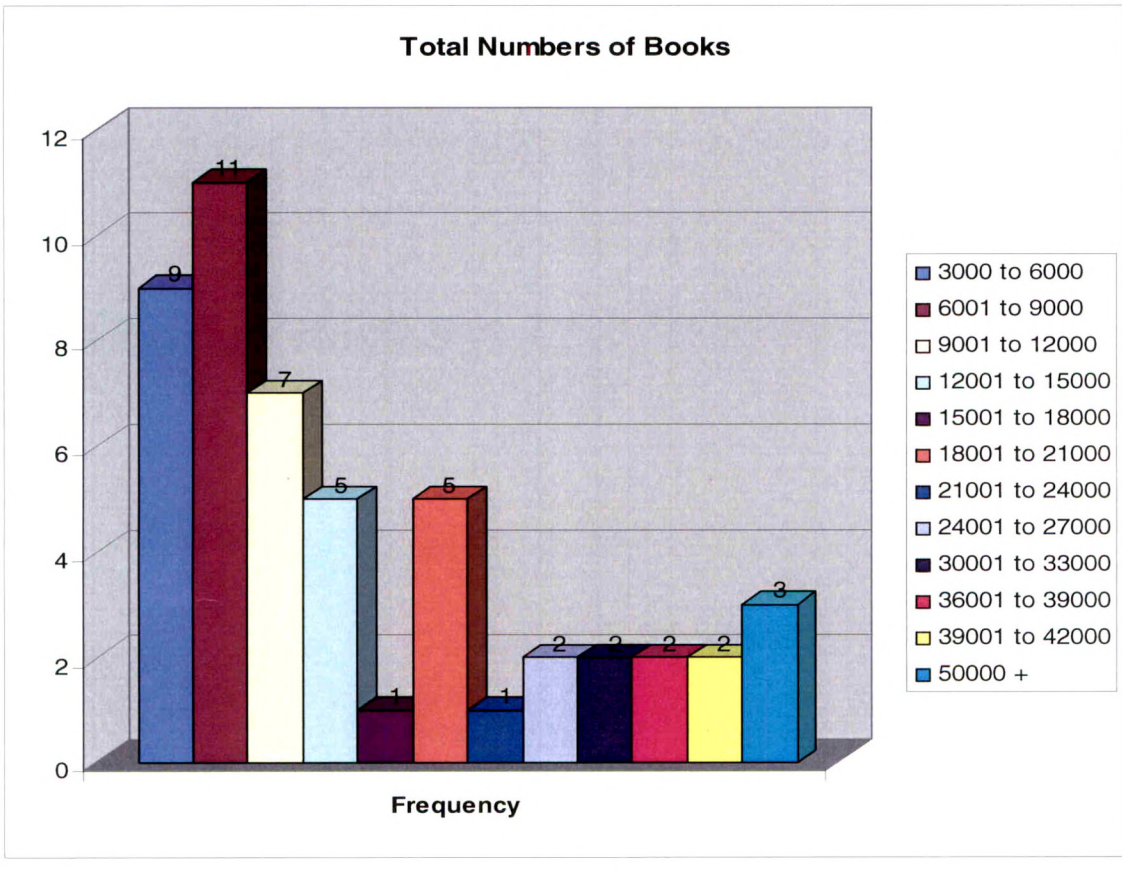
	Frequency	percentage
C.C.C.	0	0
A.A.C.R.	18	36
Computerized	30	60
Other	2	4
Total	50	100



It is found from the above table that more then 60% libraries are using OPAC Cataloguing System.

5.2 Total Numbers of Books

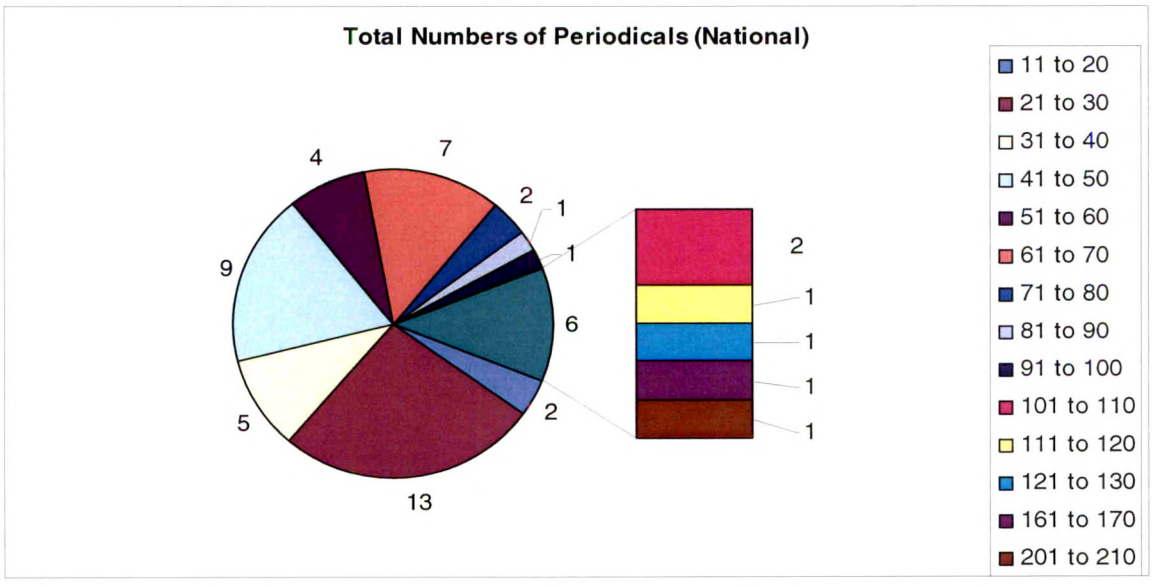
	Frequency	percentage
3000 to 6000	9	18
6001 to 9000	11	22
9001 to 12000	7	14
12001 to 15000	5	10
15001 to 18000	1	2
18001 to 21000	5	10
21001 to 24000	1	2
24001 to 27000	2	4
30001 to 33000	2	4
36001 to 39000	2	4
39001 to 42000	2	4
50000 +	3	6
	50	100



Some of the libraries & colleges opened recently so the collection wise they are poor, but others have good collection. It is seen from the table that 11 colleges have more than 24000 collections.

5.2.1 Total Numbers of Periodicals (National)

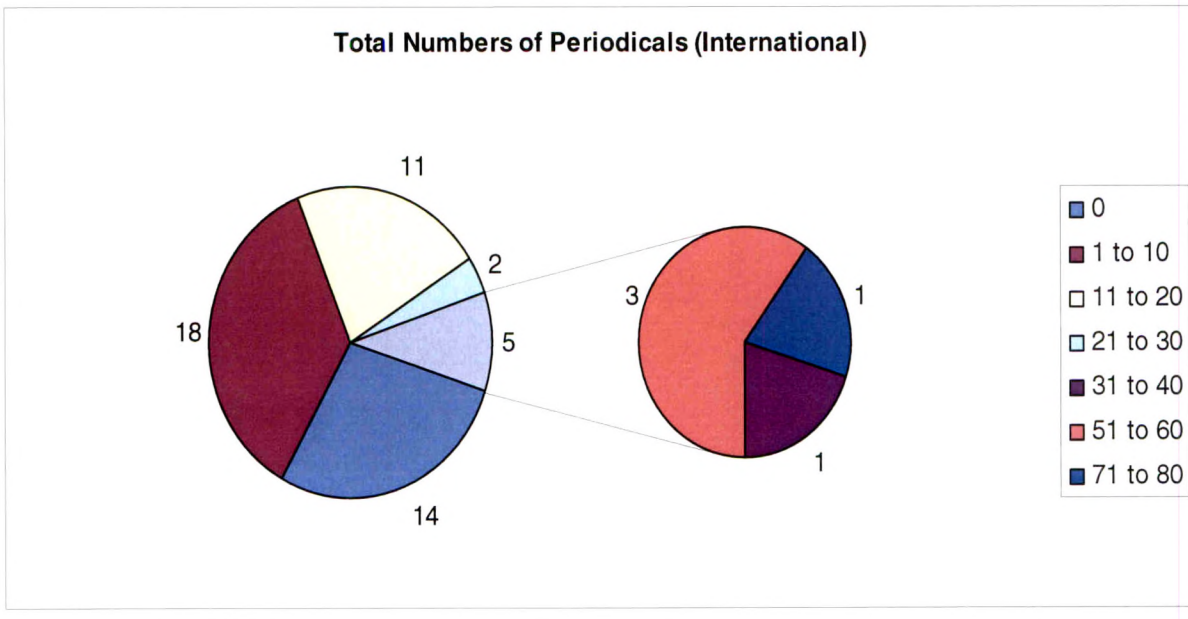
	Frequency	percentage
11 to 20	2	4
21 to 30	13	26
31 to 40	5	10
41 to 50	9	18
51 to 60	4	8
61 to 70	7	14
71 to 80	2	4
81 to 90	1	2
91 to 100	1	2
101 to 110	2	4
111 to 120	1	2
121 to 130	1	2
161 to 170	1	2
201 to 210	1	2
Total	50	100



So far as the National periodicals are concern all the libraries are comparatively poor.

5.2.2 Total Numbers of Periodicals (International)

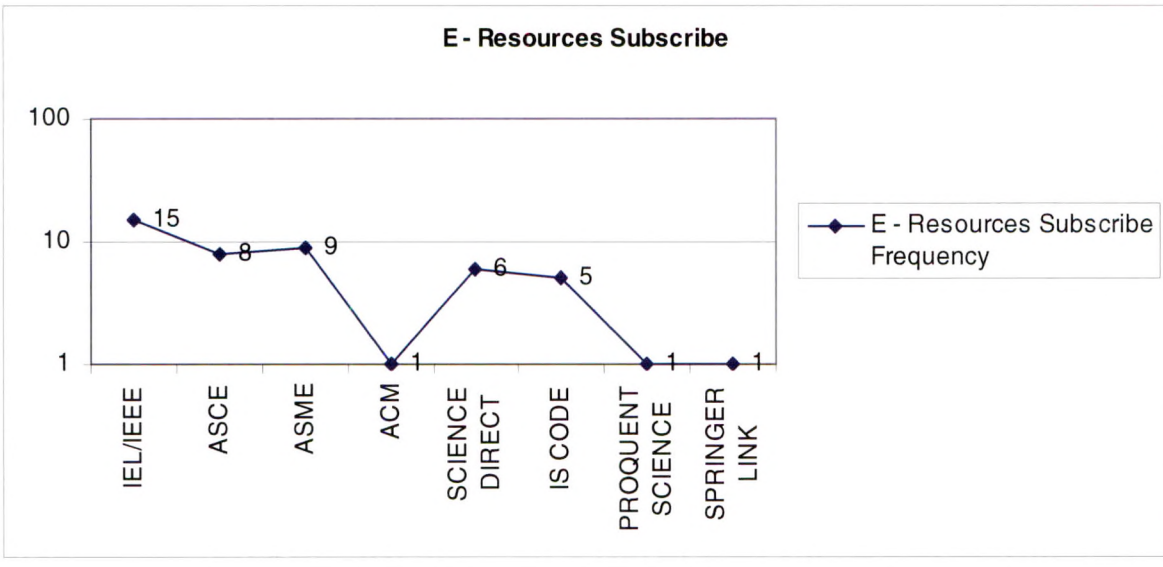
	Frequency	percentage
0	14	28
1 to 10	18	36
11 to 20	11	22
21 to 30	2	4
31 to 40	1	2
51 to 60	3	6
71 to 80	1	2
Total	50	100



So far as the International periodicals are concern all the libraries are very poor. Because all these reasons the users do not know the latest development of the field.

5.2.3 E - Resources Subscribe

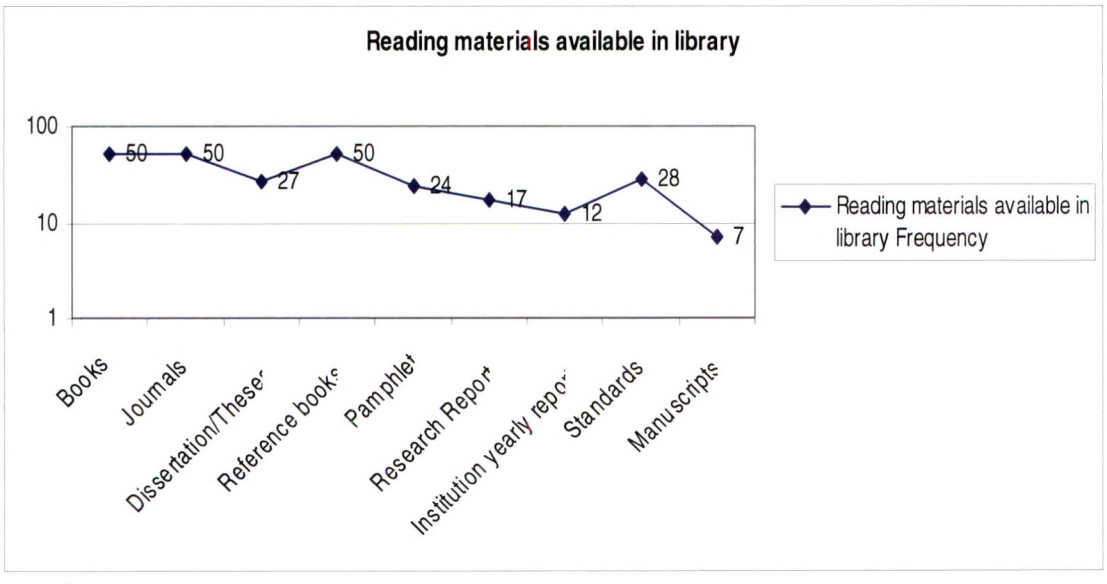
	Frequency	Percentage
IEL/IEEE	15	30
ASCE	8	16
ASME	9	18
ACM	1	2
SCIENCE DIRECT	6	12
IS CODE	5	10
PROQUENT SCIENCE	1	2
SPRINGER LINK	1	2



It is found from the above table that maximum number of libraries use Databases in their field as E – Resources.

5.2.4 Reading materials available in library

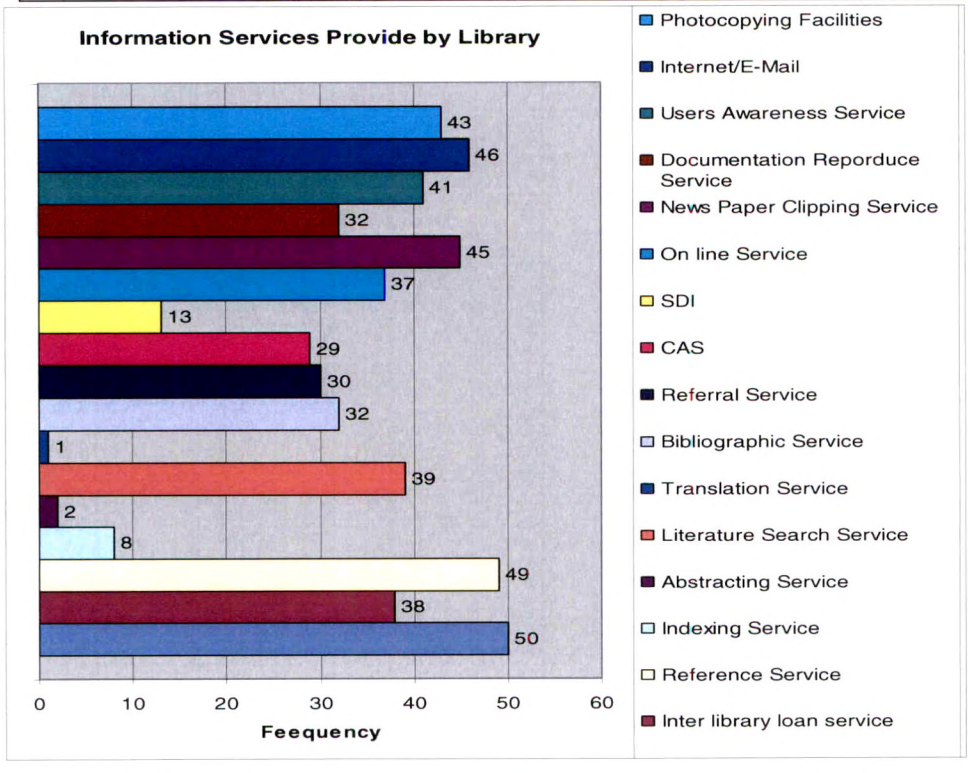
	Frequency
Books	50
Journals	50
Dissertation/Theses	27
Reference books	50
Pamphlet	24
Research Report	17
Institution yearly report	12
Standards	28
Manuscripts	7



From above table Books, Journals & Reference Books are used maximum compare to other types of materials, while manuscripts are hardly used.

5.3 Information Services Provide by library

Particular	Frequency
Document issue/return srvices	50
Inter library loan service	38
Reference Service	49
Indexing Service	8
Abstracting Service	2
Literature Search Service	39
Translation Service	1
Bibliographic Service	32
Referral Service	30
CAS	29
SDI	13
On line Service	37
News Paper Clipping Service	45
Documentation Reporduce Service	32
Users Awareness Service	41
Internet/E-Mail	46
Photocopying Facilities	43

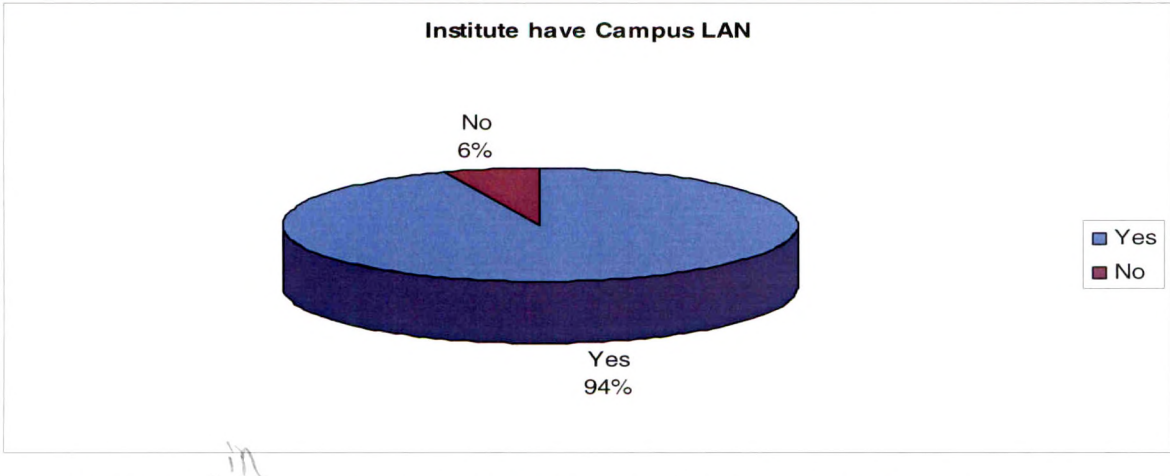


Library's main function are services so different services are provided by librarians out o that Document issue/return, user's awareness, Reference services, Internet/E-mail, News paper clipping, Photocopying services are used maximum, but Translation, Abstracting, SDI service are used hardly.

5.4 Intranet & Internet Infrastructure

5.4.1 Institute has Campus LAN

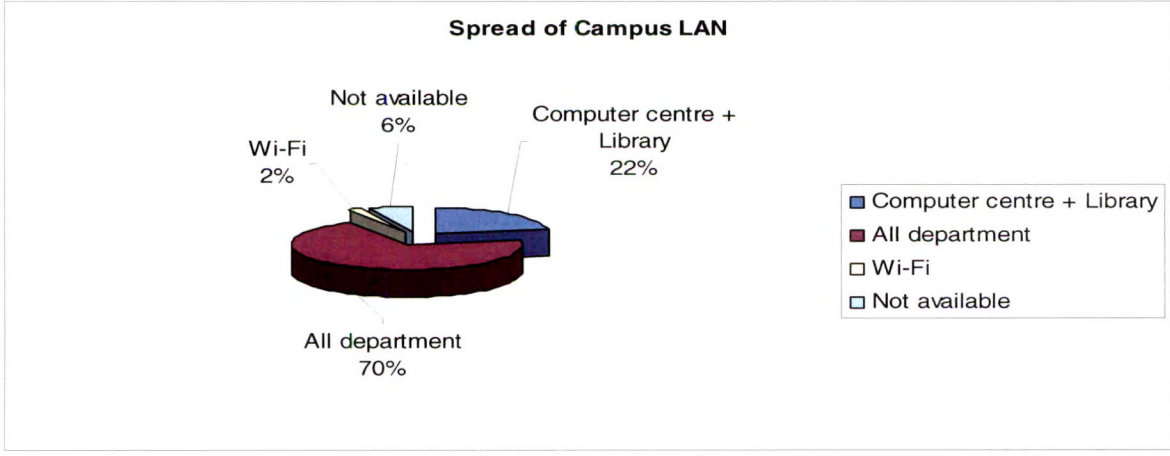
	Frequency	percentage
Yes	47	94
No	3	6
Total	50	100



Use of IT is used maximum & all most 94% libraries are joined with LAN Network.

5.4.2 Spread of Campus LAN

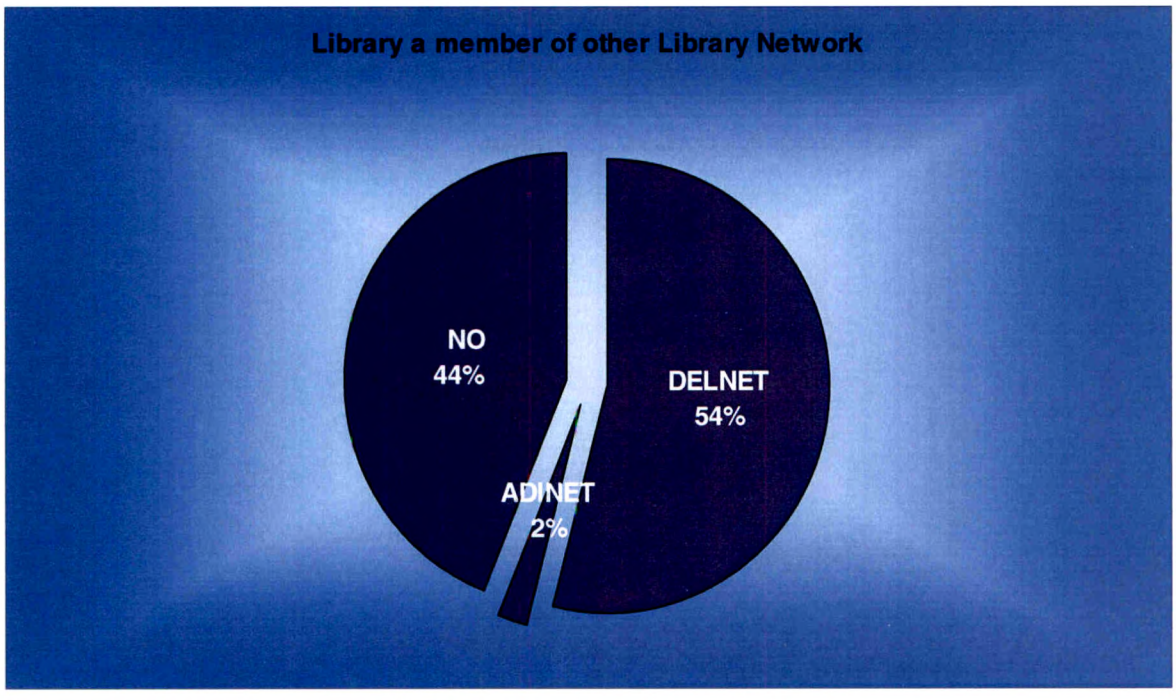
	Frequency	percentage
Computer centre + Library	11	22
All department	35	70
Wi-Fi	1	2
Not available	3	6
Total	50	100



11(22%) institute have LAN in Computer centre + Library, 35(70%) institute have LAN in all departments, 1(2%) institute has Wi-Fi system & 3(6%) institute have not Campus LAN.

5.4.3 Library a member of other Library Network

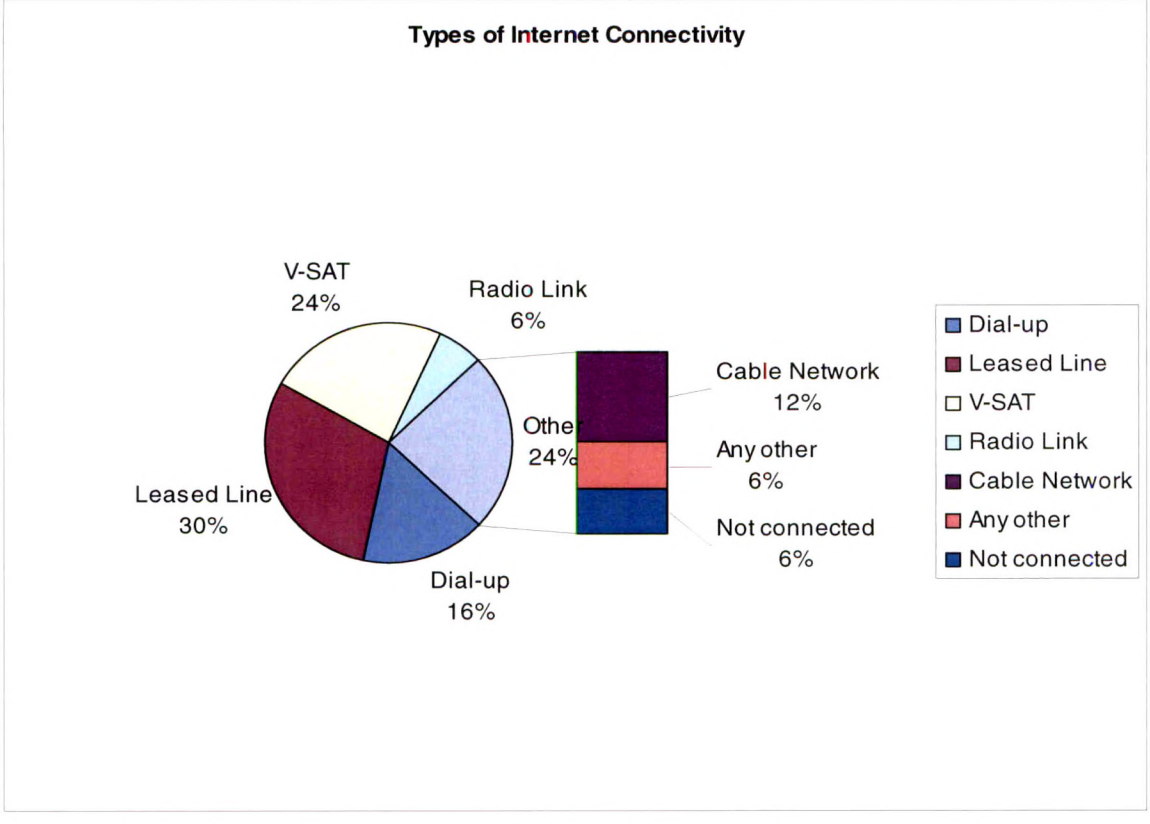
	Frequency	percentage
DELNET	27	54
ADINET	1	2
NO	22	44
Total	50	100



It is found from the above table that maximum numbers of libraries are joined with other national & local network for resource sharing.

5.4.4 Types of Internet Connectivity

	Frequency	percentage
Dial-up	8	16
Leased Line	15	30
V-SAT	12	24
Radio Link	3	6
Cable Network	6	12
Any other	3	6
Not connected	3	6
Total	50	100

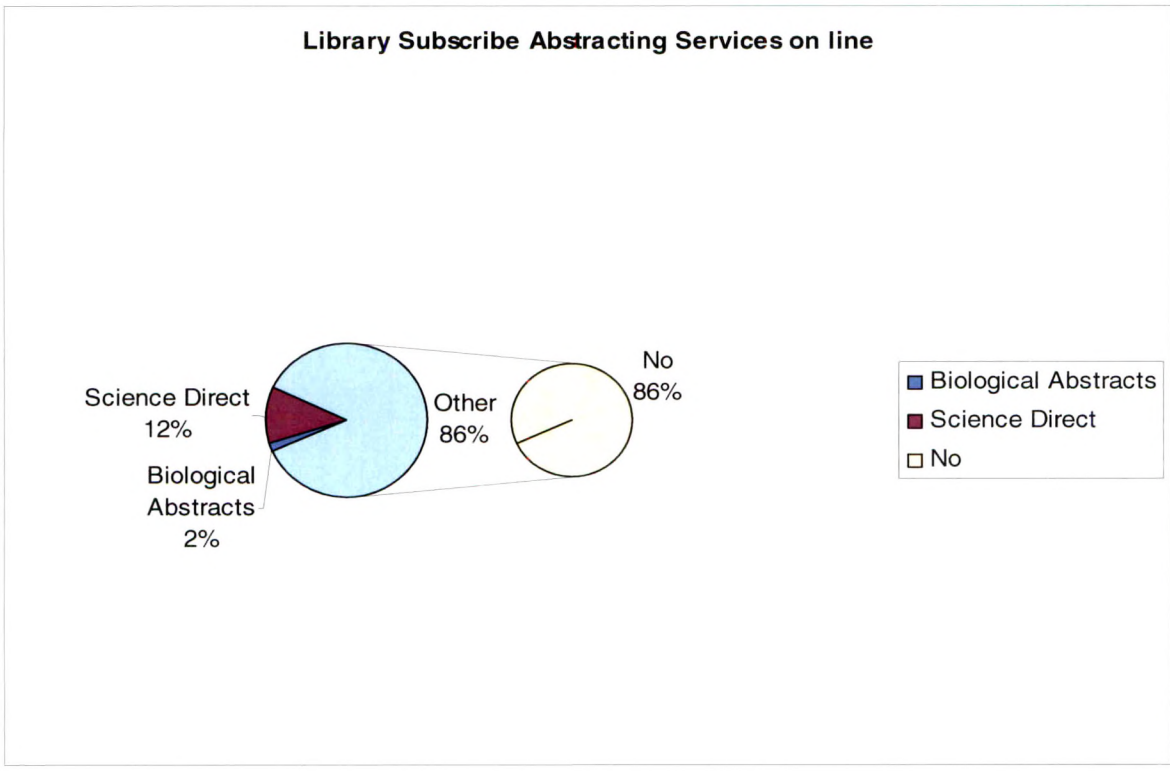


Different libraries are connected with different Internet connectivity, Dial-up, Leased Line & V-SAT are used maximum. The remaining INTERNET connectivity are used less.

5.5 Library Automation

5.5.1 Library Subscribe Abstracting Services on line

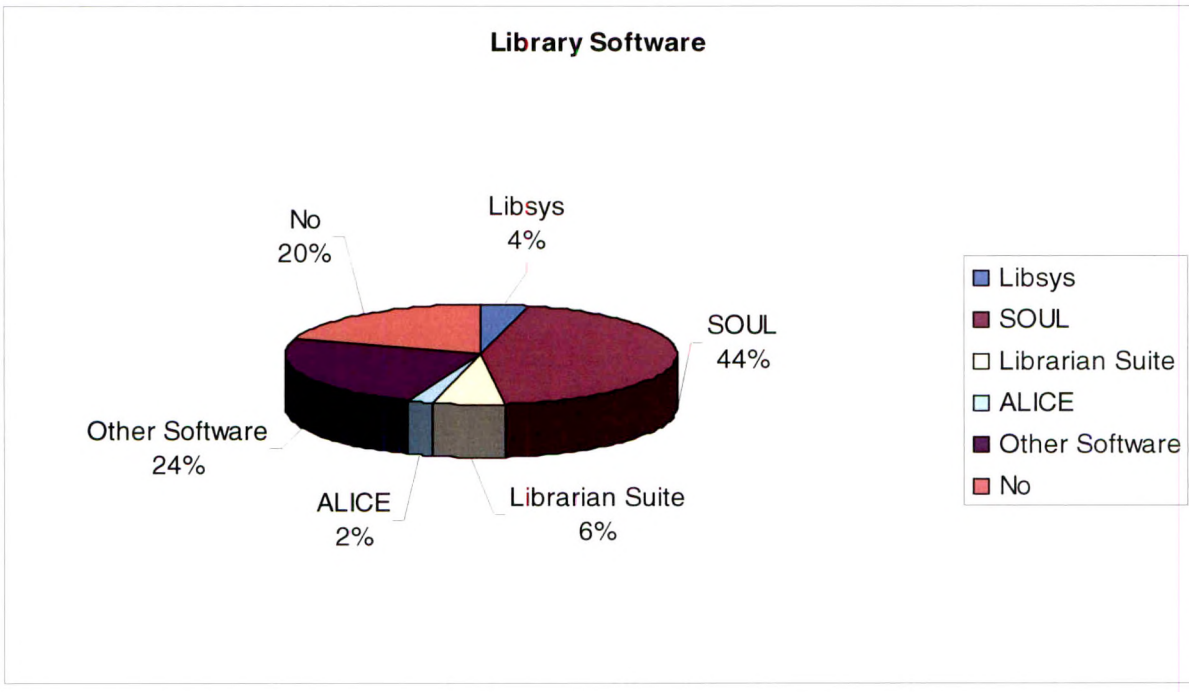
	Frequency	percentage
Biological Abstracts	1	2
Science Direct	6	12
No	43	86
Total	50	100



Abstracting journals are hardly subscribed some library.

5.5.2 Library Software

	Frequency	percentage
Libsys	2	4
SOUL	22	44
Librarian Suite	3	6
ALICE	1	2
Other Software	12	24
No	10	20
Total	50	100



As these are academic libraries & SOUL software is used by maximum number of colleges, it will be easy to sharing the information in engineering colleges are also used such type of ready made software.

5.5.3 Library Computerization

	Frequency	percentage
Fully Computerization	10	20
Partially Computerization	20	40
Process of Computerization	10	20
Not Knows at this Computerization	10	20
Total	50	100

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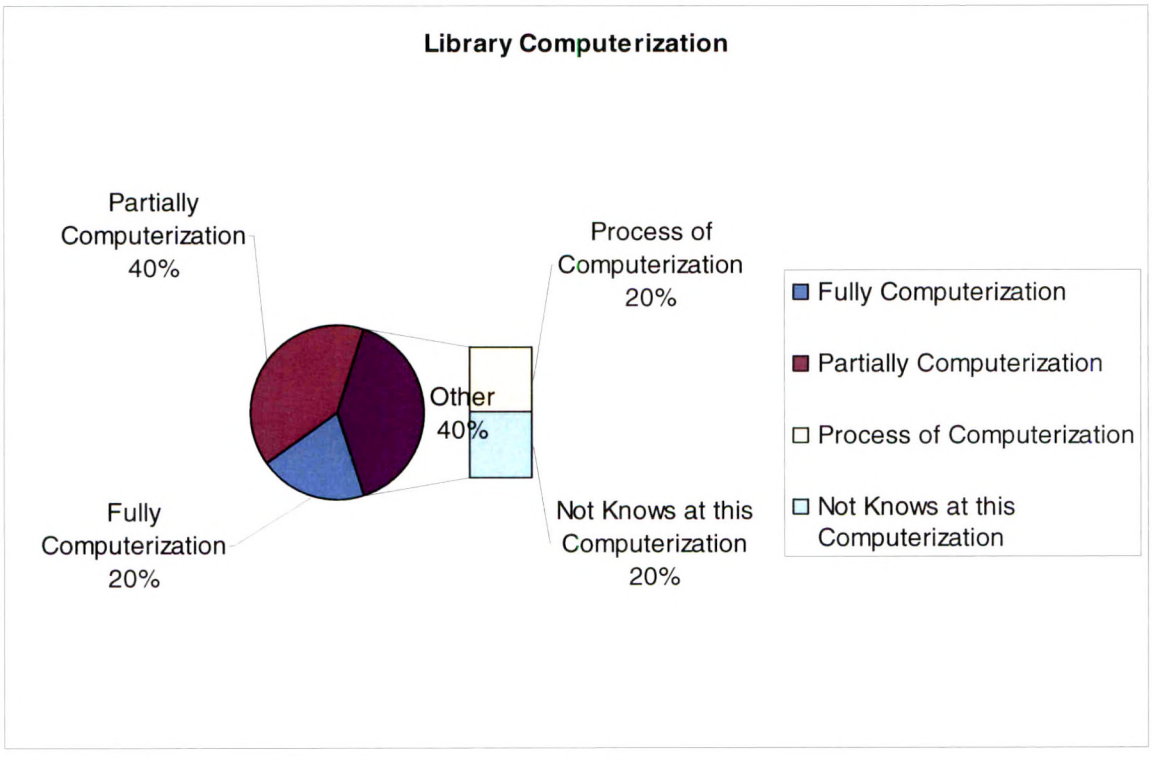
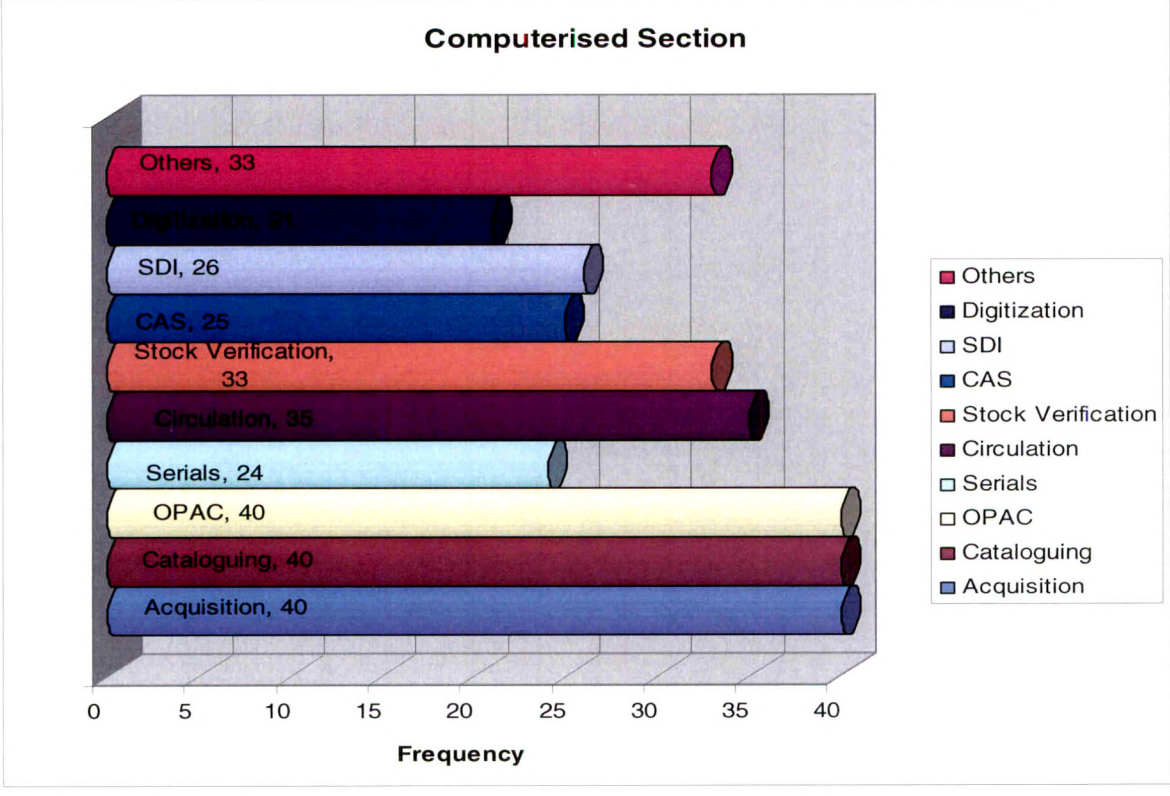


It is found that earlier colleges are full computerized, while almost 40% are partially computerized. 20% colleges have not started computerization.

5.5.4 Computerized Section

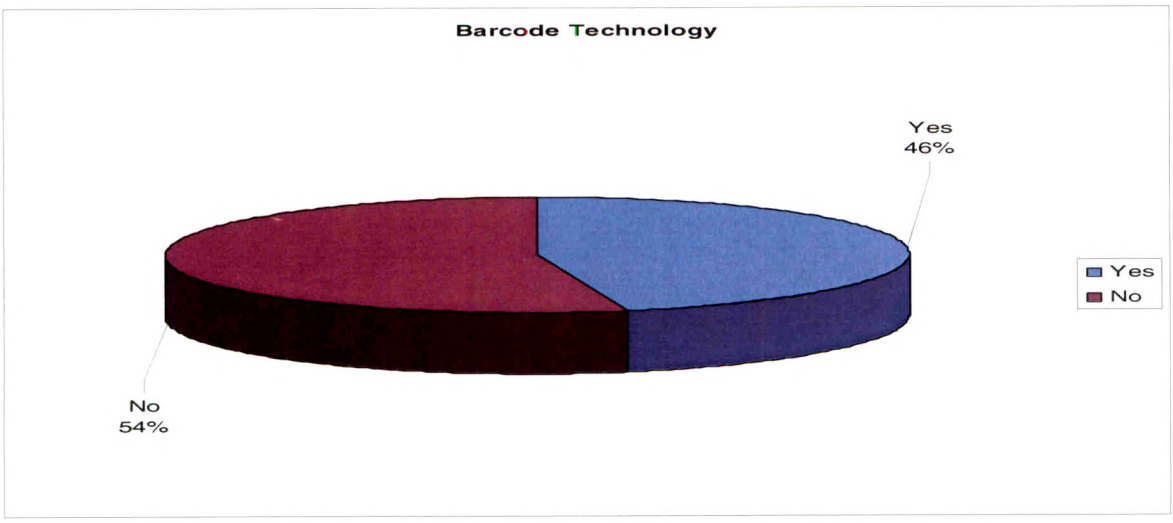
Particular	Frequency	percentage
Acquisition	40	80
Cataloguing	40	80
OPAC	40	80
Serials	24	48
Circulation	35	70
Stock Verification	33	66
CAS	25	50
SDI	26	52
Digitization	21	42
Others	23	46



It we will go in detail about the section which are more used by users are computerized i.e. Acquisition, Cataloguing and OPAC.

5.5.5 Barcode Technology

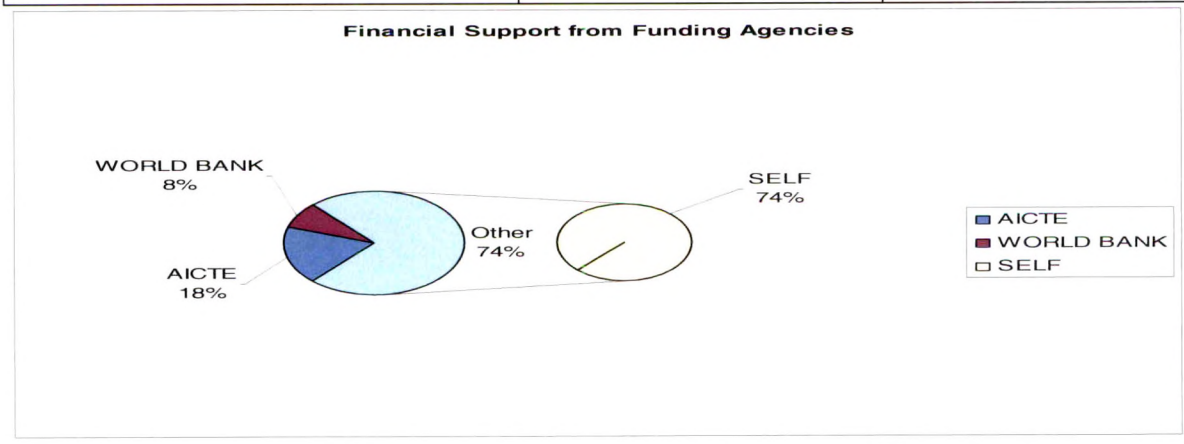
	Frequency	percentage
Yes	23	46
No	27	54
Total	50	100



It is found from the above table that maximum numbers of libraries used Barcode technology. Barcode technology is used for annual stock verification and circulation. Few libraries used smart card and RFID technology.

5.5.6 Financial Support from Funding Agencies

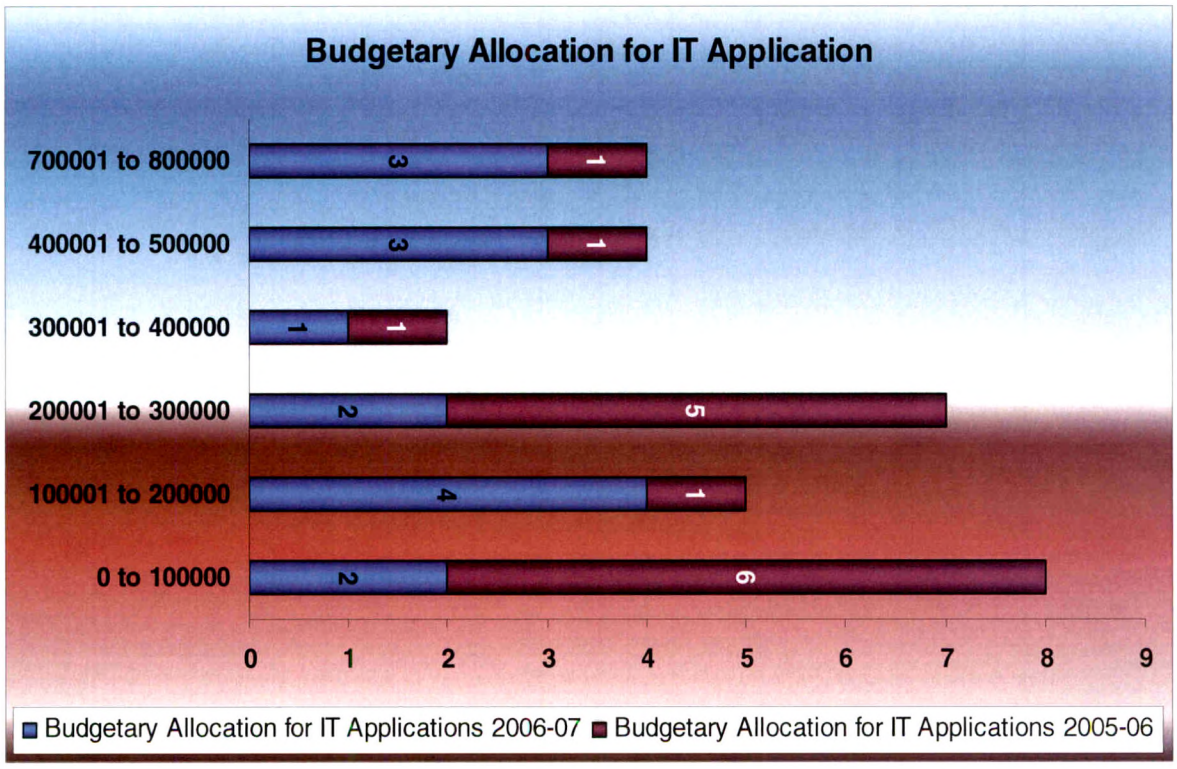
	Frequency	percentage
AICTE	9	18
WORLD BANK	4	8
SELF	37	74
Total	50	100



It is found from the above table that maximum numbers of libraries received fund from self organization.

5.5.7 Budgetary Allocation for IT Applications

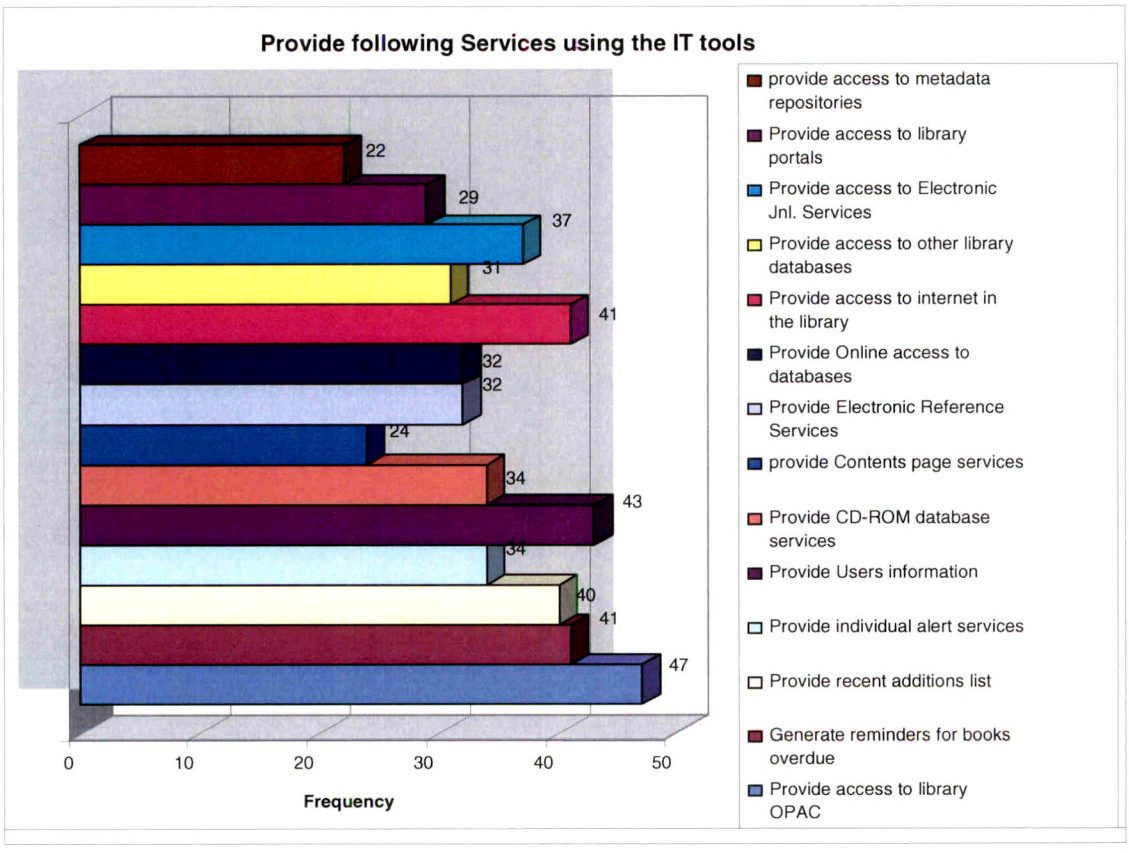
Rs.	2006-07	2005-06
0 to 100000	2	6
100001 to 200000	4	1
200001 to 300000	2	5
300001 to 400000	1	1
400001 to 500000	3	1
700001 to 800000	3	1



All most all libraries have not adequate budget allocation out of total budget of institute.

5.6 Provide following Services using the IT tools

	Frequency	percentage
Provide access to library OPAC	47	94
Generate reminders for books overdue	41	82
Provide recent additions list	40	80
Provide individual alert services	34	68
Provide Users information	43	86
Provide CD-ROM database services	34	68
provide Contents page services	24	48
Provide Electronic Reference Services	32	64
Provide Online access to databases	32	64
Provide access to internet in the library	41	82
Provide access to other library databases	31	62
Provide access to Electronic Jnl. Services	37	74
Provide access to library portals	29	58
provide access to metadata repositories	22	44



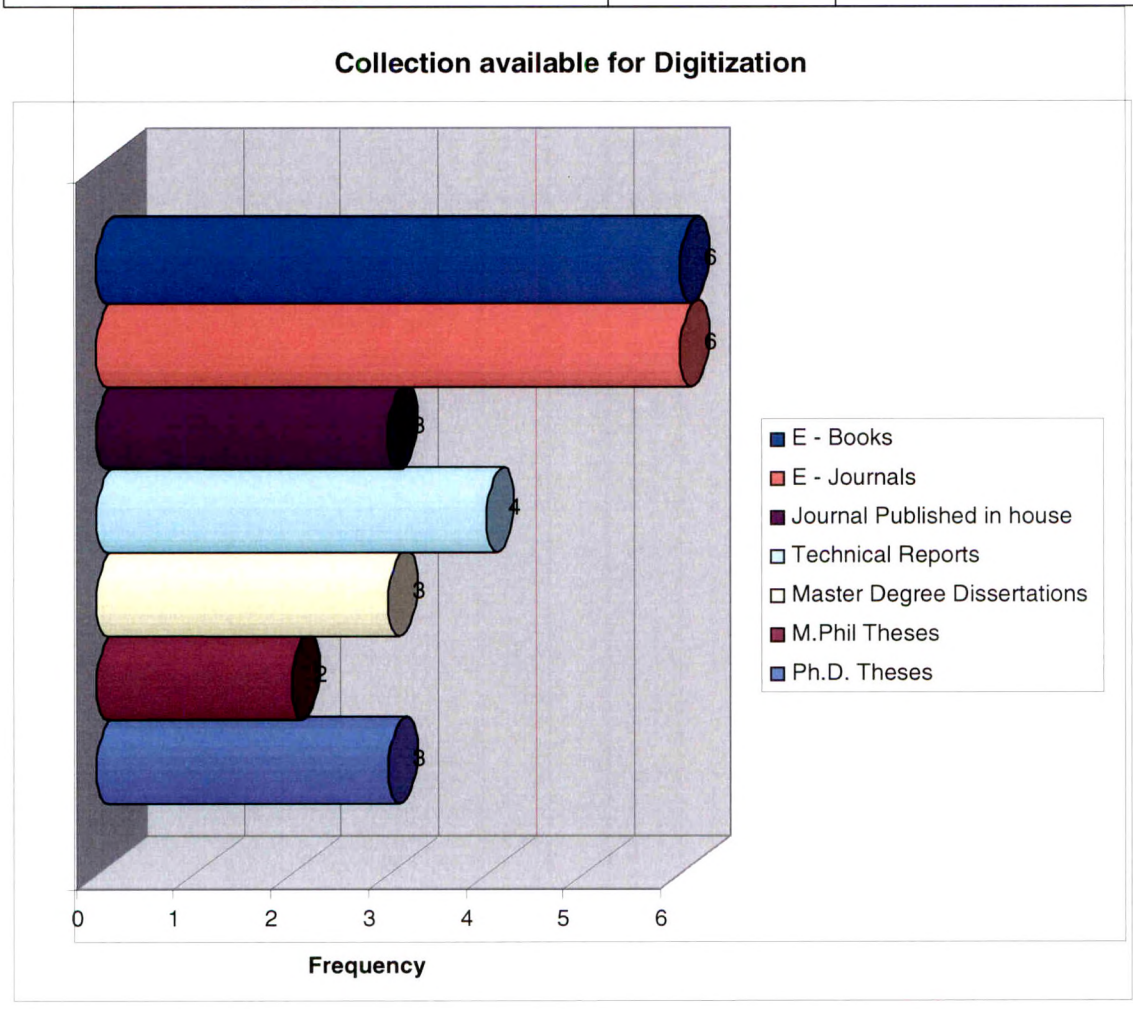
It is found from the above table that maximum numbers of libraries provide OPAC services, user information, internet, reminders for book overdue using information technology tools, provide recent additions list, provide individual alert services, provide

CD-Rom database services. Most of libraries think that if new services using IT in the library develops than the overall library services have improved.

5.7 Library Digitization Programme

5.7.1 Collection available for Digitization

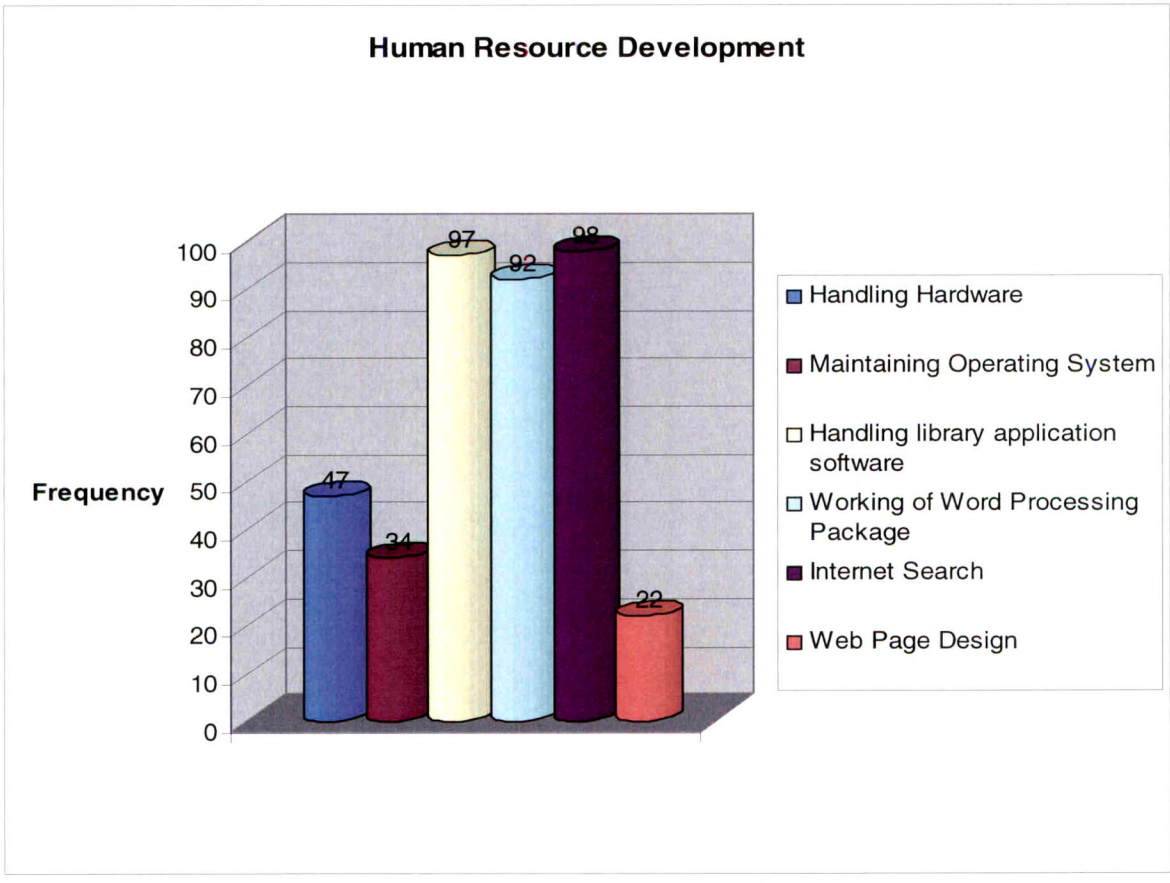
	Frequency	percentage
Ph.D. Theses	3	6
M.Phil Theses	2	4
Master Degree Dissertations	3	6
Technical Reports	4	8
Journal Published in house	3	6
E - Journals	6	12
E - Books	6	12



It is found from the above table that maximum number of libraries are not thinking for digitization, but it is needed for the virtual library, number of journals are coming on E – format & other sources are also available in E – form.

5.8 Human Resource Development

	Frequency	percentage
Handling Hardware	47	27.49
Maintaining Operating System	34	19.88
Handling library application software	97	56.73
Working of Word Processing Package	92	53.8
Internet Search	98	57.8
Web Page Design	22	12.87



It is found from the above table that maximum numbers of library professionals trained for handling hardware, handling library application software & word processing packages. But numbers of personnel's are not able to handle hardware, web-page & operating system. At least persons must have knowledge about web page.

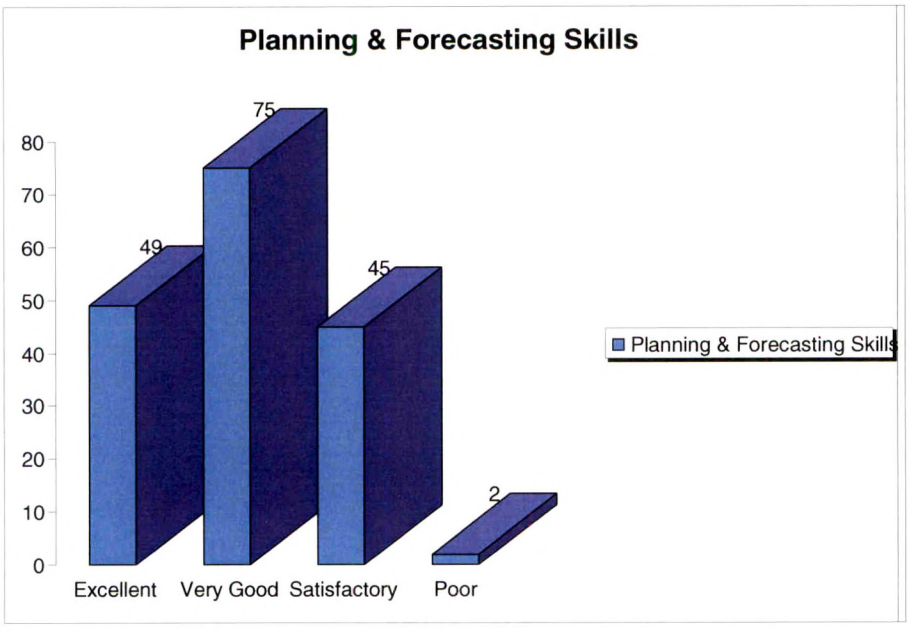
5.9 Managerial skills of the library professionals working in engineering colleges

Table No.	Managerial skills of the library professionals working in Engineering colleges								
Sr.No.	Managerial skills	Number of library professionals responded & related percentages							
		Excellent		Very Good		Satisfactory		Poor	
		No.	%	No.	%	No.	%	No.	%
5.9.1	Planning & Forecasting Skills	49	28.7	75	43.86	45	26.32	2	1.17
5.9.2	Independent Decision Making Skills	41	24	74	43.27	54	31.58	2	1.17
5.9.3	Leadership Skills	55	32.2	80	46.78	35	20.47	1	0.59
5.9.4	Self Confidence & Supervision Skills	45	26.3	75	43.86	49	28.65	2	1.17
5.9.5	Time Management	87	50.9	45	26.32	38	22.22	1	0.59
5.9.6	Authority & Responsibility	61	35.7	66	38.6	39	22.81	5	2.92
5.9.7	Directing Skills	51	29.8	83	48.54	35	20.47	2	1.17
5.9.8	Interpersonal & Human Relation Skills	54	31.6	77	45.03	40	23.39	0	0
5.9.9	Conflict Resolution Skills	36	21.1	70	40.94	58	33.92	7	4.09
5.9.10	Motivation	53	31	74	43.27	38	22.22	6	3.51
5.9.11	Problem Solving Skills	55	32.2	65	38.01	50	29.24	1	0.59
5.9.12	Co-ordination Skills	53	31	80	46.78	38	22.22	0	0
5.9.13	Developing Team Spirit	61	35.7	75	43.86	33	19.3	2	1.17
5.9.14	Motivational Skills of Superiors	52	30.4	80	46.78	37	21.64	2	1.17
5.9.15	Job Satisfaction & Recognition	46	26.9	95	55.56	30	17.54	0	0

As researcher identified 15 managerial skills for the library professionals, a questionnaire is circulated among all the respondents to collect their responses.

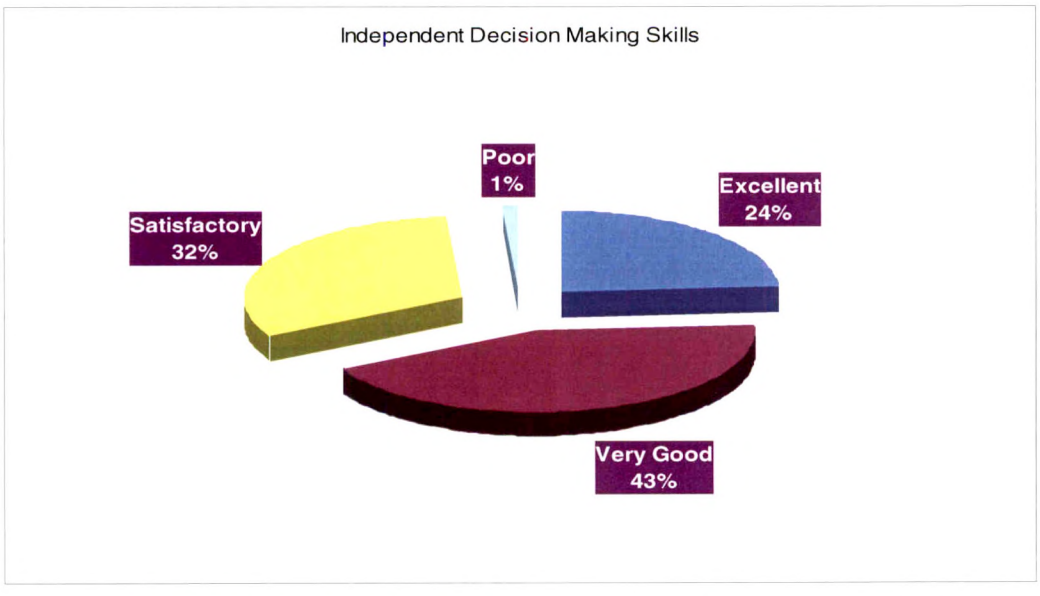
Among all the library professionals working in 55 Engineering College Libraries, 171 library professionals have responded. The total respondents include 45 Librarians, 126 Asst. Librarians and other professional staffs (Library Assistants, Technical Assistants, Senior / Junior Assistants etc.). Over all the managerial skill of staff is Excellent or Very good.

5.9.1 Planning & Forecasting Skills



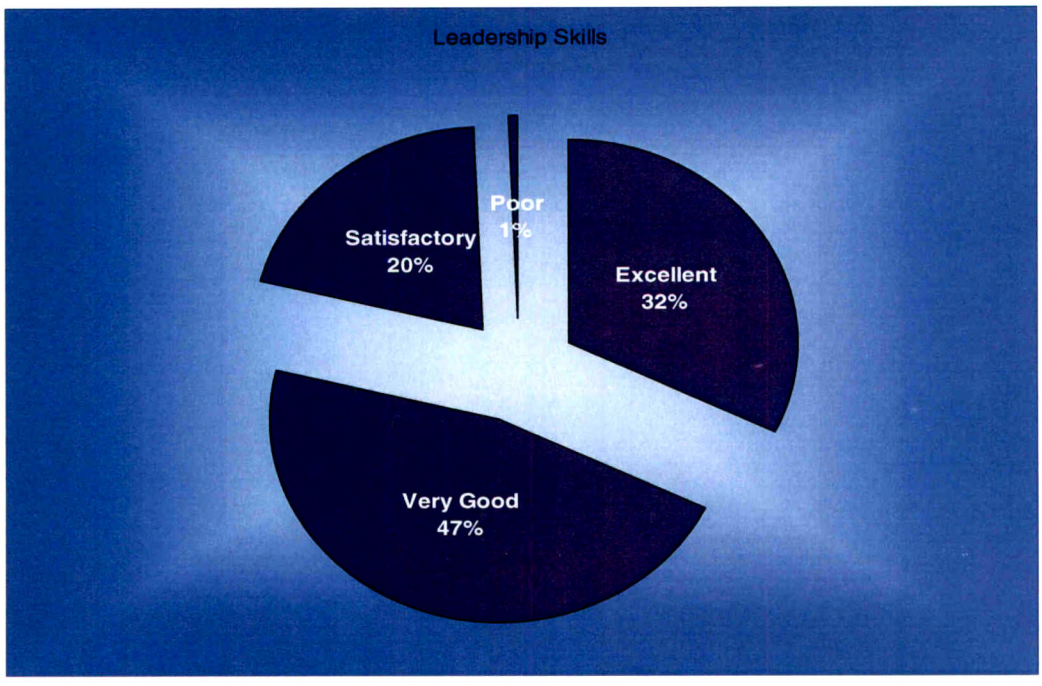
Among the library professionals, 49 (28.65%) have Excellent knowledge in Planning & Forecasting Skills followed by, 75 (43.86%) professionals have Very Good knowledge, 45 (26.32%) have Satisfactory knowledge and 2 (0.17%) are Poor.

5.9.2 Independent Decision Making Skills



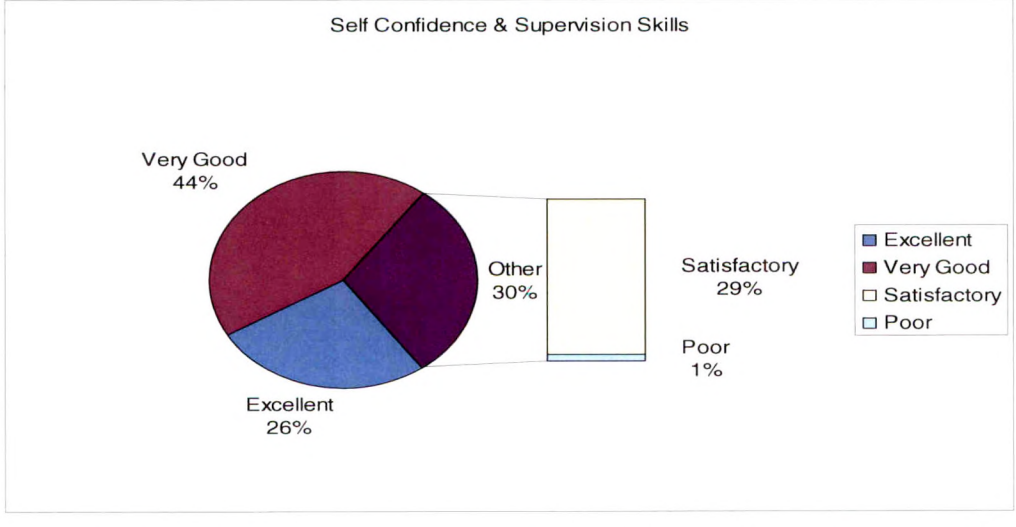
On Independent Decision Making Skills, 41 (23.98%) are Excellent followed by, 74 (43.27%) professionals as Very Good, 54 (31.58%) as Satisfactory and the remaining 2 (1.17%) professionals are Poor.

5.9.3 Leadership Skills



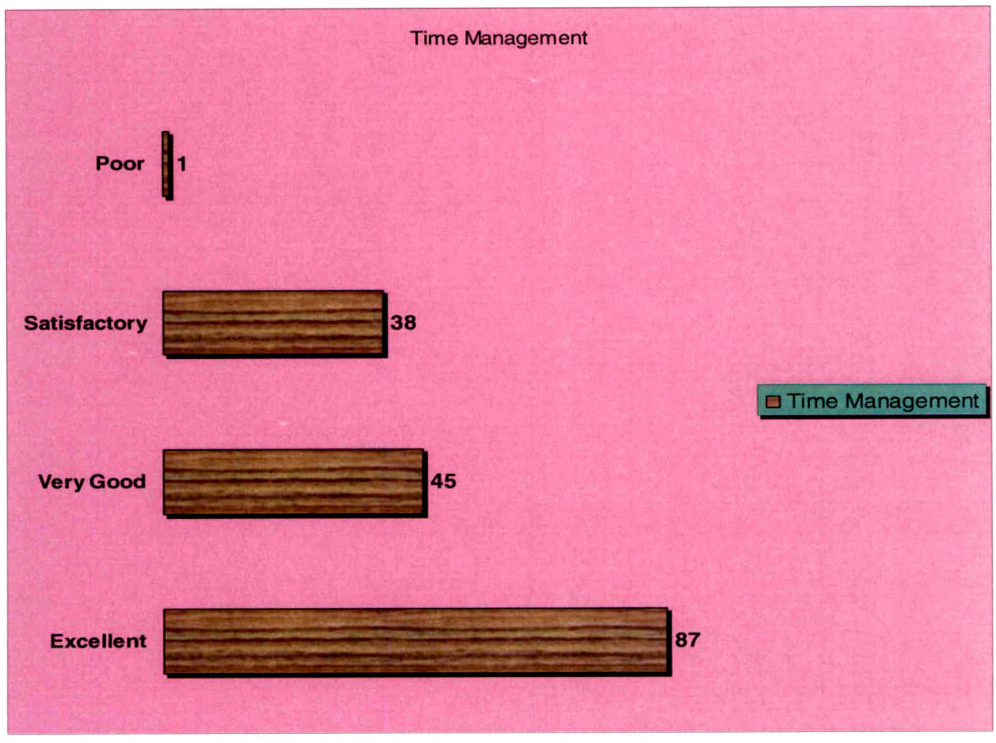
Regarding Leadership Skills, 55 (32.16%) professionals are Excellent Leaders, followed by 80 (46.78%) professionals are Very Good Leaders, 35 (20.47%) professionals having Satisfactory Leadership knowledge and remaining 1 (0.59%) are Poor in Leadership Skills.

5.9.4 Self Confidence & Supervision Skills



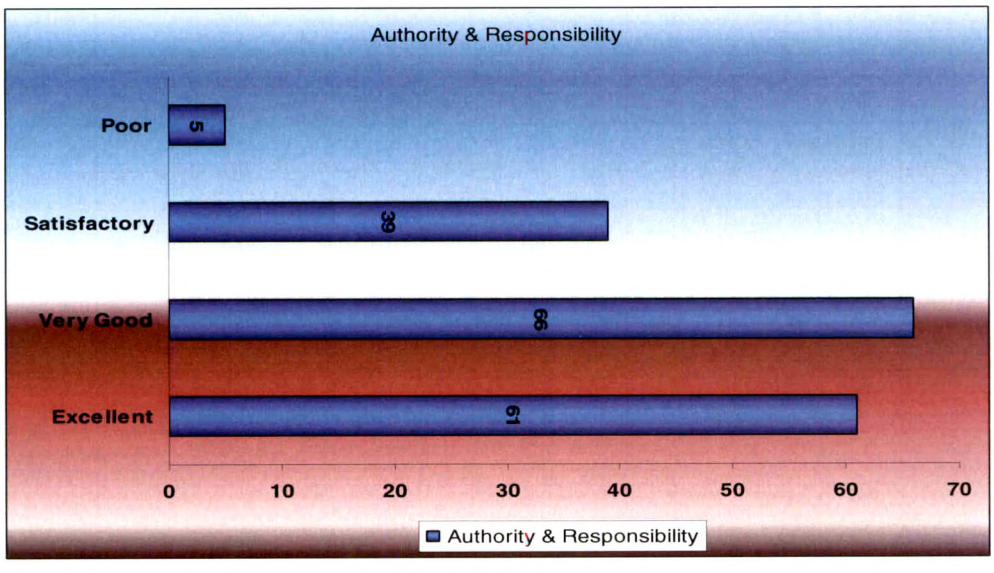
Self Confidence and Supervisory Skills are Excellent in 45 (26.32%) professionals followed by, 75 (43.86%) having Very Good, 49 (28.65%) professionals are Satisfactory and the remaining 2 (1.17%) are Poor.

5.9.5 Time Management



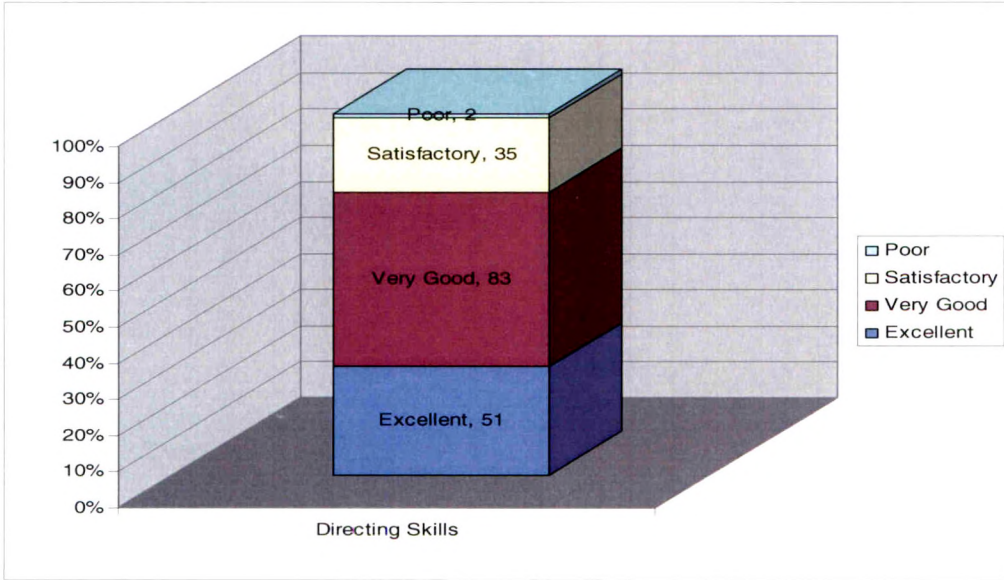
Among the library professionals responded, Time Management Skills are Excellent in 87 (50.87%) professionals. Very Good is 45 (26.32%) professionals, Satisfactory is 38 (22.22%) and Poor in 1 (0.59%) professionals respectively.

5.9.6 Authority & Responsibility



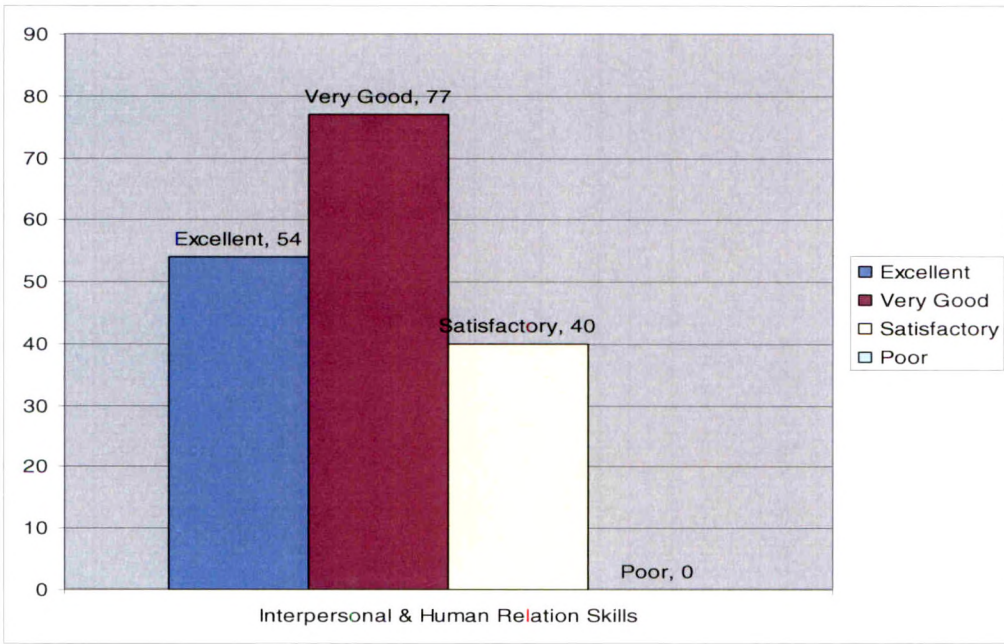
Authority and Responsibility are Excellent for 61 (35.67%) professionals followed by Very Good for 66 (38.60%) professionals, Satisfactory for 39 (22.81%) professionals and for remaining 5 (2.92%) is Poor.

5.9.7 Directing Skills



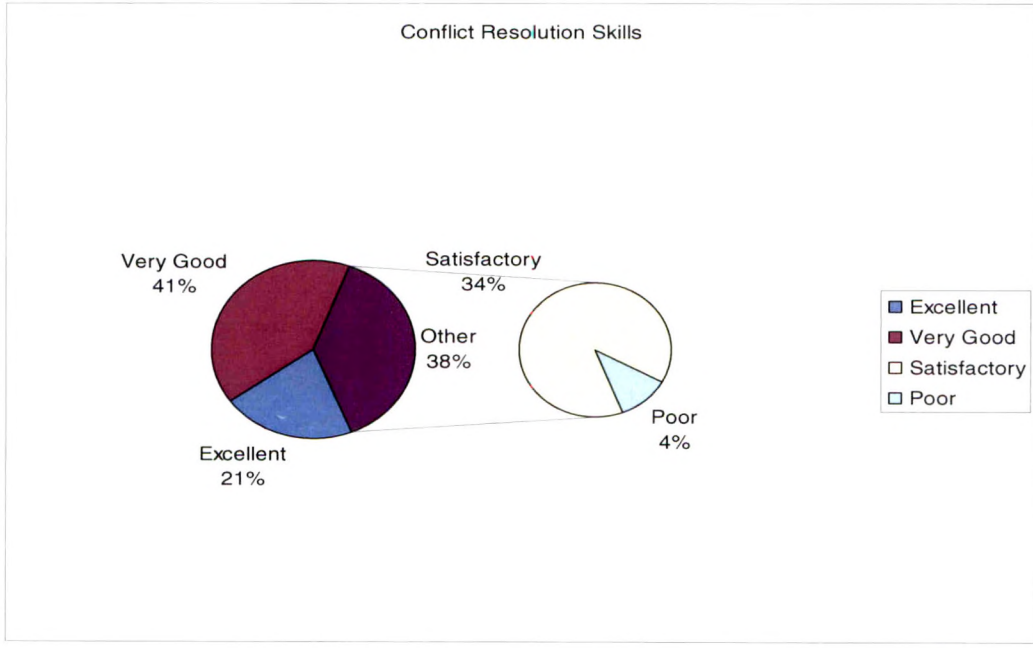
Among the library professionals responded regarding Directing Skills, 51 (29.82%) are Excellent, 83 (48.54%) are Very Good, 35 (20.47%) are Satisfactory and remaining 2 (1.17%) are Poor.

5.9.8 Interpersonal & Human Relation Skills



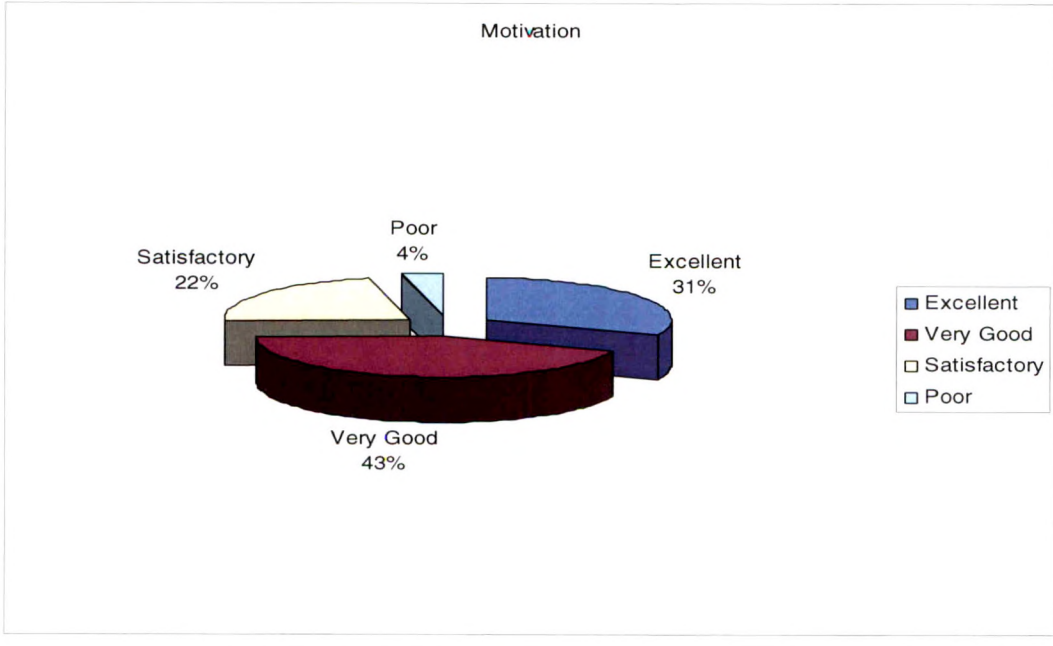
Regarding the Interpersonal and Human Relation Skills, 54 (31.58%) professionals are Excellent, 77 (45.03%) are Very Good, 40 (23.39%) are Satisfactory.

5.9.9 Conflict Resolution Skills



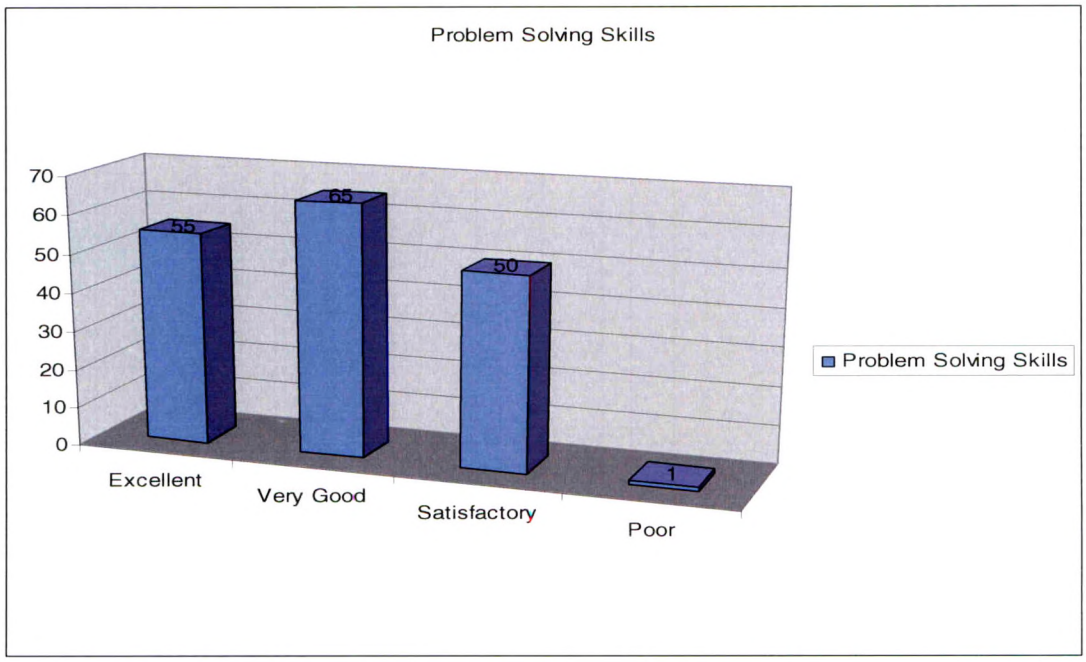
Conflict Resolution Skills are Excellent in 36 (21.05%) professionals, Very Good in 70 (40.94%) professionals, Satisfactory in 58 (33.92%) professionals and Poor in remaining 7 (4.09%) library professional.

5.9.10 Motivation



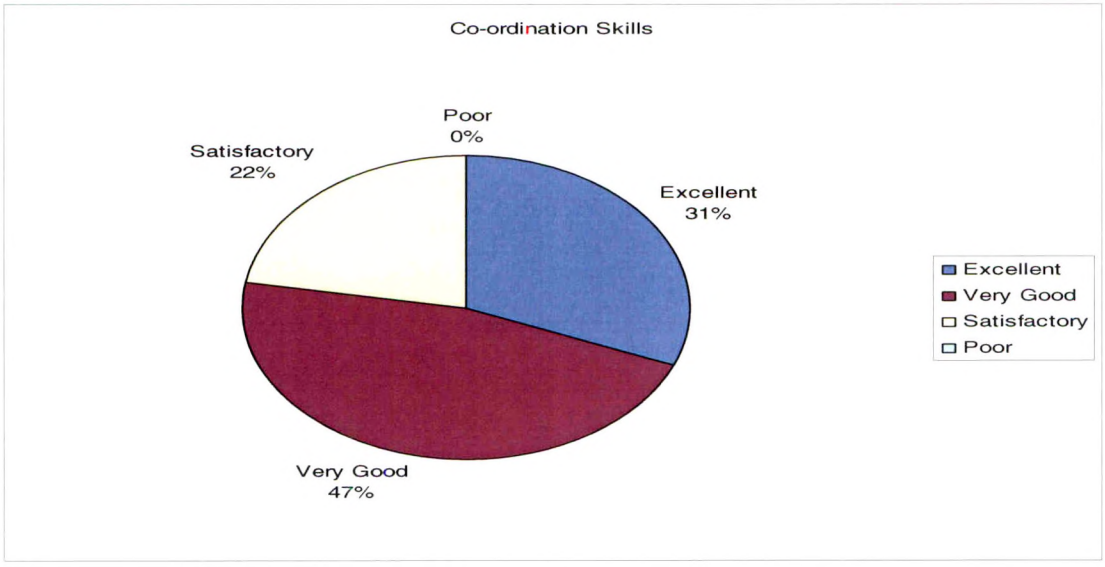
Regarding the Motivation, 53 (31%) professionals are Excellent, 74 (43.27%) are Very Good, 38 (22.22%) are Satisfactory and the remaining 6 (3.51%) are Poor.

5.9.11 Problem Solving Skills



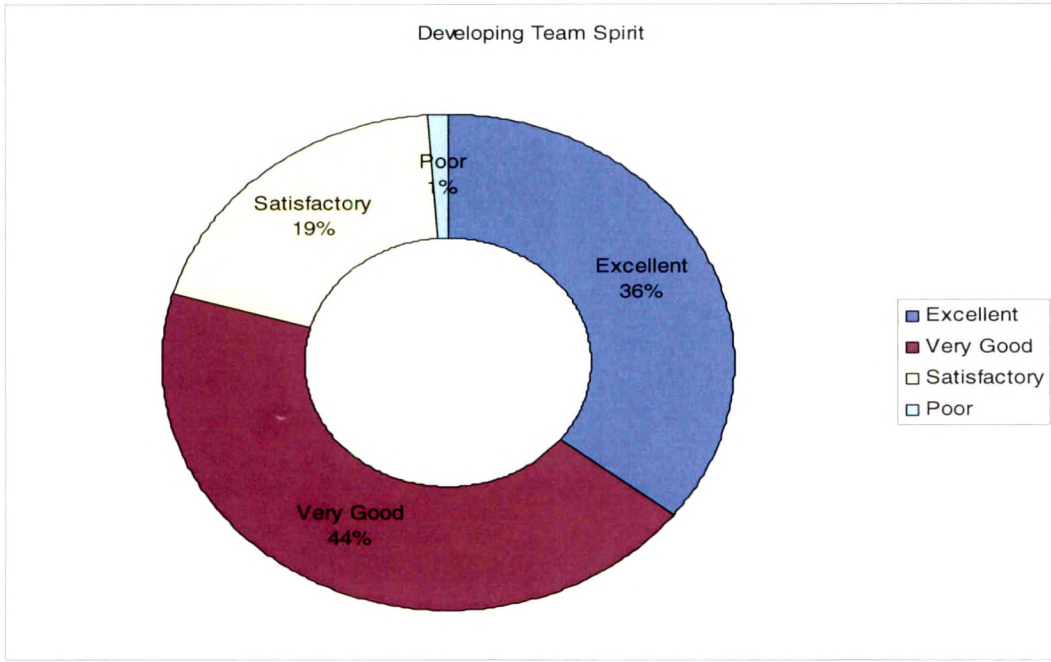
Problems Solving Skills are Excellent in 55 (32.16%) professionals, Very Good in 65 (38.16%) professionals, Satisfactory in 50 (29.24%) professionals and remaining 1 (0.59%) professional is Poor.

5.9.12 Co-ordination Skills



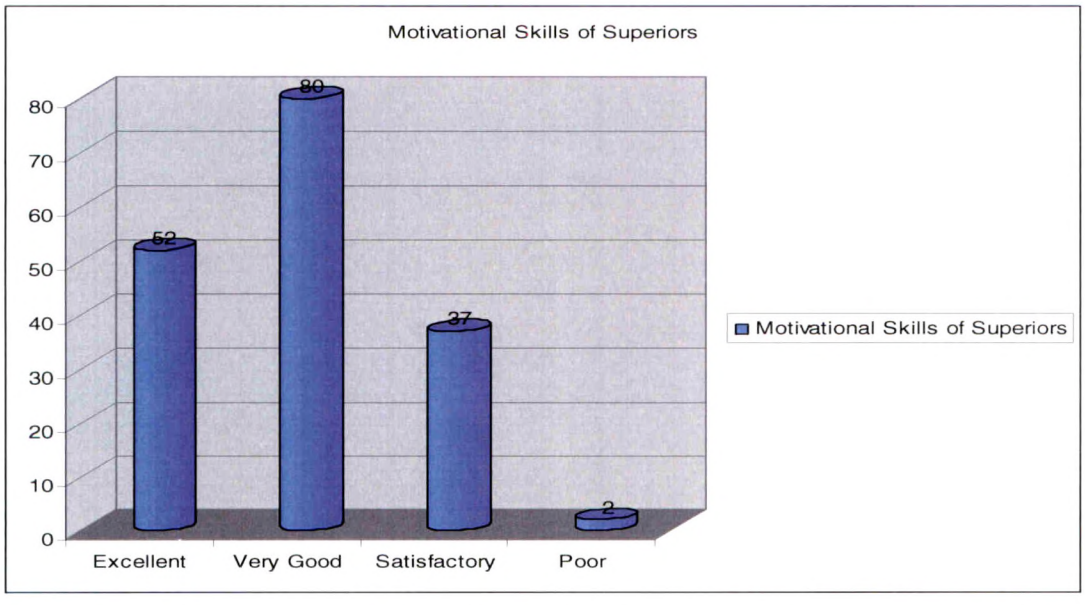
Co-ordination is Excellent in 53 (31%) library professionals followed by Very Good in 80 (46.78%) professionals, Satisfactory in 38 (22.22%) professionals.

5.9.13 Developing Team Spirit



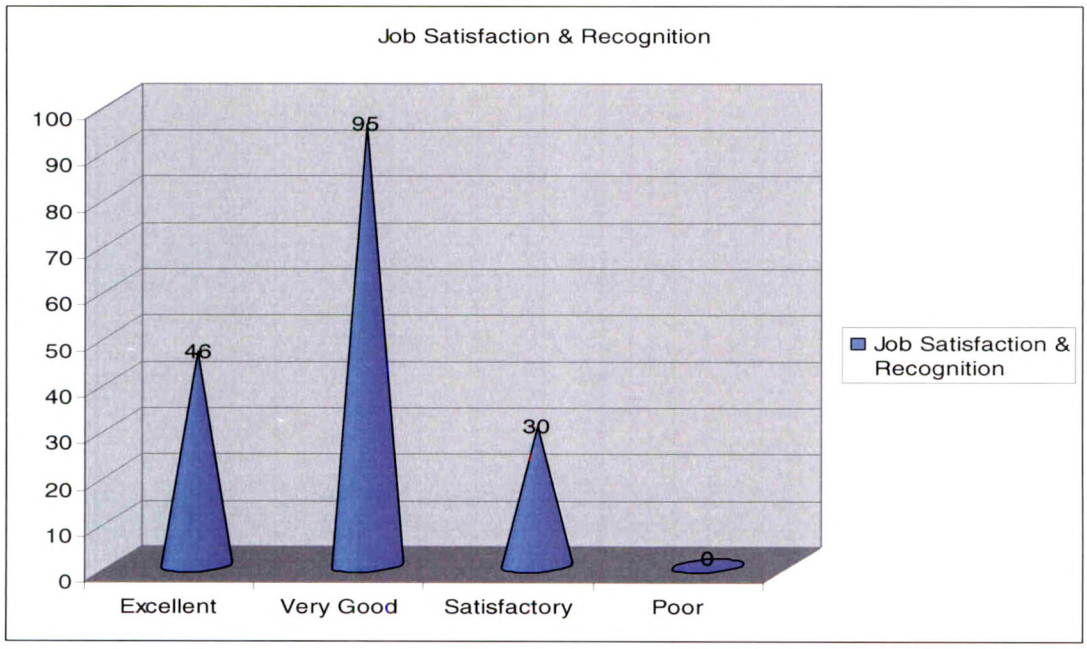
Developing Team Spirit is Excellent with 61 (35.67%) professionals followed by, Very Good with 75 (43.86%) professionals, Satisfactory with 33 (19.30%) professionals and Poor with 2(1.17%) professionals.

5.9.14 Motivational Skills of Superiors



As per the responses of the library professionals as Subordinates, 52 (30.41%) professionals are rated the Motivational Skills of their Leaders as Excellent, 80 (46.78%) professionals rated the same as Very Good, 37 (21.64%) are rated as Satisfactory and 2 (1.17%) professionals rated the Motivational Skills as Poor.

5.9.15 Job Satisfaction & Recognition



Library professionals, 46 (26.90%) expressed their view that their Job is Excellent and Satisfied, 95 (55.56%) professionals stated that their Job is Very Good, 30 (17.54%) is Satisfactory.

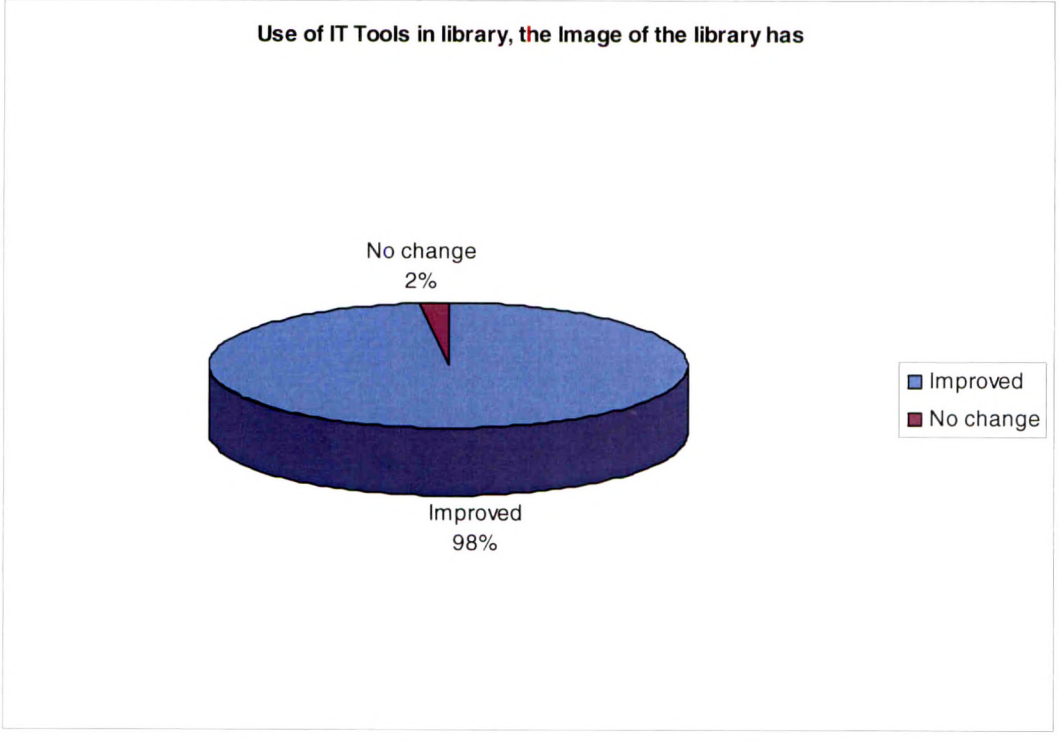
It is noted from the above table that, the majority of the library professional are having Very Good knowledge about all the Managerial Skills. But a few of the library professional staff member are shown Poor, as they are not having these Skills. Many of the Training Programmes such as Refresher courses, Orientation Programmes, Workshops and Seminars etc. have been conducted by the various institutes to improve the Skills of the professionals.

While conducting the research, a question is also been asked, as to whether the library professionals need a specialized Training to meet the specific professional requirements of the library professionals. All the professionals have emphasized for the specialized Training Programme for library professionals. The programme must include various Management Games, Exercises and with practical Demonstrations etc., which will improve Managerial Skills of library professionals.

5.10 Implementation of Computerization

5.10.1 Use of IT Tools in library, the Image of the library has

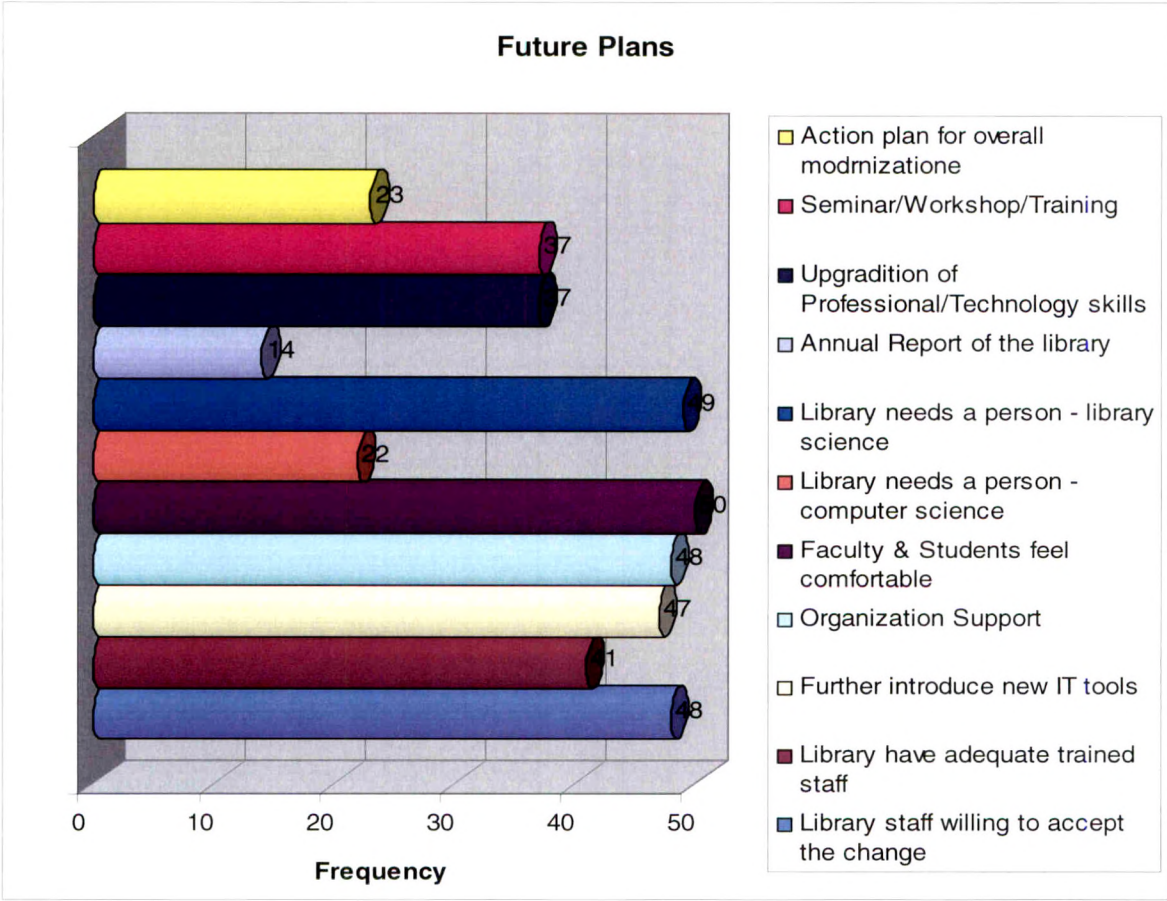
	Frequency	percentage
Improved	49	98
No change	1	2
Total	50	100



Most of all libraries understand that the introduction of IT in the library, the image of the library has improved & institute/organizational very good support toward IT library,

5.11 Future Plans

	Frequency	percentage
Library staff willing to accept the change	48	96
Library have adequate trained staff	41	82
Further introduce new IT tools	47	94
Organization Support	48	96
Faculty & Students feel comfortable	50	100
Library needs a person - computer science	22	44
Library needs a person - library science	49	98
Annual Report of the library	14	28
Up gradation of Professional/Technology skills	37	74
Seminar/Workshop/Training	37	74
Action plan for overall modernization	23	46



Most of all library staff are willing to accept the changes being brought by IT in the library & libraries have adequate trained staff to handle IT based services, Maximum libraries introduce new IT tools in library & organization support with required resources to modernize the library, all Faculty and Students feel comfortable and needs more computer based services, 49(98%) librarian feel that a librarian with professional degree in library science can handle IT based services in the library better.

Maximum libraries have the provision for up gradation of professional/technology skill by seminar / workshop / training. 23(46%) organization have action plan for overall modernization of library services.

CHAPTER 6

Findings & Suggestions

Chapter – 6 : Finding and Suggestions

Findings of the study:

1. The tremendous growth in Engineering education has been found during 2004 – 2009 and its still increasing and as projected estimated institutions about 75 at the end 2011.

2. The self finance trusts are taking more interest in engineering education where as Government & Universities are playing passive role.

3. All the Engineering colleges start their library beginning of the college. It also reflects that institutions follow the rules and regulation framed by All India Council for Technical Education (AICTE) regarding the need of library.

4. Qualified Librarian is must for quality base library & information services. 43(86%) institutes have well qualified librarians with prescribed qualifications (MLISC) by AICTE , but 2 (4%) institutes does not qualified librarians & 5 (10%) institutes does not librarian, it means the post is vacant.

5. About 9 (18%) libraries run by only one library professional. i.e. no supporting staff is available to assist the librarian.

6. All the institutes have sufficient members of actual users.

7. All most all libraries have not given the figures as per the adequate budget allocated to the library in their Budget.

8. Sufficient amount spent to purchase the books and journals are found correct in all most institutes.

9. Most of all libraries are closed on Sunday & on Public holidays. Libraries timings are of eight hours in 19(38%) and 11 (22%) libraries timing are for twelve hours.

10. The issue - return system of 25(50%) libraries are Brown system & 21 (42%) libraries use Bar code technology.

11. 38 (76%) libraries are using Open access system.

12. 38 (76%) libraries Classification system is DDC & cataloguing systems is AACR or Computerized.

13. Only 15 (30%) libraries having subscribe E – Resources.

14. 47 (94%) institutes have Campus LAN.

15. 27 libraries are DELNET member.

16. 22 libraries are using SOUL Software.

17. Only 10 (20%) libraries are fully computerized & 20 (40%) libraries are partially computerized.

18. Only 15 (30%) libraries have given partial answer about the library budget.

19. 11 (22%) libraries used Smart cards & 2 (4%) libraries used RFID technology.

20. 23 (46%) librarian feel that the amount given to him for IT applications in the library is sufficient for them.

21. 26 institutes have trained library manpower

22. 48 (96%) library professionals understand that the new services are of IT based in the nest one year. The overall library services will be improved because of IT services.

23. 97 library professionals having a knowledge about how to handling library software.

24. The majority of the library professionals are having very good professional knowledge and all the managerial skills.

25. 49 institutes understand that the introduction of IT in the library, the image of the library will be improved.

26. No. of books issued by the library per day, are comparatively sufficient..

27. 47 (94%) institutes have Web site.

28. 43 (86%) libraries not subscribe any abstracting services.

29. 10 (20%) libraries are not using any library software.

30. 40 (80%) libraries have computerized sections – Acquisition, Cataloging & OPAC.

These findings are on the basis of questionnaires. Which were circulated to the engineering college libraries, But by personal interviews & seeing the structure of library by the researcher is found that numbers of college librarian have not fully satisfied the infrastructure as per standards of AICTE. Second most important things is that most of the librarians are trained but not that much adequate with latest developments in the field of IT. Its to be needed of the in house training at a regular bases to the staff.

SUGGESTIONS:

Creating good human resource for digital environment in libraries is not one time act, but a dynamic and continuous activity which requires sharpening as per the technological changes and developments. It is suggested that:

1. Library professionals should be deputed for continuous education programmes and trainings from time to time to upgrade their skills. Some provision should be made in the library budget for human resource development. Besides Professional Up gradation should be made mandatory for promotions to senior grades/scales.
2. Library Associations can play an important role in providing continuous education programme by holding conferences, seminars, training programmes etc. At least one conference at national level followed by state level seminar conducted by Library Association would encourage discussing professional matters.
3. The budgetary provision should be as per the standard given by Dr. S.R. Rangnathan.
4. The furniture & all other infrastructure facilities are to be provided to the library professionals for the benefit of the library users.
5. There is need to develop specialized software for libraries.
6. More facilities for IT & Internet should be provided for users.
7. In house training centre should be started on regular basis, so that when ever any new development occurs in the field, it should immediately adopted.
8. Persons must have skills of Repackaging of information.
9. More and more services should be provided to the users for the new services with latest information should be developed.
10. A state/national level Engineering Documentation Center on the pattern of DESIDOC & INSDOC, need to be established for promoting engineering documentation, taking up project to help engineering libraries in database development & retrospective conversion, bring out scholarly publication like

Indian Engineering Abstract, Directory of Engineering periodicals etc. Develop software package exclusively to meet the automation requirements of engineering libraries, besides train the Engineering 'Human Resource' for digital environment to meet the latest trends in Information Management.

11. Several high level committees have been appointed by AICTE in the past to meet the challenges of IT and bring improvement in the functioning of Engineering libraries and Information centers. Generally the studies made by these committees create deep awareness among the authorities and led to the acceptance of recommendations made; however, the implementation part always remains inadequate and lacking.

12. There is a need for strong professional commitment by engineering librarians to revive the standing advisory committee and meet at least once a year to review and discuss the problems, needs of upgrading HRD and reengineering to engineering library services.

13. The library and information centers are facing challenges in providing information to satisfy the users. A wide variety of technology options that exists now are regularly updated. User Education is day by day becoming an important aspect of information because of complex. With the availability of sophisticated tools like, microprocessor and microcomputers. With the dramatic increase in electronic services in the last few years, we have to pack more information into these formats. User Education is essential for effective learning. The reference librarians, who teach the Orientation Classes, were looking for a new way of teaching, one that would be effective without overwhelming participants with information. The success in methods of orientation programme would depend upon the proper planning, psychology of the users and involvement of the library staff to develop positive attitude of the users by conducting workshop/seminars/training programme on UEP to maximum utilization of library resources.

14. Library Professionals need a specialized Training to meet the specific requirements of Library users. All the library professionals have emphasized for

the Specialized Training Programme. The Programme must include various management Games, Exercises, demonstration etc. which will improve managerial skills of the Library Professionals.

15. It is fact that skills play a crucial role in fulfilling manpower needs of libraries. It is also true that manpower needs of the libraries may not be fulfilled unless professionals have adequate knowledge. If person has adequate knowledge, learned skills, but not positive attitude, still then one can not successful in his/her goal in achieving objectives of the organization in a better way. Therefore, professionals should acquire adequate knowledge learn skills and have positive attitude to fulfill objectives of the users..

16. Digital library initiative is going on in most of the libraries. So many open sources software's and commercial software's are available. It instantly reaches the user, consumes less space & is not destructive. With the digital signature and cryptographic techniques, it can be made tamper proof and duplication can be prevented. Maintaining a digital library requires skilled personnel's. In library's professionals job to ensure password verification, watermark the print – protected information. Formal digitization policy will make a difference especially with regard to internally generated technical reports by clearing hurdles with regard to resource sharing of digitized internal reports. Also one should not the problem of fragility of digital bits and short lives of hardware and software. Proper preservation and backup support is equally important to manage a digital library.

17. Engineering College librarians have to be serious in developing their own proficiency as well as must find out that how to develop the professional competency in general. Since the users are more prone to on-line and electronically delivered services, the growing role of the librarian in engineering college would lie in information counseling, training advising user on services and information products appropriate to their needs and how to use best them. This is a time that necessitates innovative ways of thinking about services, collections, information access and also our roles as academic librarians. Being prepared to manage changes can furnish us with the ability to flourish.

18. The paradigm is shifting; our world is increasingly built on information. So there is a pressure to adopt new technologies. The warnings are clear and loved 'adopt or die'. Evolutionary is however a slow process especially for long established reactionary hierarchical organization and professionals. Resistance to change can not be under estimated and in the electronic arena there are always waiting in the wings, keep to replace those who fall by the way side.

19. Digitizing and networking of information resources and services means creating a global community with a vast storehouse to knowledge and a continuous dialogue among its members to solve various problems related to the lives and work of people across the globe. The librarian needs to have parallel touch with cutting edge developments. He has to overcome the most laudable security shock which are the most of database, copyright infringements, viral invasions, parallel satellite networking, stress are some of the issue Digital library to be conformed as way of routine.

20. Framework can be taken up as a standard on which to base professional competencies expected of an LIP in specific work setting, function, role, position or job. Competencies are contextual varying with the environmental conditions. Hence they have to be formulated at different levels and continuously modified. Close coordination is required between LIPs, educationalists, and employers to formulate competencies. In this regard Library associations at national and state levels could play an active role so as to bring an overall improvement in the state of the profession.

21. Digitized information in Use through the Internet across our own country and abroad, there must be transformation of the traditional libraries into modern, well equipped interconnected digital libraries, which should be accessible to all. The information scientist and libraries seat together and work for the prime goal of the boundary less digital libraries. The Government has recently taken initiative in this regards and large numbers of educational network like ERNET, INFLIBNET, INFONET, DELNET, INDEST and many others have come into existence. However by that time, our professional colleagues should gear themselves to take

up the challenge of technological change so that lack of Expertise may not come in the way of building digital libraries.

22. Acquisition of information: Acquiring information in the modern digital environment has taken on a completely new dimension in addition to the systems that have been used to acquire materials in the past and are still being used by many institutions even now. For example, ordering of printed materials can be digitized. Added to this, issues concerning the handling of acquisition of electronic material. This may not fit in well with the acquisition processes of invoices and receipts that exist in the acquisition of physical from of information materials. For this, one has to have skills and competencies in the use of the Internet and other technologies. Selection, evaluation, and locating electronic information sources require completely new skills and competencies compared to those used in the physical information formats as these materials differ considerable from the formats that have existed all along. An Understanding of various information suppliers and how can they operate in the electronic environment also becomes crucial.

23. Technical processing & organization of materials: The standards used to process physical formats of information sources can not always be used to process electronic information sources. As such, standards that can be used for such information materials have to be developed. Among the modern skills and competencies, therefore, one has to acquire skills and competencies in the use of Metadata, standards such as Uniform Resource Identifiers (URI) and Dublin Core and Various Other abstracting and indexing techniques that are used in the processing of Internet resources.

24. Storage of information materials: Storing electronic information sources there are other challenge. Sometimes electronic documents are removed from the Internet after some time and they become Unavailable when one needs them. This raises storage issues of specific information that one thinks the users would need in the future even after the original document has long been removed from the Internet. This needs skills and competencies on how to store electronic files in a manner

that they can easily be retrieved when it will be needed. Among such skills and competencies are those on how to develop subject Bases Information Gateways (SBIG) and Subject Based Web Portals.

25. Dissemination of Information: For a Library Professional skills and competencies of surfing the Web looking for information are not a luxury at all. Knowing that Internet contains so much information and that most of it may not be relevant to a user every time they carry out a search, such skills and competencies become extremely useful. Skills and competencies needed in such a function include knowledge of which search engines to use for specific searches; what electronic databases to search; search strategies for different search engines and databases; and best formats in which outputs should be repackaged.

26. Resource management: Added skills and competencies required for resource management in the modern digital environment are also mostly to do with the management of information sources that are available or ought to be preserved in electronic and digital formats. It is increasingly becoming obvious that issues of access and preservation of information in modern ways such as digital formats are becoming crucial management issues. It is imperative for a modern Information Manager, which acquire or identify skills and competencies that will facilitate this, Library professional should understand what is involved in managing electronic information sources, digitizing an information collection, deploying and training staff with skills in electronic information environment, and generally be well conversant with the changes taking place in the modern digital environment on a regular basis.

27. Managerial skills are only a beginning from which to start in evaluating the means of improving skills and competencies, but they do provide a framework to look at some of the past failings and some future methods of improvement. Using list of skills and an understanding of how manager's think, libraries can being to develop programs that teach librarians managerial skills. Such programs can be as inexpensive as rotating committee assignments and encouraging particular

thought patterns to as expensive as sending people to conferences or to paying for additional coursework.

28. The basic goal of library and information profession has always been to provide access to information to those who need it. The activities realizing this goal have evolved and transformed over the year. This includes – Available technology, and need of an evolving information society. Information activities have been guided by the developments in the field of storages, presentation and archiving of knowledge, collection development and organization of knowledge, information explosion and computers in information retrieval. Librarian and information professional involved in information gathering, storage, retrieval and dissemination on one hand and on the other hand the computer specialists who supports the library professionals in this endeavor. For successful implementation of new services, it is essential that LIS professionals are well trained and possess requisite knowledge and skills in this respect.

29. The world of information is undergoing rapid change. An information age at a great turning point in the history of civilization. The day has arrived when it is most important to learn to access, analyze apply and evaluate such information. As traditional custodians of information, librarians need to be aware of the implications of these changes and develop technological and managerial skills, which will enable them to make effective use of information and to meet their changing information needs of users in modern society.

Development of information technology is playing a crucial role in restructuring of the libraries. Shift from human dependent operations to machine dependency, mechanization (data processing) to knowledge processing, stand alone system to network computing, local LAN to wireless access protocol systems. Document centered information to user (Access) centered information; print media to electronic (Access) media, data capture methods, human to machine oriented. Library automating (in-house) to web – enabled services, (WAN ACCESS), online information retrieval to CD ROM Databases to Internet.

These prolonged shift in application of innovative IT to library and information profession can be attributed to the changes in the last 2 decades.

30. The role of librarian has changed in the information era. It is, therefore pertinent on the part of the librarian to acquire new skills required for developing and managing the digital libraries. The library and Information Professionals are required to acquire such knowledge and skills as the library is one of the highly IT influenced service profession. The empowerment of library and information professionals with IT skills is aimed at providing services that are expected from the clientele in the new environment & complex format of information.

    The society has brought a tremendous change in the way information is stored and accessed. This has brought about a change in the concept of librarian, their collection and services. Many new terms viz, Digital Librarian, Libraries without walls, virtual libraries, is emerging to describe the libraries of new Age.

31. Core competencies anchor the professional and personal competencies. These two core competencies are absolutely essential, for all information professionals. Information Professional include, but are not limited to librarians, knowledge managers, chief information officers, web developers, information brokers and consultants. As educated professional, Information Professionals Understand the value of developing and sharing their knowledge; this is accomplished through association networks and by conducting and sharing research at conference of publications and in collaborative arrangements of all kinds. Information Professionals also acknowledge and adhere to the ethics of the profession. The importance of these two cardinal core competencies cannot be emphasized enough; these are paramount to the value and viability of the profession.

The following sections highlight the major professional and personal competencies of librarians & library staff.

- **Professional Competencies:**

1. Has expert knowledge of the content of information resources, including the ability of critically evaluate and filter them.
2. Has specialized subject knowledge appropriate to the business of the organization or client.
3. Develops and manages convenient accessible and cost effective information services that are aligned with the strategic directions of the organization.
4. Provides excellent instruction and support for library and information service uses.
5. Assesses information needs and designs and markets value added information services and products to meet identified needs.
6. Uses appropriate information technology to acquire, organize and disseminate information.
7. Uses appropriate business and management approaches in to communicate the importance of information services to senior management.
8. Develops specialized information products for use inside or outside the organization or by individual clients.
9. Evaluates the outcomes of information use and conducts research related to the solution of information management problems.
10. Continually improves information services in response to the changing needs.
11. An effective member of the senior management team and consultant to the organization is on information issues.

Personal Competencies

1. Committed to service excellence.
2. Able to face challenges and develop new opportunities both inside and outside the library.
3. Looks for partnerships and alliances.
4. Creates an environment of mutual respect and trust.
5. Have effective communications skills.
6. Work well with other in a team.
7. Provides leadership
8. Plans, prioritizes and focuses on what is critical.
9. Is committed to lifelong learning and personal career planning.
10. Has personal business skills and creates new opportunities.
11. Recognizes the value of professional networking and solidarity.
12. Is flexible and positive in a time of continuing change.

These are the competencies of librarians for the 21st century. They have their roots in the past, but they reach for into the future, Librarians & Library staffs recognize the expanding nature of the challenges that face them in the information age and the range of competencies that are required to meet them. The challenges represented by these competencies must be seized and acted upon today in order to ensure that librarians & library staff have a viable tomorrow.

Finally there is a need to develop such type of network by which Resource Sharing can be done very well by looking all the engineering colleges. Researcher has suggested the structure of Network which includes computer competency, system & software.

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Network Module of Engineering College Libraries in Gujarat

❖ Network Module of Engineering College Libraries in Gujarat

7.1 Objectives of proposed Network

The reasons for participating in the network are minimization of duplication, providing all types of services to their users; saving of costs especially foreign exchange and overcoming financial constraints, etc.

The following objectives are therefore proposed for the Gujarat Engineering College Library Network (GUJELIBNET) at Nadiad.

A. To evolve a network of Gujarat Engineering College for optimum utilization of information resources.

B. To optimize the utilization of funds by minimizing duplication in all spheres.

C. To provide access to document collection of all the libraries in the GUJELIBNET.

D. To improve the inter-library loan services among the libraries with smooth and speedy exchange of information through cheaper telecommunication links.

E. Standardization of library services and activities in all the GUJELIBNET.

F. To facilitate inter communication and cooperation among the libraries and information centers in the Gujarat state.

G. Encourage co-operation among libraries, special libraries and information centers in the area of Gujarat state.

H. To provide access to other Regional / national / international networks.

I. To actively participate with all Regional / National / International Networks.

7.1.1 Salient features of GUJELIBNET:

The following would be the salient features of GUJELIBNET.

- User will be able to get any information or documents this network would be able to request the documents etc. needed by its users on inter-library loan from other participating libraries.
- It would be possible to identify books and other documents available on a subject in order to facilitate development of proper collection.
- It would be possible to share cataloguing of reading materials, by using the descriptive information (OPAC) and thus maintaining standards and reduce costs.
- This network would be able to know information in the field of engineering in the world, disseminated speedily at the grass root level.
- Participating institutes and R & D centers arrange their money from different sources related to engineering information product & services.
- To make this networking efficient, skilled and experienced human resource is being deployed.
- This Network enables duplication of costly of highly used journals may be avoided by some mutual agreements and the same can be shared through the network.

7.2 Suggestions and Recommendations

Considering the various problems recorded above the following suggestions and recommendations are made:

1. For early data conversion, data entry personnel are appointed on contract basis.

2. Library staff should be trained in computer use. College may sponsor library staff for training in computer institutions at local level. Also the existing staff, be given training at regular intervals. Hence need for staff training programmes. Manpower

requirements and existing qualifications for various posts have to be reexamined keeping in view new and emerging job requirements.

3. There is urgent need to introduce proper practical and hands on courses for the use of IT. There is a need to organize managerial courses for senior librarians.

4. Looking to the requirements of manpower, the post sanctioned under library management programme should be filled up immediately.

5. Library catalogue should be made available on computers and action to enhance its use through users' orientation programmes.

6. The college library media resources should convert its bibliographic holding into machine readable form and provide access to this information through on-line catalogue, to the remote users also.

7. Action should be taken by the college library to provide automated information services and processes.

8. Computerized readers services should be started as early as possible.

9. There is also need to popularize the use of multimedia services and make them easily accessible to all academicians.

10. Internet should be used as a tool for promoting services / products to both in house as well as external users.

11. To cover all the engineering college libraries, WAN facility should be provided immediately.

12. The users' education programme in new information technology must be under-taken by the library in a systematic way every year.

13. A variety of products of high quality on IT above series are needed to be pressed into the Engineering college library and R & D centers scenario in Gujarat.

14. New products and services should be launched tailored to users' need.

15. For the convenience of users, distribution channels such as mail, Message, telephone, online, e-mail etc. should be used for delivery of information.

16. The libraries should initiate action to establish a separate marketing division for popularizing their information products and they create avenues for earning additional revenues.

17. There is an urgent need to develop next-generation, web enterprise management solution.

18. For uniformity and consistency there is need to develop new standards due to changing environment, emergence of newer media, new services, communication, networking, computer and IT changes, importance should be given on team management and total quality management.

19. Library management programme required to be followed vigorously. There is a need to draw up programme for data conversion and networking with in a period of one year. Also a programme / plan for converting the present libraries to digital libraries and thus to be a part of global environment.

20. Keeping in view the emerging demands in the 21st century there is need to convert and develop college libraries into "Information Centers" besides offering the traditional library services to the computer added information services.

21. It is suggested that definite proportion or percentage of total college budget showed be increase because it constant increase in users' community, explosion of publications increase of price and emerging new subjects and information sources and also importance of current concept. Now the age is called information age where the information becomes power.

22. The library should send the machine readable data to state center regularly for check and for creation of national level data bases.

23. There is an urgent need to go for local area networking (LAN) also.

7.2.1 Plans for Action

As regards objectives of the study undertaken, the researcher suggests an action plan for:

A) To computerize the resources of all the Engineering college libraries of Gujarat state and to offer on line facility for the benefit of the users of the libraries. The work to be completed on a project mode basis and in a time bound period i.e. one year.

B) To develop a module to offer networking facilities of the Gujarat state engineering college libraries to cover GUJELIBNET. Under this programme the resources of the all Engineering college libraries of Gujarat state could be made available and accessible not only to academic user of the state but also Engineering scientist, academic community and R&D centers requirements for teachers, students and research engineers in engineering field in the city including rural and urban are a as at the state and extended to other information seekers. It

will help in ultimately creating national level academic information network. This has become an immediate necessity to help our country to maximize the social and economic benefits.

C) It is also planned to include R&D centers of Engineering industry in the proposed network to get the benefit of industries about current – scenario. This will helpful for the users of academic and social communities to aware with the present research and development plan. Researcher suggests connecting R & D centers resources to the nearest Engineering college library network.

Dr. R.A. Malshelkar, the eminent scientist has drawn our attention in his article, published in the journal of chartered secretary in its issue of January 2002. He aptly referred that the 21st century will be the century of knowledge, indeed the century of the mind. Innovation is the key for the production as well as processing of knowledge. A nation's ability to convert knowledge into wealth and social goods through the process of innovation will determine its future. In this context issues like, generation, valuation, protection and exploitation (of knowledge) are going to become critically important all around the world. Increasing growth of scientific knowledge demands easy and quick access to knowledge and transmission of related information, increasing domination of the new knowledge economy over the old brick and mortar economy. Complexities linked to traditional knowledge, community knowledge and animate objects will poise a challenge in setting the new 21st century agenda.

As been recognized in 1948 Universal Declaration of Human Rights every one has the right to share in scientific advancement and its benefits. Even our constitution provides for free information. It is essential that in the interest of the individual, country and society, we provide for facilities for access to information and for its transfer, exploitation and use for the benefit of the society ready the college libraries in the state to provide facilities to easy access to information, it possess easy transfer and its exploitation by the users because of various factors. In this context the researcher feels that the modernization of engineering college libraries in the Gujarat should be taken up

on a war footing, a time bound project of not more than one year. So that, the libraries present holdings are converted into machine readable form and available on-line to the academic community of the college libraries, university and other universities of the state. This will entail each college library to computerize its holding and to develop networking facilities on its campus. It also propose to provide for to linkage to all the Engineering college libraries, university libraries and Engineering R & D centers of Gujarat state for resource sharing and to maximize the use of information available in other libraries.

As the community also needs information that is available in the Engineering College, university and Engineering R & D center's libraries it is proposed to develop information network namely GUJELIBNET in the case of engineering college libraries of Gujarat state. This is a consonance with the objectives initially framed under library management programme.

7.2.2 Infrastructural facilities & (development of Network module) Network with estimated cost

Computerization of all the activities of all engineering college libraries within Gujarat on priority basis on the specific time duration of one year. All library house keeping jobs, viz. acquisition of resources, classification of documents, circulation control, serial control, reference and information services, etc. to be computerized. From a definite date all new acquisitions would be done in machine-readable form. As for retrospective conversion, the work should also be started simultaneously. They should also responsible for actual conversion of records and creation of databases and for editing the databases created. All the created databases sent are to central library for editing and merging into national databases.

To complete the above mentioned work in creating college library's databases, it is proposed that one time provision to meet the expenses to convert the records in a time bound period be made as a special case.

In the above proposed network, researcher has to assume each zone will act as a hub center for their area college library. Then each hub center will connect with the Gujarat state A.P. center which is probably located at Nadiad. In Gujarat, there are five zones so probably five hub centers will be form.

All the created database from other various college libraries will sent their databases to related zone hub center then each zone hub center will send it to main state center. The state central will provide all the data's to individual colleges directly or through hub centre. All the hub centers will be also connected with each other.

So far as Engineering College, Nadiad library is concerned for retrospective conversion of library records as per suggested by the researcher and it will be main centre.

Initial budget:

If any library having about 40,000 books, they must need infrastructure facilities as per under:

(A)	**One time cost :**			
(1)	50 Computers x Rs. 25,000/-	=	Rs.	12,50,000/-
(2)	Networking cost with necessary equipments	=	Rs.	6,00,000/-
(3)	Database entry (Rs. 2/- per book)	=	Rs.	80,000/-
	Total Cost.....		Rs.	19,30,000/-

(B) Recurring cost:

(1) Annual Maintenance Contract (AMC) after three years approx. 5% of the computer cost.

(2) Network maintenance charge.

1. Once the retrospective conversion work of available databases is made, the library will be ready to offer computerized service and access their records at

college level, university level, state and national level and will be ready to enter the the 21st century.

2. The second issue would too simultaneously to develop networking facilities and linkage to other zone through networking system. This will encourage resources sharing and on-line access to information. Researcher proposes that the college library should also develop a city network and to make available the information it has in its collection to Engineering R & D centers etc. at a reasonable price and with out much affecting the library staff. It will allow the libraries to generate new sources of income in the course of time. The fund so created could be used for expenditure that may arise. In this way academicians, industrialist as well as society could be benefited and the burden on the college, university, industry and state government would be reduced.

3. All the college librarians lack exposure to computer related activities, and are not able to get proper guidance. It will be necessary that a detail plan for library computerization and networking and to offer various services to be made available. If this activity is started and implemented, it is also necessary to have a time bound programme to be implemented in phases. The researcher also felt the rich collection of college library be also made available and exposed to community at large on the campus and other campuses, colleges, university campus, city and outside. That rich and valuable collection of library is used by one and all, which needs information. Then researcher has therefore submitted a plan for

(1) Computerization of the library activities including housekeeping jobs of the library.
(2) Networking facilities and resource sharing.
(3) LAN and WAN facilities within the city and outside and to create a city network system and these be extended to cover the other university libraries of the state, the country and out side.

7.2.3 Proposed Network

To keep peace with the changing scenario of the IT, the computerization and networking is major thrust area for zone libraries in Gujarat state. Under this plan each zone library shall be systematized with computer network facilities by adopting LAN and WAN technologies.

First of all each Engineering college library will ~~have~~ be fully computerized at local level. Then each library will develop their campus network. College library will be a co-coordinating center.

With the campus network of each Engineering college library, all other Engineering R & D centers of their city will be connected. Thus city network will be developed. It may be extended to districts in future.

All the five zone libraries networks and city networks will be connected to a powerful state capital hub (Main hub center) at Nadiad.

Due to the linkage of all the Engineering college libraries will be able to transfer and exchange their information with each other as well as with other colleges and R & D centers.

The above network is sample of the proposed network structure for college library campus and city network.

The network would be hierarchical, centralized and decentralized. Each college library would function as a co-coordinating centre.

7.2.3.1 First level

First each Engineering college libraries of Gujarat sate will be fully computerized. One network will be started for the library operations and services which will connect to various sections in the library. Library management software will be used for house keeping

operations and other operations. There will be switches to connect the computer in different sections and UTP cables will be used. It will run on Sco UNIX Platform and also all nodes at different sections will have latest configuration & operating system installed in it, to run the client server of library management software.

Another network will be established the library to connect different machines used for internal services. It will run under latest network operating system platform and it will facilitate internet connection to all departments, administrative office within the campus. The connections to the departments will be made possible through main switch within library using proxy server. For this purpose college library have to purchase software of proxy server. The necessary computer system for internet connectivity will be provided by the concerned departments. Thus campus network will be worked as a whole system.

Network for library resource sharing can also be established. The objective of a computer and communication network can be attained without much expense. By establishing such network all the participating libraries will be able to browse the catalogues of the college library without visiting the college library and vice versa. If all the libraries participating in the network prepare their catalogue in machine readable form and make a collective database like union catalogue, then by establishing a network all members of each library will be able to know what is available in other libraries. This will further help to reduce the unnecessary duplication of reading material in different libraries.

7.2.3.2 Second level

The all Engineering college campus network and city network will be developed jointly. The developed network will be act as part of our proposed GUJELIBNET. It will be supported by NISSAT as it is responsible to develop city networks.

Engineering college library, would act as the coordinating centre. All the departments, administrative section, and Engineering R & D centers etc. in campus as well as in adjoining areas will be connected with the main hub provided at engineering college library. This main hub will be in engineering college library. Thus college campus network and city network will be developed as a part of GUJELIBNET.

This network would be extension of original information network. However, it will cover both the Engineering college library as well as R & D centers in the city and adjoining areas. In this way the college library network will really became network covering both academics as well as R & D Centers in around engineering college area. In this way it will make college library network more effective, cost-worthy and all comprehensive.

Thus suggested module could be applied by other college libraries and thus created network of academic libraries, special libraries, R & D centers and other institutions.

7.3 Phase wise Implementation

It is to be kept in mind that before the actual implementation of the proposed GUJELIBNET, a detailed system analysis will have to be done. GUJELIBNET will be module for other zone libraries of other state. All the five zone libraries can be followed this plan. The successive of this project depends upon the following factors.

1. Having adequate computer facilities.
2. Appointing and training the library personnel for development and maintenance of the system.
3. Collection, context and methods of entering bibliographical data.
4. Existence of an efficient and reliable communication system.

Considering the existing infrastructure facilities, financial resources, manpower and technological aspects, the implementation of the module can be made in three successive phases.

The phase wise implementation tasks to be undertaken as follows:

7.3.1 Phase – I

The phase wise implementation tasks to be undertaken as follows. There is a basic requirement to be drawn a technical plan. The plan will be prepared with the help of computer experts.

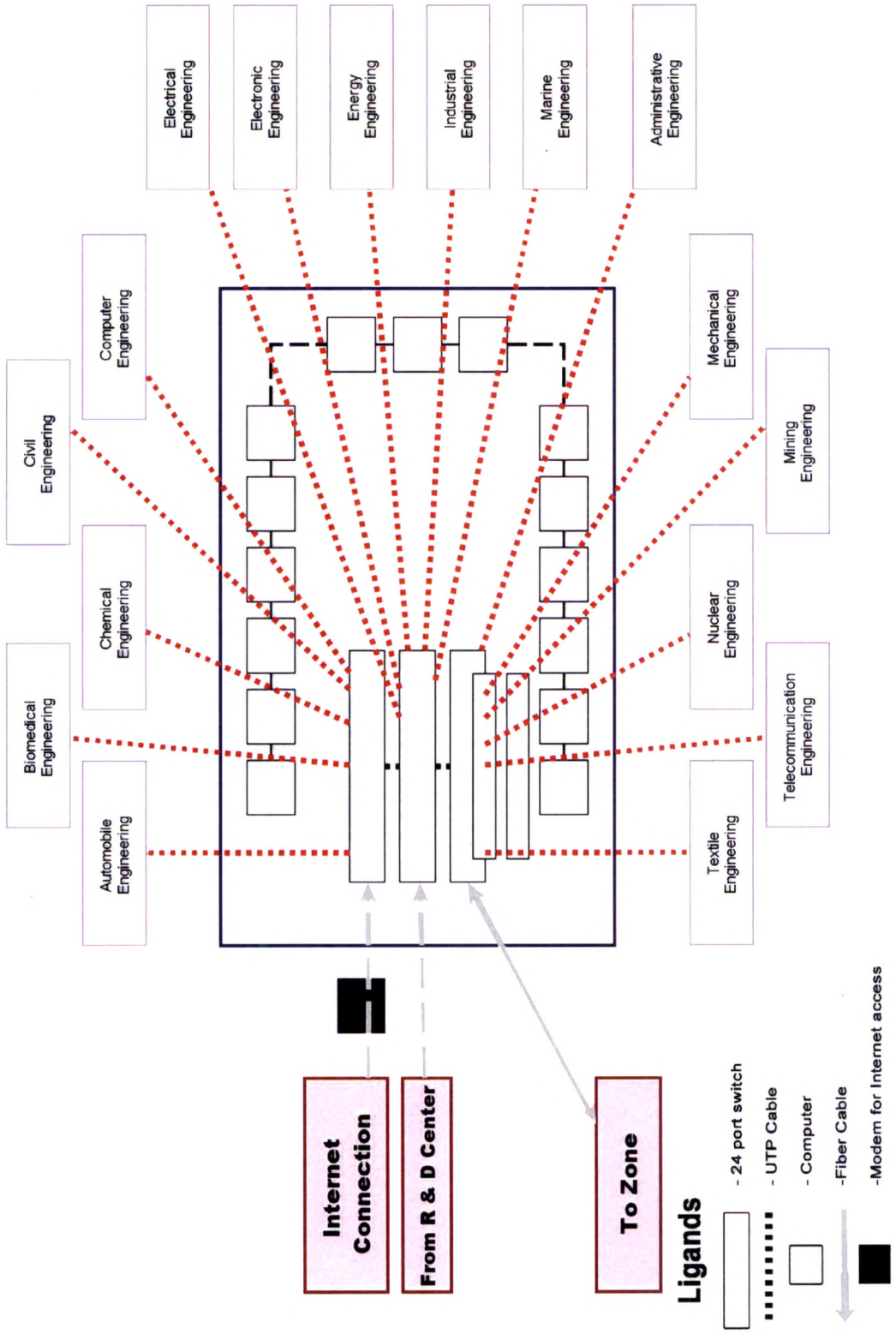
1. Introduction of computer culture in the Engineering College libraries and R & D centers.
2. Computerization of each Engineering college library and participating libraries under GUJELIBNET.
3. Setting up of networking infrastructure.
4. Selection of proper location of the computer laboratory.
5. The laboratory should consist of required hardware. It should also contain layout of hardware CPU, printers, nodes, and also electric installation plan, switches and earthing, writing, stabilizer to take care of electric fluctuation etc.
6. Software installation – The authorized integrated library management software.
7. During the phase – I, researcher is also proposed to connect various R & D center around the Engineering college libraries to share their various resources.
8. All the departments within college are also connected with library center.
9. Internet connection will be terminate on the switch in the library and it will extend to the all the nodes of library and various departments.
10. To get better bandwidth of the internet connectivity. It is proposed that leased line should be requiring with high end type of modem.
11. After completing the phase – I, one fiber up link will be connected with related zone hub center during phase – II.
12. Nodes.

- Laboratory should have a latest configured computer.
- All the nodes are easily accessible for the users.

Each section selection like acquisition, serial control, circulation, cataloguing, reference services should be provide at least with one node. But circulation section should have two nodes for charging and discharging activities. For internal use, there should be separate nodes.

13. Air conditioners as per requirement.
14. Providing training for the existing staff.
15. House keeping work

Phase I : **College Library Internal Network (LAN)**



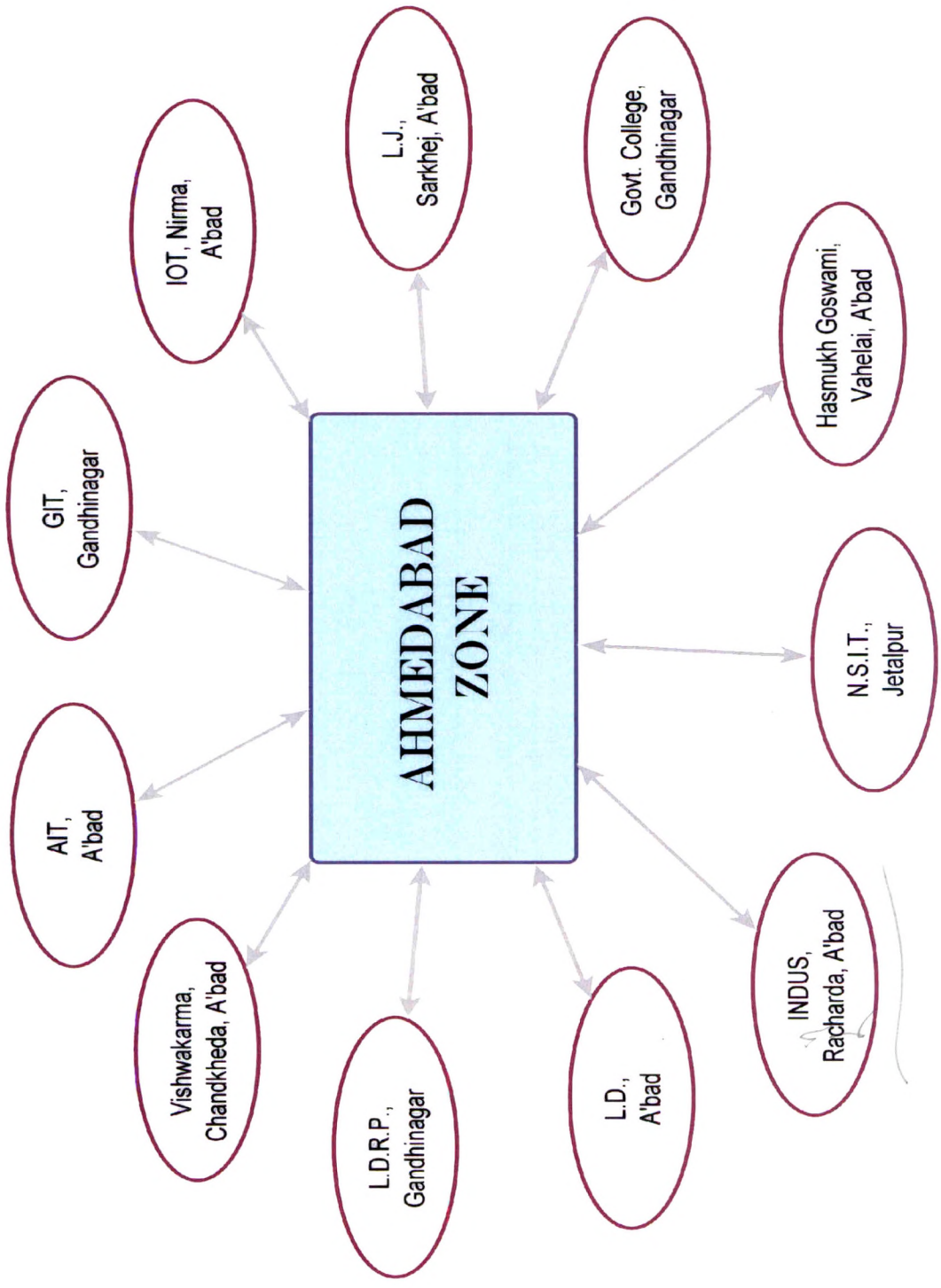
First of all the housekeeping functions e.g. acquisition control, serial control, circulation control, fine system, user records, cataloguing etc. should be started. With the database creation activities should be started. Both the work should be completed within one year. Six months for automation of Engineering college libraries and six months for editing of the entered data. Then the data is to be merging with main hub center record. The current data should be computerized at a given time and parallel work should be started for retro conversion work. This work should be finished within one year.

7.3.2 Phase – II

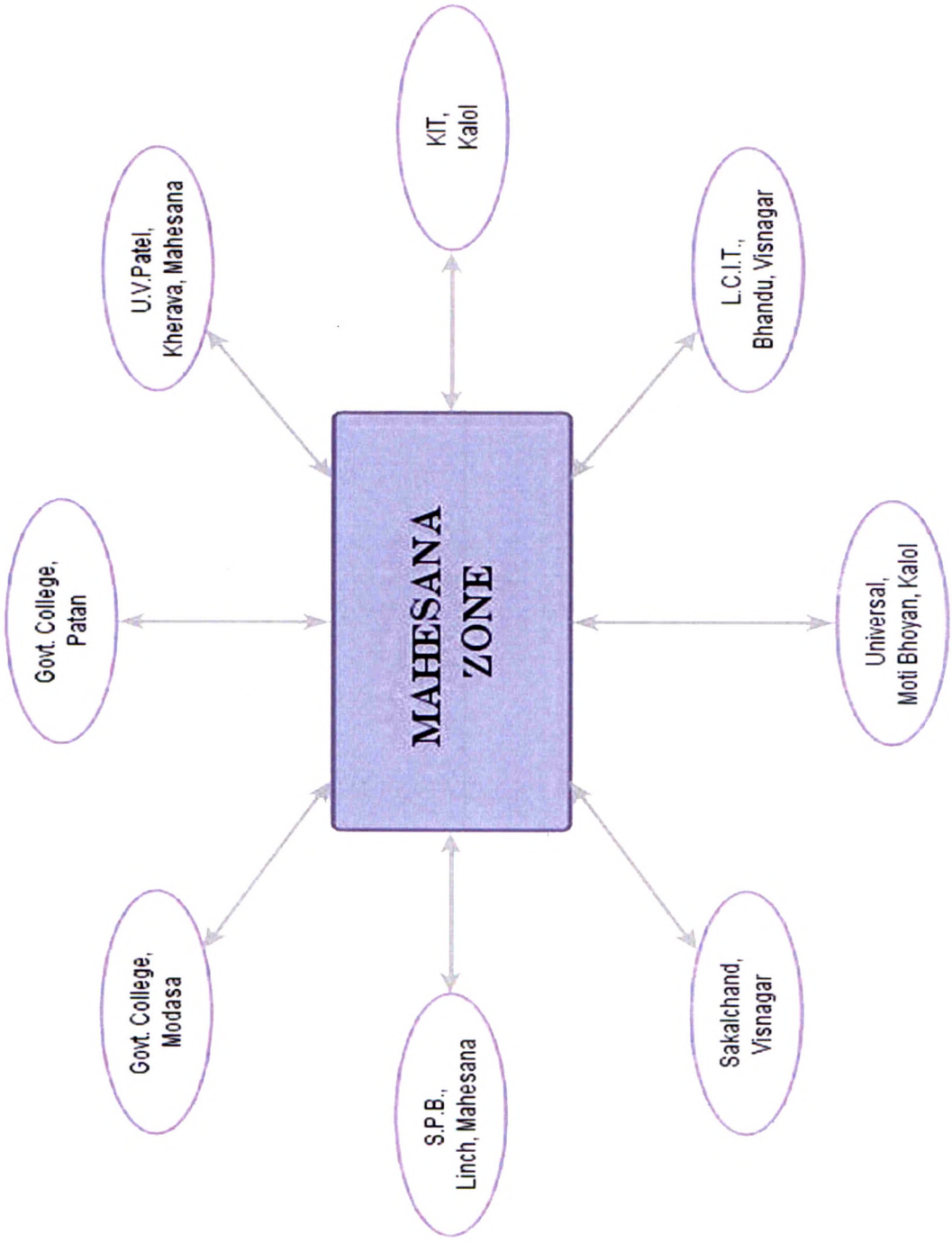
1. Proposed plan is as per figure- .
    - Phase II – A: To connect the various college libraries with Ahmedabad zone with Fiber backbone.
    - Phase II – B: To connect the various college libraries with Mahesana zone with Fiber backbone.
    - Phase II – C: To connect the various college libraries with Rajkot zone with Fiber backbone.
    - Phase II – D: To connect the various college libraries with Surat zone with Fiber backbone.
    - Phase II – E: To connect the various college libraries with Vadodara zone with Fiber backbone.

2. Setting up of the Network.
3. Linking of the participating libraries and information centers.
4. Introduction of various user services through network.

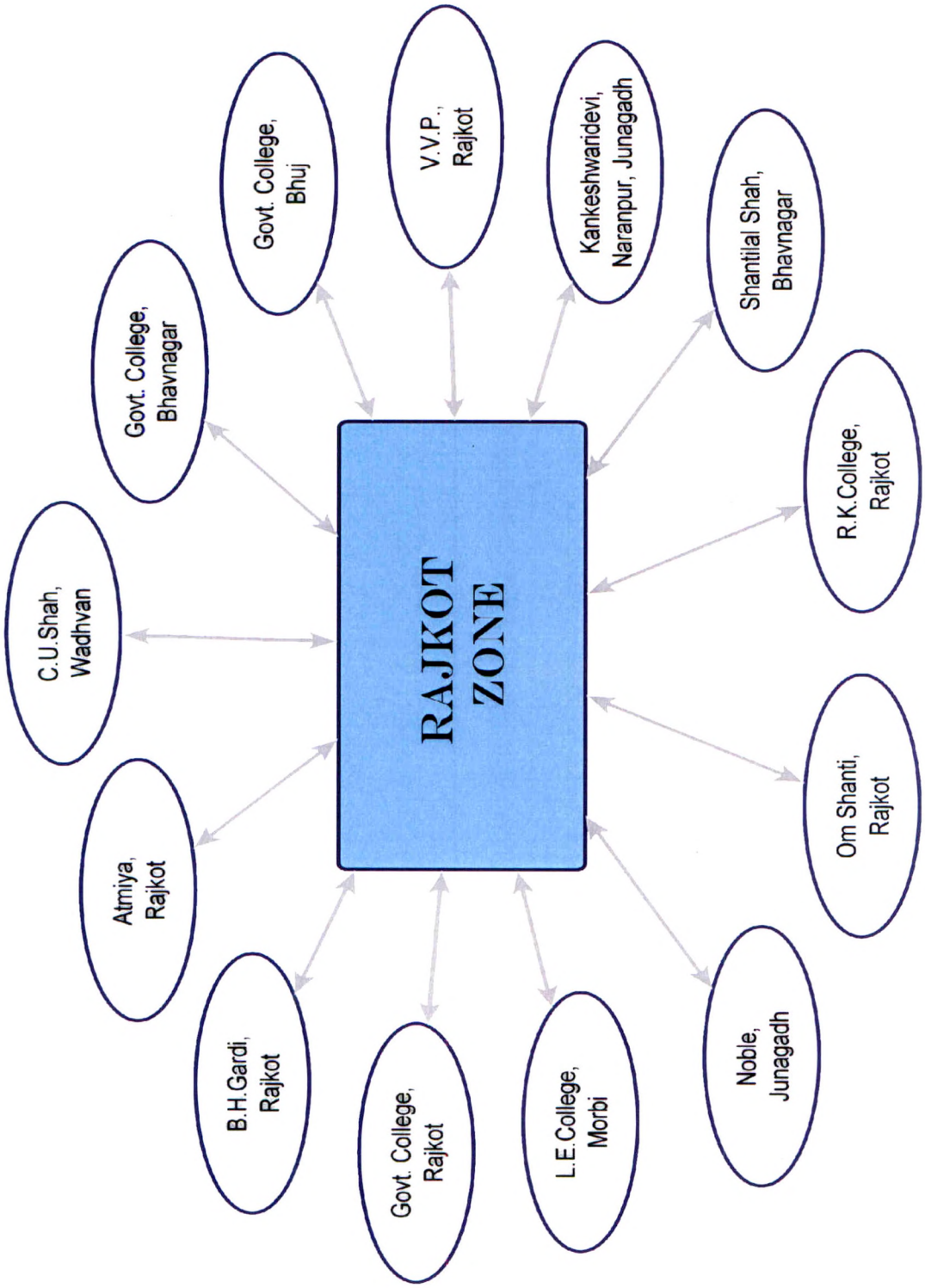
Phase II – A: **To Connect the Various College Libraries with Ahmedabad Zone with Fiber Backbone**



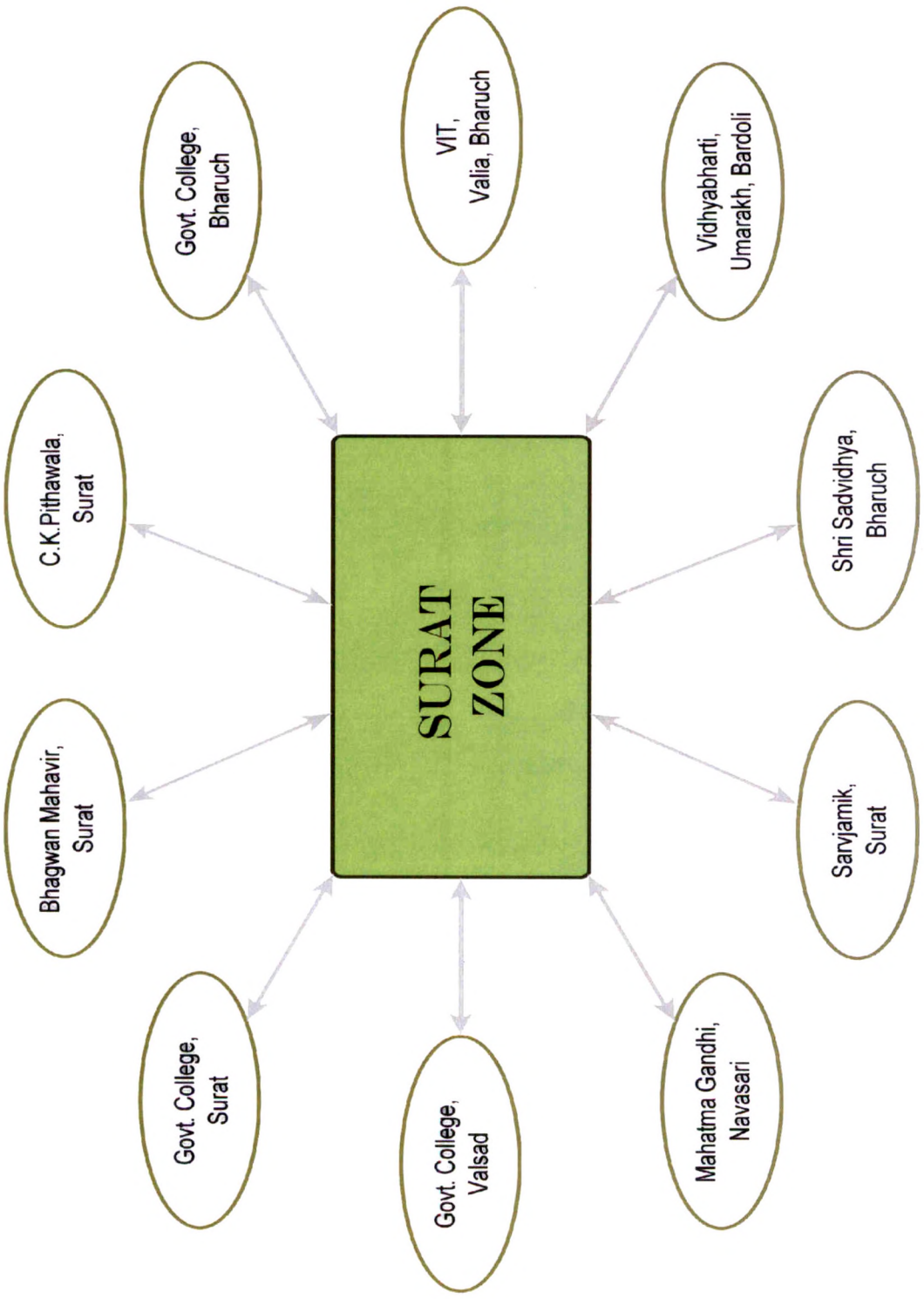
Phase II – B: **To Connect the Various College Libraries with Mahesana Zone with Fiber Backbone**



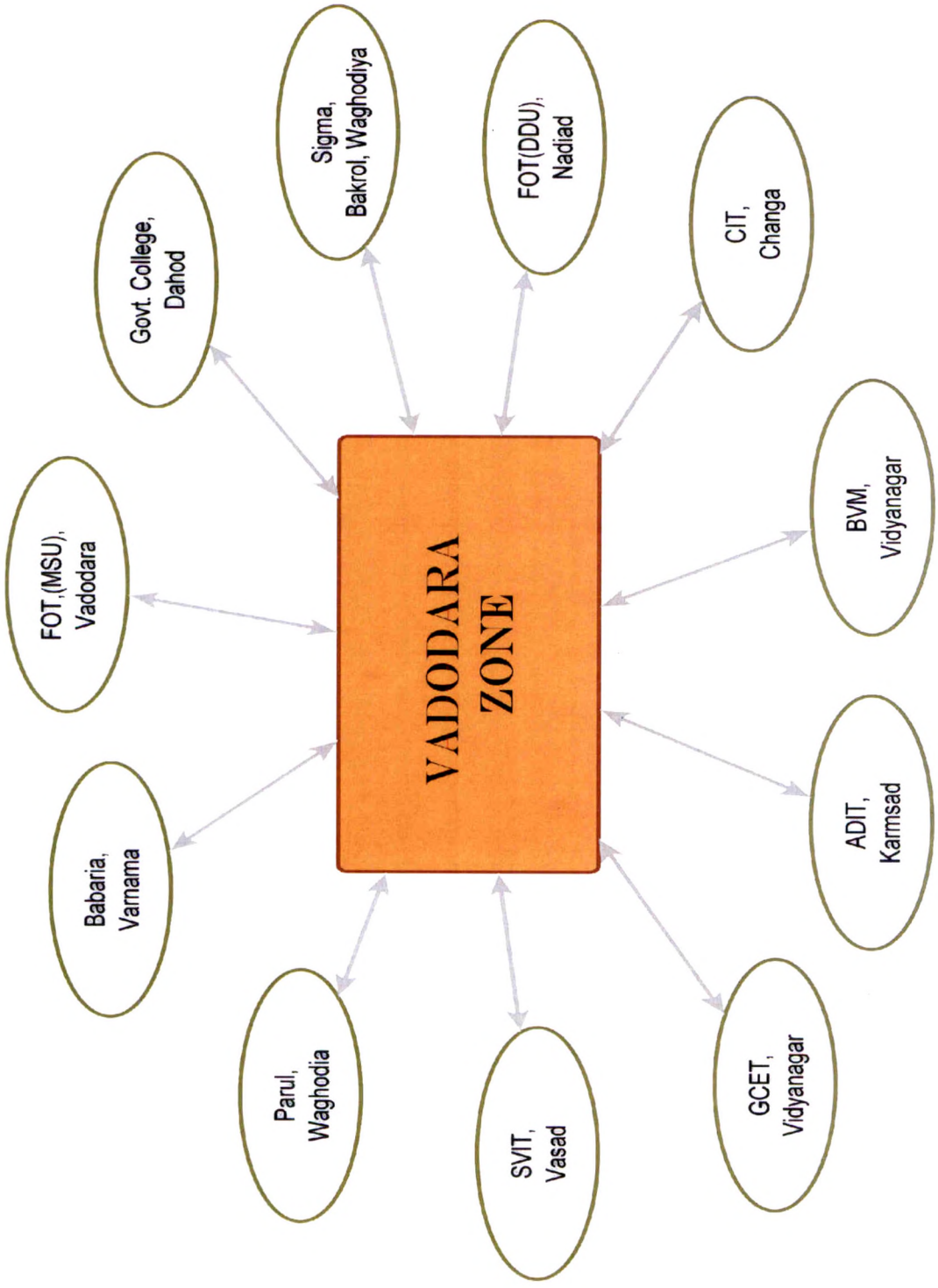
Phase II – C: **To Connect the Various College Libraries with Rajkot Zone with Fiber Backbone**



Phase II – D: **To Connect the Various College Libraries with Surat Zone with Fiber Backbone**



Phase II – E: **To Connect the Various College Libraries with Vadodara Zone with Fiber Backbone**



7.3.3 Phase – III

Phase III: Proposed Network of Engineering College, Libraries of Gujarat State.

1. Bringing the entire zone Gujarat, Engineering college libraries and libraries of Engineering R & D centers in to the network.

2. Linkage with other college libraries, university libraries networks in Gujarat state through central hub at – Nadiad.

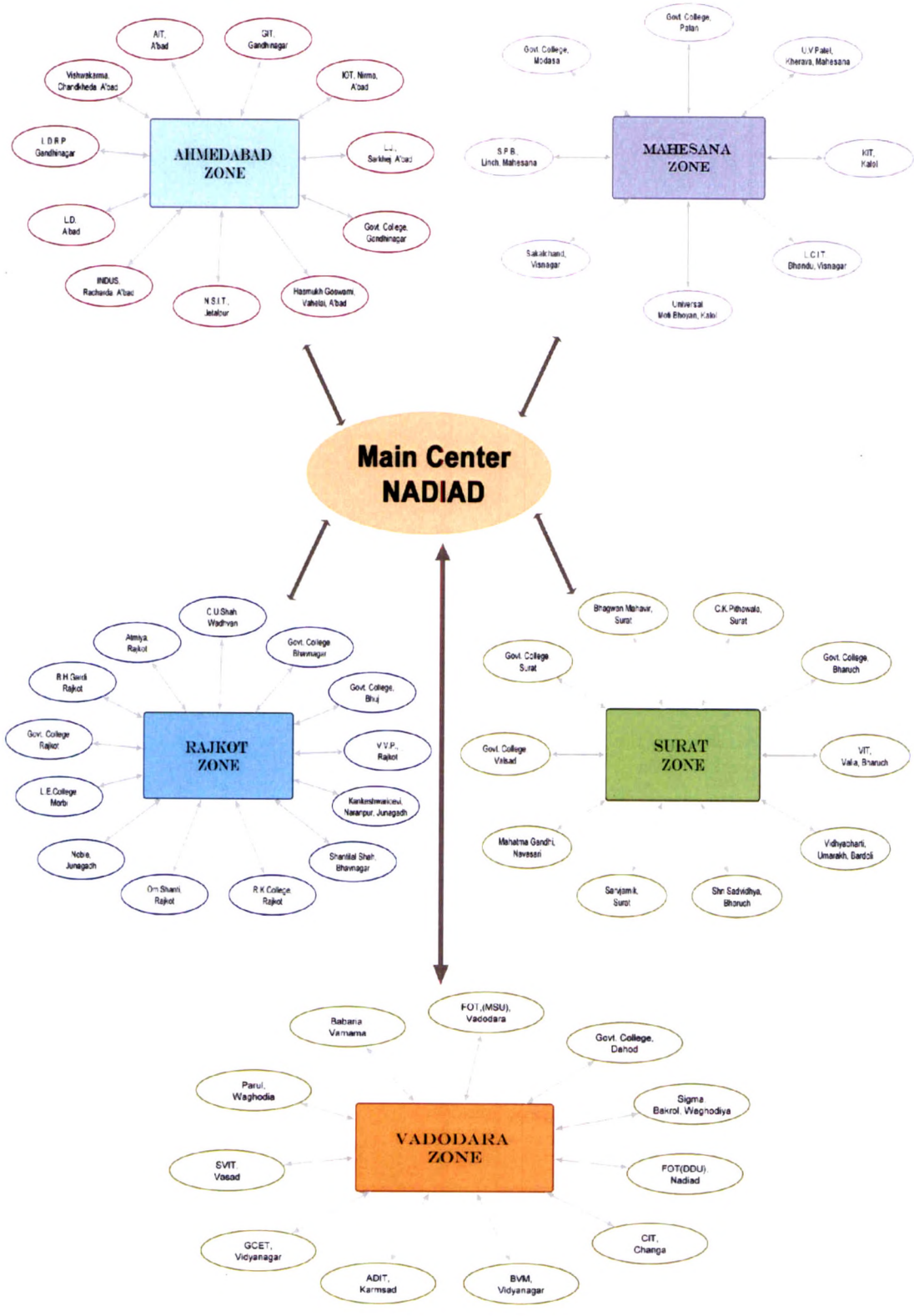
3. Join hands with other local, regional, national & international network like INFLIBNET, DELNET.

   As per the above phase wise targets, the software modules to be developed first will be the packages required for automation of individual libraries such as acquisition, fund accounting, serial control and circulation, the catalogue creation of a standard CCF, communication module.

   As they are developed and being implemented, the other modules required for updating of databases and utilize for networking and text retrieval to help in searching can be developed.

4. User's training should start for a successive library network. The use of information product and services should be started.

Phase III: **Proposed Network of Engineering College, Libraries of Gujarat State**



Conclusion

(1) All the Engineering college libraries and R & D center will connect to the related zone center during phase - II, While each library Local Area Network will be established during Phase - I.

(2) Each zone center will act as a hub center for their area colleges and they all are connects with main state wide center which is probably located at Nadiad during Phase - III.

(3) As a result of phase - I, II & III, proposed GUJELIBNET will be developed as per Figure.

7.3.4 Hardware Configuration (for College level)

Suggested minimum computer hardware configuration:

A. Configuration:

Computer Terminals Dual Core	- 50 Nos.
Clock speed	- 2.93 GHz
RAM	- 1 GB
Storage requirement	- 160 GB
Disk I/O	- Minimum 5 Mega Bytes / hr.
Printing Load	- 2000 pages / day
Communication Load	- Minimum 5 Mega Bytes / day
Fax	- 3000 bytes/day
Monitor	- 17" VGA
CD-ROM	- Combo Drive with Writer
NIC Card	- 10/100 Mbps supported Ethernet card

Keyboard, mouse, modem (as per requirements)

B. Technical Specifications:

1. 64 bit main frame computer with 2.93 GHz clock speed, main memory 1 GB and disk space 160 GB.

2. At least 50 terminals with latest configuration & preloaded latest operating system and antivirus Software.
3. 10/100 Mbps network supported card.
4. One each of lesser printer, dot-metrics and one letter quality with 300/pm, 30 cps speed.
5. One each of back up and I/O processor.
6. Two streamer – tape drives, two cartridge tape drives.
7. Desk top publishing, two CD-ROM drives and two fax machine.
8. To run under UNIX or an equivalent multi-user operating system.
9. Availability of communication software.
10. UPS as per requirement.

7.3.4.1 Suggested Network Hardware Configuration

Switch:

10/100/1000Base T – Layer – 2 Switch (24 Port)

- Standards IEEE 802.3, 802.3u, 802.3x, 802.3ab
- Ports 24 No. of RJ-45 10/100/1000
- Copper Cabling Type Category 5e or Gigabit supported
- LEDs System, 1 through 24
- Certifications FCC Class B, CE
- Operating Temperature – 32^0F to 122^0F (0^0C to 50^0C)
- Storage Temperature – 40^0F to 158^0F (-40^0C to 70^0C)
- Operating Humidity 20% to 95%, Non-Condensing
- Storage Humidity 5% to 95%, Non-Condensing

Modems

Modem should be have with following features

- Providing high-speed internet access via a common telephone cable
- Supporting multiple line modes (self-adaptive lines)
- Providing a 10/100 Base – T Ethernet facilities
- Providing a USB1.1 interface

- More highly reliable, simpler operation and less power consumption
- Supporting the bridge or Router mode
- Supporting the built-in PPPoE dialup function
- Supporting the Network Address Translation (NAT) function
- Supporting the DHCP server function
- Supporting the quick configuration function
- Environmental requirements

Environmental temperature: 0^0C-40^0C (32^0F-104^0F)

Humidity: 20% - 90% (non-condensing)

- Power specification

Power adapter: Input: AC 100-240V to50/60Hz 0.3 Amax

Output: DC 5.2V DC 1A

7.3.4.2 Suggested Network - Software Requirements

- The computer can not work without software; hence the basic software i.e. operating system is a must. It may be UNIX, Windows. Antivirus software should be installed.
- To connect computer with the main switch plug the UTP cable with RJ-45 connector at the both end of the cable.
- Proper bandwidth management software like cyberoam software is required which will provide the facility for the login and manage the bandwidth of each users based on the IP address.
- For connecting website it needs Java compiler and for searching website.
- For Library operations it needs to have Library management software
- Library Management Software (Window based package)

IBM Blade Center S Chassis (For Zone)

Specifications

IBM Blade Center S at a glance	
Form factor	Rack/7U, high-availability midplane
Blade bays	Up to six 1- or 2-processor, and up to three 4-processor
Disk bays	Up to 12 SAS, 12 Nearline SAS, or 12 SATA, or an intermix of the disks
Media	Optional DVD multi-burner accessible from each blade server
Switch modules	SAS, Gigabit Ethernet, Fibre Channel switch modules available
Power supply module	Up to four (hot-swap, auto-sensing, and redundant 950 W/1450 W with load-balancing and failover capabilities)
Cooling modules	4 hot-swap and redundant blowers standard
Systems management hardware	1 management module standard
I/O ports	Keyboard, video, mouse, Ethernet, USB
Systems management software	Open and easy systems management and trial deployment tools
Predictive Failure Analysis	Hard disk drives, processors, blowers, memory
Light path diagnostics	Blade server, processor, memory, power supplies, blowers, switch module, management module, hard disk drives and expansion card
Limited warranty3	3-year customer replaceable unit and onsite limited warranty
External storage	Support for IBM System Storage solutions (including DS and NAS family of products) and many widely adopted non-IBM storage offerings

Highlights

- Integrates servers, SAN storage, networking, I/O and applications into a single chassis
- Uses standard office power plugs with 100 – 240 V, so you do not need a data center to take command of your data
- Featuring the Blade Center Start Now Advisor, making it easy to set up servers, SAN storage, network switches and SAN switches, all from a single console
- Flexible modular technology integrates Intel®, AMD Opteron™, or POWER™ processor-based blade servers supporting a wide range of operating systems
- Comes with management tools that are open and easily integrated, allowing you to focus on your business, not your IT
- Helps build greener IT infrastructures with powerful IBM Cool Blue™ technology, and a portfolio of products and tools to help customers plan, manage and control power and cooling.
- **Features**

Easy to use, space-saving 7U chassis that incorporates hot-swap disks,	• Blade Center S can meet your IT needs with six server bays and up to 5.4 TB of SAS, 12.0 TB of Nearline SAS or 12.0 TB of SATA, or an intermix of the disks. • Highly integrated IT infrastructure helps simplify the deployment, of servers and storage. • Comes with an easy setup flyer and the Blade Center Start Now Advisor tool to get you up and running quickly. • Blade Center S uses standard office power supplies, enabling you to build your IT outside of the data center. • Support for common Blade Center blade families including Intel servers, AMD Opteron servers, new workstation blades, and POWER- based blades. Allows you to select the blades based on what best fits the

	application workloads. • Virtualization capability allows you to "virtualize everything" for a more flexible, better utilized and potentially lower cost IT infrastructure with a common management construct. • Innovative design reduces cables by up to 80% compared to rack servers, helping save you installation time and on cable costs. • Extensive compatibility with the family of Blade Center blades, switches and ecosystem products.
Energy-efficient design	• Blade Center S supports a very broad portfolio of low-voltage processor options, helping enable customers to lower their power usage without sacrificing performance.2 • Because Blade Center S uses power supplies that are as much as 90% efficient, much less power is wasted as heat and more power is available for the chassis and servers to use. • Blower/fan modules in the chassis adjust to compensate for changing thermal characteristics. At the lower speeds they draw less power. • The use of fewer and lower-power components helps enable power and cooling savings.
IBM Open Fabric	• Delivers a flexible, open, connected infrastructure to help optimize application performance. • Blade Center supports a wide array of fabrics including: SAS, Ethernet, Fibre Channel, and iSCSI. • Helps centralize storage, including boot capability, which can help reduce the effect of a disk outage on an

	application. • New Brocade and QLogic NPIV Fibre Channel switches help simplify SAN deployment and management.
Powerful solutions management	• Provides intelligent systems management for rock-solid reliability. • Exploits hardware capabilities by surfacing pertinent information about your blade server. • Easy-to-use Deployment Wizard provides step-by-step installation instructions with automated deployment capabilities. • Advanced Management Module provides more robust hardware running Linux® and supporting many industry-standard, open protocols.
High-availability midplane	• Provides a fault-tolerant connection from the blade server to all modular components. • Innovative midplane design provides support for you to upgrade to new technologies and helps preserve your original investment.
Hot-swap, management, switch, power supply and blower modules	• Provides single point of control for managing the entire solution helping to increase system reliability and availability. • Blade Center S comes standard with one Advanced Management Module. • IBM smart management capabilities can help boost administrator productivity. • Uniquely designed Calibrated Vectored Cooling technology helps protect critical system components to help drive toward On Forever™ reliability. • Supports a wide selection of integrated switching

	components from industry-leading ecosystem companies such as Cisco, Nortel, Brocade, Q Logic, and McDATA. • Optional Gigabit Ethernet switch modules provide Gigabit Ethernet communication between blade servers, management modules and external hardware. • Optional Fibre Channel switch modules deliver highly available cost-effective storage network, including support for IBM System Storage™ SAN. • Supports up to four 950 W/1450 W power supplies with load-balancing and failover capabilities, providing additional reliability and protection. • Each power supply includes a customer replaceable fan pack to help keep the power supplies running at peak performance.
Advanced server management	• Supports system availability to accurately measure planned vs. unplanned outages. • Supports capacity manager to help monitor critical server resources, identify and predict bottlenecks and recommend upgrades to prevent diminished network performance. • Supports rack manager to conveniently configure and monitor rack components and provide health information. • Supports software rejuvenation (PFA for software) to monitor performance trends of software over time, predict software aging issues and schedule servicing when required.
IBM Remote Deployment Manager	• Simplifies and automates deployment and redeployment for efficient installation and setup of your blade servers.

	• Perform deployment tasks via the network that previously may have required a visit to each system, helping save your administrator valuable time. • Supports all Wake on LAN® and Pre-boot eXecution (PXE) enabled products.
Light path diagnostics self-diagnosis panel	• LEDs located on the front and rear of the system provide quick and easy guide to troubleshoot your server to help provide more availability and faster system uptime.
Predictive Failure Analysis	• Helps save you time and money by decreasing unplanned downtime. • Helps increase uptime by allowing you to receive proactive alerts and take corrective action, in some cases as much as 24 - 48 hours in advance.
3-year customer replaceable unit and onsite limited warranty3	• IBM Global Services organization provides reliable, dedicated and skilled assistance when you need it. • Provides peace of mind for an extended period of time.

IBM Blade Center HX5 (For Main hub Centre)

Specifications

Form factor/height	Singlewide (30 mm) – quadwide (120 mm)
Processor (max)	Intel® Xeon® 7500 and 6500 processors; 4/6/8 cores, up to 2.66 GHz Up to 2 processors per singlewide HX5; scalable to 4 processors
Number of processors (std/max)	1/2 (scalable to 4)
Cache (max)	Up to 24 MB per processor (8 core)
Memory (max)	16 DDR-3 VLP DIMM slots, capacity up to 128 GB, per singlewide HX5 (scalable up to 640 GB max, at speeds up to 1067 MHz, via 80 DIMM slots, using 2 MAX5 expansion blades)
Expansion slots	1 CIOv slot (standard PCIe daughter card) and 1 CFFh slot (high-speed PCIe daughter card) for total of 8 ports of I/O to each blade, including 4 ports of high-speed I/O Scalable up to 16 ports of I/O in 4-socket, doublewide form factor
Disk bays (total/hot swap)	2 non-hot-swap bays supporting solid-state drives per singlewide HX5
Maximum internal storage	Up to 100 GB of solid-state storage per singlewide HX5
Network interface	Broadcom 5709S onboard NIC with dual Gigabit Ethernet ports with TOE
RAID support	Optional RAID-0, -1, -1E
Systems management	Integrated systems management processor
Operating systems supported	Microsoft® Windows Server, Red Hat Linux®, SUSE Linux, VMware, Sun Solaris
Limited warranty	3-year customer replaceable unit and on-site limited warranty

Feature	Benefits
Fifth generation of IBM® X-Architecture® technology	• The broadest portfolio of systems optimized for your most demanding workloads • Flexible portfolio and systems to implement what you need • Maximized memory bandwidth and capacity for unprecedented performance • Optimized for enterprise workloads for faster time to value • Easy to acquire, own and manage • On Forever™ reliability using high-end technology for maximum availability
Up to 32 processor cores with a 4-processor blade in a 1.25U equivalent space	• High-density computing capacity with maximum performance and productivity at reduced cost per workload • Performance per watt enables energy-efficiency advantage • Greater number of database transactions per minute
MAX5 memory module	• Ability to add memory without additional processors or software license costs • Additional DIMM slots to mix and match smaller, cheaper DIMMs to help reduce system costs • Maximum memory bandwidth and capacity for unprecedented performance • Leadership virtualization performance • Large memory footprint for reduced I/O requirement, significantly reducing total system TPC-C costs
Up to 640 GB maximum memory capacity	• Allows optimum utilization for memory-rich applications • Fits more VMs per blade to keep costs down
Flexible systems that can	• Ability to get up and running up to four times faster by standardizing on a single platform for 2- and 4-socket server

Feature	Benefits
independently scale for processor and memory	needs • Faster time to value using a single scalable system • Adds capacity on demand as your requirements change • Helps eliminate headroom costs at time of purchase
Flexible logical node partitioning	• No-touch partitioning of a 4-socket blade to two 2-socket blades without any physical system reconfiguration • 2-in-1 systems let you run interactive apps by day on a 2-processor system and batch jobs by night on a 4-processor system • Turn off underutilized nodes for power savings • Flexible partitions to accommodate workload and licensing requirements • Server infrastructure that can change with your roadmap • Runs Windows® and Linux® on the same box without virtualization software costs or overhead
Virtualization support	• Optional embedded hyper visor USB key
Automatic node failure	• Greater uptime of multinode configurations without administrative intervention
Predictive Failure Analysis	• Helps minimize interruptions from planned and unplanned downtime
Machine check architecture	• Enables faster recovery with more efficient error checking and correction
Trusted platform module (TPM)	• Integrated hardware chip enabling advanced security features
Light path diagnostics standard	• Provides a lighted path to the failing component inside the system • Helps expedite hardware repairs to reduce service time

Feature	Benefits
Dual and redundant power and I/O connection	• No single point of failure, resulting in increased uptime
IBM Systems Director Active Energy Manager™	• Comprehensive systems management tools • Allows continuous real-time monitoring, measuring and management of power consumption

Product features

- Built on the latest IBM X-Architecture technology with fifth-generation eX5 innovation
- Modular design, enabling standardization on same platform for 2- and 4-socket server needs to deliver faster time to value
- Greater memory capacity, enabling more or larger VMs per server
- Enhanced computing capacity facilitates more transactions per minute in a blade
- Optional memory expansion separates memory capacity from processors, enabling full utilization of license-constrained, memory-rich applications
- High-density, high-utilization computing allows superior price performance as well as performance per watt
- Flexible node partitioning and pay-as-you-grow expansion offer great investment protection
- Mainframe-inspired reliability and automatic node failover for optimal system uptime
- Remote management from a single graphical console with IBM Systems Director

Hardware summary

- Compute capacity of up to 16 processor cores in little more than .5U space

- Scalable memory expansion module for up to 640 GB capacity in a 2.5U equivalent space
- Expansion capabilities from a 2-processor system to a 4-processor system
- Partitions a 4-processor blade to two 2-processor blades without requiring physical system reconfiguration
- Optional embedded hyper visor

7.3.4.3 Other preparations:

(1) Preparation of site for internal nodes

Library should identify an area for installation of internet node. A particular area in the library should be allocated / identified for internet facility for this purpose. It should be near the optical fiber connection. This should be equipped with chairs, tables, electricity supply and portion with security arrangements. Library should identify resources available on internet for different subjects.

(2) Preparation of Directory

A directory of Web Sites useful for each subject be prepared along with the contents, databases, available on web sites with their Internet addresses and be provided to the post – graduate departments.

(3) Access to Information

For accessing the information or databases which are free based (it is necessary to change fees) or subscription is to be paid by the library. Recommendations in this respect are invited from heads of the departments and scholars and necessary budgetary provision be made in the periodicals budget of the selected library. A made from periodicals budget for subscribing to databases available on internet not received elsewhere in the college to avoid duplication.

(4) Training

Training is very important. It should be given to the students and staff members in the use of internet resources for identifying, locating and for downloading information.

(5) Maintenance

- Funds are allocated for maintenance of this service / equipment this unit.
- Fees are charged for this service from the students etc. This item is placed before the library committee for consideration.
- Collection development policy of the library may be modified accordingly.

(6) CD Collection

CD's are useful for research and be acquired from the budget allocated for periodicals and books. For this purpose CD-Net of 14 CDs be purchased and installed in this unit. This will facilitate to access CDs from any node from the library or even on internet it connected to optical fiber connection.

(7) Staff

Some professional staff in the library is made in charge of this service. He/She would be deputed for training required for this purpose and also other staff as per requirement.

(8) Design of Web Site for Library

Web Site should be designed for the library. In this web site information towards the library services given by the library as well as collections available in the library is advertised. Documentation lists and bibliographies compiled by the library are disseminated to other university libraries in particular to Indian work in General.

7.4 Services by GUJELIBNET

The following services will be offered by GUJELIBNET.

1) OPAC

An On-line Public Access Catalogue to the entire holdings of college library enables users from different departments in the campus to have on-line access to the library database from their terminal. User can search a particular topic from journal, book database etc. and get a print-out of the list of references, on the search topic. Users need not come to the particular college library to enquire or search a book or to get a list of references on a given topic.

2) Reservation

User can search the databases and reserve a particular book from their terminal if the required book has been issued.

3) Reserved Books

User can also view the list of reserved books. If a particular book has been reserved by a number of users, the order of reservation can also be checked as the date and time of reservations is also recorded.

4) User Status

User can find out what are he books issued to them at any given time and when they are due from return. Reminders can be sent to the borrowers in an advance. However the cumulative reminder for overdue books standards / Back volumes will be available on the network till the document will be returned.

5) Current Awareness Services

List of latest additions of books, journals, CD-ROMs and other documents to the library can be displayed virtually on the LAN /WAN for users attention.

6) Selective Dissemination of Information (SDI)

Users e-mail requests may be collected and matched against the latest documents and matched ones can be sent back to the required user which can be possible only through networks.

7) CD-ROM Network Service

CD-ROM Network service can be provided through LAN or WAN so that a large number of users will be benefited at a time. They can retrieve information relevant to their needs within a reasonable time from any of the CD-ROMs provided in the CD-ROM Tower.

8) E-mail Services

E-mail services can be provided by the college library and also through Internet. A message can be easily posted to all the departments using common mail ID-Sernet. The college library will use this e-mail ID to send / post any message to the departments, a number of electronic newsletters and user-group discussions can be subscribed by the library via. E-mail and can be forwarded to all the users in the network, if the information is found to be useful.

9) Bulletin Board Service

A Bulletin Board is a public discussion area where people can post message without sending them to anyone's E-mail address - that can be viewed by any one who enters the areas. On campus serve a Bulletin Board is called a Forum. On the Internet, the equivalent areas are called News groups.

Separate Notice Board option can be created through e-mail facility and the latest information of the daily news, job opportunities, admission notices, entrance examinations, scholarships and fellowships, new courses etc. can be posted and made available for the through this bulletin board service.

10) Indexing and Abstracting Service

For the benefit of research scholars, indexing and abstracting services for the latest electronic texts and journals can be provided through LAN / WEB.

11) Internet Service

Internet has become a boon to the user groups. It is a world wide web of interconnected colleges, universities, R & D centers, Business and science network and is a network of computer networks. It is made up of Local Area Network (LANs), Citywide Metropolitan Area Networks (MANs), and huge Wide Area Networks (WANs) connecting computers of organizations all over the world. These Networks are hooked together with everything from regular dial-up phone line to high speed dedicated based lines, satellites, The three basic internet applications or functions are Electronic Mail, Remote Log-on and the File Transfer. Services such as mailing lists, directory, enquiry, Usenet news and tools such as archie, Gophers, WAIS, Vernica, WWW, etc. go beyond the three basic internet functions to bring people closer on the Internet and make information on the network on the network easier to locate and use. Internet has two main uses; one is person-to-person communication and other is finding information.

(12) Bibliographic Information Service

Bibliographic services includes – the creation of bibliographic records and the compilation of bibliographies, catalogues, indexes or any other form of bibliographic database. Access to the databases created by the individual libraries and also the union database access provides the bibliographic details of an item held by the libraries. Bibliographic information services, provides the patrons with access to databases from a variety of databases. This also includes the access to the database subscribed by the individual libraries in CD-ROM as well as the database subscribed at the network center.

This network helps the librarians to provide this service in a much better way to maximize the information services of the library and the network as well. Individuals affiliated to networks have access to the databases developed at national and international level provides access to bibliographical details of the sources available with them.

Libraries make effective use of the databases and provide better service to its users Full text access to publications The existing collection to many of our libraries is not enough to meet the actual requirements of the academicians and researchers. To supplement the collection and to provide an access to large number of journals, and full text databases in electronic form at an economical rate. A Network centre can play a major role in providing access to full text of publications to the member libraries.

(13) Organization of Internet Resource and Provide Access

Information on the internet is growing every day. Lot of it is not found useful for academic and research work. Filtering the useful information, organizing it and providing easy access to the same will be a Herculean task. In the network based environment it is possible to venture into initiate the work of organizing the internet resources to buildup virtual library particularly for Indian resources and provide access to tend users.

(14) Providing access to Information of Indian Origin

Internet has provided an opportunity for access to ocean of information published on the web. But this data is mostly of data published from other countries. An emphasis on the data relating to Indian origin need to be given access to such data of Indian origin. All those individuals and libraries using the network based information services in India agree that, Indian content is very limited. There are various reasons of not many databases are being created though efforts are on to add new databases to the network or available in India made accessible through the net. In recent years some efforts are being made and developed the databases and web / home to hook up over the Internet to provide access to data of Indian origin. There is a need for creation of indigenous databases of various types in different subjects, and the areas of importance to users in India. If these databases are once put on the web, rest of the users can access such data. An effort needs to be made to provide access to such data of Indian origin.

(15) Promoting the Discussion forum in different subjects

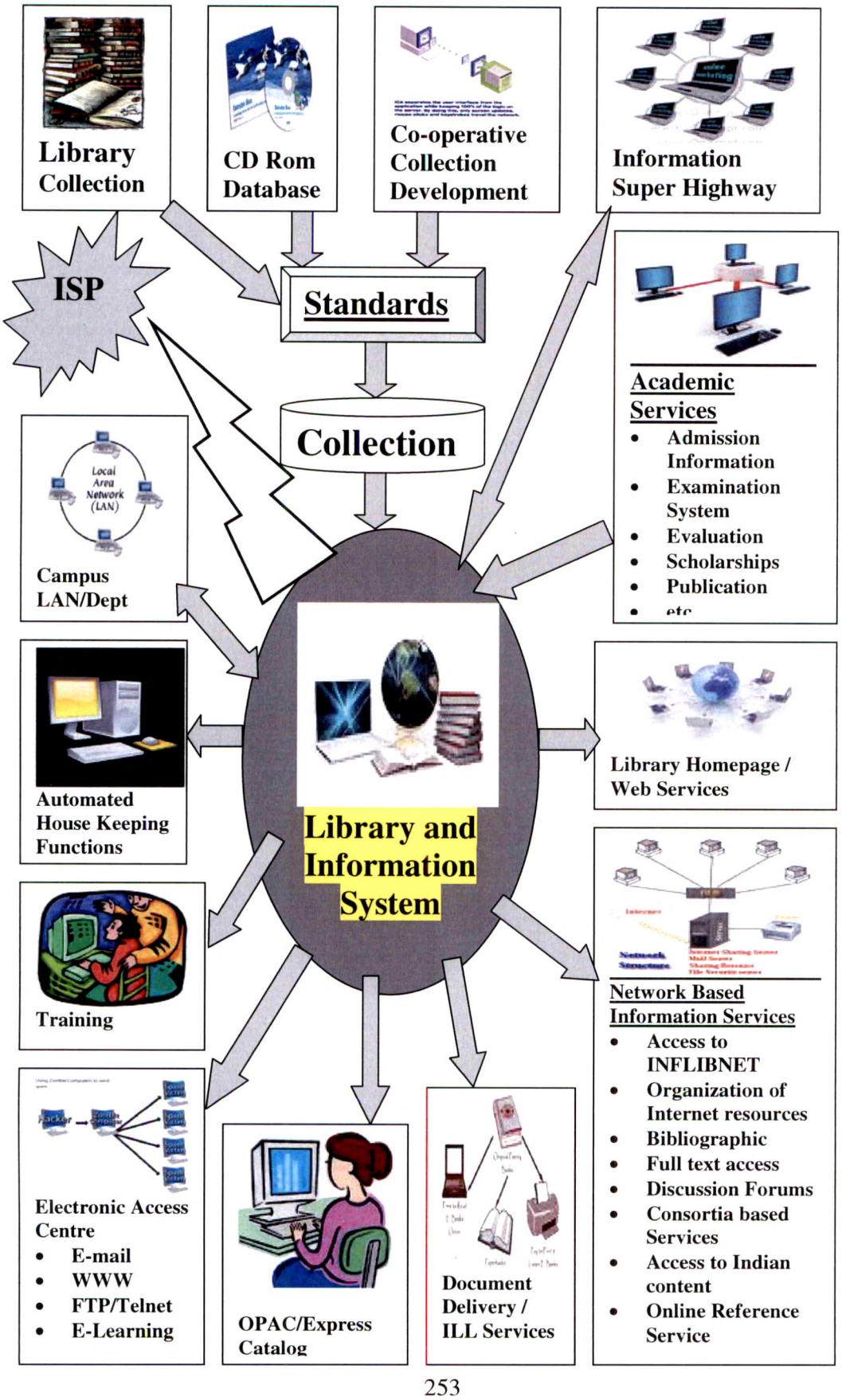
In the network environment, it is quite possible to create discussion forum in different subjects to help individual to interact with their own group of users working in

their area of interest for problem solving and discussion among the users to enhance their skills by participating in the discussion forum. To facilitate exchange of ideas and promote communication among faculty members, engineers and academicians electronic discussion forum will help to interact each other. This kind of service can be coordinated at national level by the national network agency in the subject concerned.

(16) Consortia based service

Libraries in India have been affected by an uncertain financial environment in which resource buying has been restricted, causing them to look at ways of extending their purchasing capabilities to compensate for reduce budgets. Library consortium is the one of the emerging tool kit for the survival of libraries.

Library and Information System Model



7.5 FUTURE AREA OF RESEARCH

Development in the information and communication technologies resulted in easy access to information through the information superhighway. The research and academic users get access to latest available tools resulting in the continuous research and development. Hence there is tremendous increase in the growth of literature in all areas. AICTE as a center of monitoring body must support the academic users by feeding latest information by properly using the IT tools for better access to resources.

With the development in the electronic publishing, there is a need to study the proper mechanism for cooperative acquisition of electronic resources by libraries. A detailed study is essential to understand the pre-requisites for providing easy access to scholarly literature with consortia based solutions for e-subscriptions including the pricing model for consortia based services for the academic libraries.

More research may be necessary on the information seeking behavior of the Engineering faculty and research scholars to understand additional requirements not covered under this study.

The 21st century is a knowledge based society. Knowledge is shared by research scholars, educational personnel and industrial researchers. They communicate with each other. The Engineering industry must participate in engineering education. A details research study on probability of establishing such institutes will facilitate maintain in engineering education.

To day we live in a world of instant global communication. It is an era pointed out earlier of fast technological development and information technology. The librarians have an important role in connecting information and made it available to users, not only of the academic institution but to other users of the society. It is social obligations that to librarians have to perform.

After the establishment of GUJELIBNET, all the Engineering College libraries will connect with each other so the network would play very important role in the field of information and access and it will serve as a module for other state to follow.

It is also possible to include various other network of different fields like agriculture, medical, pharmaceutical etc. at the state level and national level.

7.6 Conclusion

It can be concluded that in a developing country like India, steps are being taken to disseminate information about Engineering to its user's community. With the explosion of information and constraints on the financial resources, the resource sharing network has emerged as an important alternative. Information technology with computer and telecommunication facilitated the resource sharing among the institutions located in different geographical area.

It is also necessary to prepare the library staff through appropriate training. The great libraries of the future will not be those with great collections, but with good staff because knowledge must be discussed in the library before it is used. Rediscovery may be as important as the creation of knowledge itself in view of the developments in I.T. that are taking place continuously.

There is no alternative for the institutions that are engaged in research & training as well as generating information on Engineering development, but to come together under a formalized network in order to develop strategies for effective communication, resource sharing and information dissemination. The Engineering scientist, students, teachers, and researchers require relevant information from wherever it can found.

Therefore, for the development our state, country and to provide the needed information to the Engineering community, resource sharing and networking among the Engineering college libraries and R & D centers in Gujarat must. For this, the participating libraries should co-operative fully to make this programme a success.

7.7 Reference:

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Appendix-I
Questionnaires

Chandrakant K. Patel
44, Ghanshyam Nagar,
Pij Road,
Nadiad – 387 002
(R) 268-2556481
(M) 9898014544
Date : 07/06/2007

Mr. Principal / Librarian

_____
_____
_____
_____
_____.

Sub. : To fill in the Questionnaire enclosed herewith for the purpose of Ph.D. thesis.

Dear Sir,

I **Chandrakant Patel**, Librarian, DDIT, am a student of the Ph.D. Programme run by Dept. of Lib. & Inf. Sci., S. P. University, Vallabh Vidyanagar. My research topic is, "**Developing Managerial Skills for Digital Environment in Engineering College Libraries in Gujarat**" under the Guidance of Prof./Dr. Chandrakant N Rawal, Head & Professor, Dept. of Lib. & Inf. Sci., S. P. University, Vallabh Vidyanagar. My research will be helpful to all Engineering College Libraries in Gujarat as far as developing managerial skills concerned.

I request you to spare some time to respond my research questionnaire, which enclosed herewith.

Thanking you

Yours faithfully,

(Chandrakant K Patel)

Office: Librarian, Dharmsinh Desai Unviersity, Nadiad – 387001 (Ph.) 268-2520502

Developing Managerial Skills for Digital Environment in Engineering College Libraries in Gujarat

1. **General Information :**

1.1 Name of College _____

1.2 Address _____

_____

_____

1.3 Name of the University _____

1.4 Name of Library _____

1.5 Year of Library establishment _____

1.6 Name of Librarians _____

1.7 Educational Qualification of Librarians

1.7.1 B.A./B.Com./B.Sc./Others ( )

1.7.2 M.A./M.Com./M.Sc. ( )

1.7.3 B.L.I.Sc. ( )

1.7.4 M.L.I.Sc. ( )

1.7.5 M.Phi. ( )

1.7.6 Ph.D. ( )

1.7.7 Other _____

1.8 Experience as a Librarian _____ year.

1.9 Information of Library staff

No.	Staff	Qualification	Total
1	Asst. Librarian		
2	Tech. Ass./Prof. Ass.		
3	Senior Ass./Senior Clerk		
4	Junior Ass./Junior Clerk		
5	Peons		
6	Others		
Total			

1.10 Use of Library Collections:

1.10.1 Library Timing:

1.10.2 Library working days in a years:

1.10.3 How many books are issued in a day:

1.10.4 Tick Mark (✓) on the Issue-return System used in the Library

1.10.4.1 Nevark System ( )
1.10.4.2 Brown System ( )
1.10.4.3 Barcode ( )
1.10.4.4 Other ( )

1.10.5 Tick Mark (✓) which type of method use in Library.

1.10.5.1 Open Access ( )
1.10.5.2 Closed Access ( )
1.10.5.3 Mixed Access ( )
1.10.5.4 Other ( )

1.11 Tick Mark (✓) on the classification system used in the library.

1.11.1 C.C. ( )
1.11.2 U.D.C. ( )
1.11.3 D.D.C. ( )
1.11.4 Any other ( )

1.12 Tick Mark (✓) on the cataloguing system followed in the library.

1.12.1 C.C.C. ( )
1.12.2 AACR ( )
1.12.3 Computerized ( )
1.12.4 Any other ( )

1.13 Details of the courses available in the college

No.	Course	Graduation (Starting Year)
A		
B		
C		
D		
E		
F		
G		

1.14 Type of Library Users

No.	Users	Users (Number)
1	Post Graduate Faculties	
2	Under Graduate Faculties	
3	Post graduate Students	
4	Under Graduate Students	
5	Research Scholars	
6	Non-teaching staff	
7	Others	

2. **Library Collection :**

2.1 No. of Books (up to 31-03-2007) _____

2.2 No. of periodicals Subscribed (up to 31-03-2007)

National : _____

International : _____

Total : _____

2.3 E-Resources:

1) _____ (2) _____

3) _____ (4) _____

5) _____ (6) _____

7) _____ (8) _____

9) _____ (10) _____

2.4 Which type of Reading material is available in your library (Please √)

No.	Description/Particulars	Tick Mark
1	Books	( )
2	Journals	( )
3	Dissertation/Theses	( )
4	Reference books	( )
5	Pamphlet	( )
6	Research Report	( )
7	Institution yearly report	( )
8	Standards	( )
9	Manuscripts	( )
10	Others	( )

3. **Information Services:**

3.1 Does your library provide the following Services (Please Tick mark)

1. Document issue/return service ( )
2. Inter Library Loan Service ( )
3. Reference Service ( )
4. Indexing Service ( )
5. Abstracting Service ( )
6. Literature Search Service ( )
7. Translation Service ( )
8. Bibliographic Service ( )
9. Referral Service ( )
10. Current Awareness Service ( )
11. Selective Dissemination of Information ( )

12. On Line Service ( )
13. News Paper clipping Service ( )
14. Documentation Reproduce Service ( )
15. Users awareness Service ( )
16. Internet / E-mail ( )
17. Photocopying Facilities ( )
18. Others ( )

4. Intranets and Internet Infrastructure

1. Does your Institute have Campus LAN? **Yes** [ ] **No** [ ]

2. Spread of Campus LAN: How Spread out Your Campus LAN is? (please ✓)

2.1. Restricted to Computer Centre [ ]
2.2. Restricted to Computer Centre + Library [ ]
2.3. Restricted No. of Connections in Departments [ ]

3. Whether the library has an independent Library Network? **Yes** [ ] **No** [ ]

4. Whether the library is part of Campus Network? **Yes** [ ] **No** [ ]

7. Is your Library a member of a Library network? **Yes** [ ] **No** [ ]

If yes, please ✓

8.1. INFLIBNET [ ]
8.2. DELNET [ ]
8.3. BONET [ ]
8.4. ADINET [ ]
8.5. MALIBNET [ ]
8.6. PUNENET [ ]
8.7. CALIBNET [ ]
8.8. MYLNET [ ]
8.9. MANLIBNET [ ]
8.10. Any Other [ ]

9. Is your Campus Network / Library Network connected to INTERNET?
Yes [ ] **No** [ ]

10. Type of Internet Connection (please ✓)

10.1. Dial-up [ ]
10.2. Leased Line [ ]
10.3. V-SAT [ ]
10.4. Radio link [ ]
10.5. Cable Network[ ]
10.6. Any Other [ ]

11. Internet Connection Speed: _____

12. Does your Institute have a Web Site? **Yes** [ ] **No** [ ]
If answer to Question 12 is yes:
12.1. Is Library represented on the Institute Web Site: **Yes** [ ] **No** [ ]
12.2. Do you host your web site on your own server or is it hosted by a hosting service / Your ISP? _____

5. Library Automation

1. Does the library subscribe to abstracting services on line

1.1. Physical Abstracts:	**Yes** [ ]	**No** [ ]
1.2. Chemical Abstracts:	**Yes** [ ]	**No** [ ]
1.3. Biological Abstracts:	**Yes** [ ]	**No** [ ]
1.4. Medline:	**Yes** [ ]	**No** [ ]
1.5. Science Direct:	**Yes** [ ]	**No** [ ]
1.6. Dissertation Abstracts:	**Yes** [ ]	**No** [ ]
1.7. Any other:	**Yes**[ ]	**No** [ ]

2. Is your Library Using a Integrated Library Software for Computerization of Library? **Yes** [ ] **No** [ ]

3. If the answer to Question 2 above is No, what steps are you taking to get the Integrated Library Software (please ✓):

3.1. In-house Development	[ ]
3.2. Purchase from Commercial Software Vendor	[ ]
3.3. Approach Your Library Network	[ ]
3.4. Any Other (Please specify)	[ ]

4. If the answer to Question 2 above is Yes, which Library Software is being used? (please ✓):

4.1. CDS/ISIS / WINISIS	[ ]	*4.2.* Libsys	[ ]	*4.3.* SOUL	[ ]
4.4. TRIM	[ ]	*4.5.* TLMS	[ ]	*4.6.* Suchika	[ ]
4.7. Librarian Suite	[ ]	*4.8.* LIBRIS	[ ]	*4.9.* NIRMALS	[ ]
4.10. PALMS	[ ]	*4.11.* TROODON	[ ]	*4.12.* SANJAY	[ ]
4.13. SLIM++	[ ]	*4.14.* ALICE	[ ]	*4.15.* TECHLIB PLUS	[ ]

*4.16.*Others (Please specify)_____

5. Whether the Library Software is a Network version? **Yes** [ ] **No** [ ]
6. Whether the Library Software has online help for Users? **Yes** [ ] **No** [ ]
7. Level of Library Computerization (please ✓)
   - *7.1.* Fully Computerized [ ]
   - *7.2.* Partially computerized [ ]
   - *7.3* In the process of computerization [ ]
   - *7.4* Not known at this point of time [ ]

8. Which sections are computerized (please ✓) (If yes, please specify %)

8.1. Acquisition	[ ]	*8.7.* CAS	[ ]
8.2. Cataloguing	[ ]	*8.8.* Others	[ ]
8.3. OPAC	[ ]	*8.9* SDI	[ ]
8.4. Serials	[ ]	*8.10* Digitization	[ ]
8.5. Circulation	[ ]	*8.11* In dest	[ ]
8.6. Stock Verification	[ ]		

9. Whether your library has introduced barcode technology? **Yes** [ ] **No** [ ]
10. If yes, mention the functions activated using barcode technology (please ✓)
    10.1. Annual Stock Verification [ ]
    10.2. Circulation [ ]
    10.3. Any Other [ ]

11. Do you use any other technology (like smart card, magnetic strips for theft detection, etc)
    (Please specify)_____
    _____

12. Did you receive financial support form the following funding agencies for Library Computerizations. If "Yes", mention the amount received:

    12.1. AICTE [ ] *12.2.* INFLIBNET [ ] *12.3.* MHRD [ ]
    12.4. UGC [ ] *12.5.* DST [ ] *12.6.* DBT [ ]
    12.7. Any Other (Pl Specify) [ ]

13. Budgetary Allocation for IT Applications:

Please indicate the amount spent on IT applications in the library during the last five years:

Year	Amount spent on IT	Total Library Budget
2006-2007		
2005-2006		
2004-2005		

14. Do you feel that the amount given for IT applications in the library is sufficient?
    Yes [ ] **No** [ ]

If no, please specify briefly the alternative sources being explored by you to meet your requirements and your plans for implementation (Please use separate sheet, if required).

_____
_____
_____
_____
_____

15. In your opinion has the automation brought any savings in the library?
    (Please√)

    *15.1.*Automation helped to manage the library with limited manpower [ ]
    15.2. Able to provide better services [ ]
    15.3. Saves lot of time, both of user and staff [ ]
    15.4. Able to generate funds through the library service, etc. [ ]
    15.5. Any other savings (please specify briefly).....

6. Services

The following questions are asked to find out the extent of new service introduced in your library using IT tools.

1. Do you provide following services using the state of-the-art Information Technology tools?

(Please √)

1.1	Provide access to library OPAC	[ ]
1.2	Generate reminders for books overdue	[ ]
1.3	Provide recent additions list	[ ]
1.4	Provide individual alert services	[ ]
1.5	Provide Users information on the status of issue/return date etc.	[ ]
1.6	Provide CD – ROM database services	[ ]
1.7	Provide Contents page service	[ ]
1.8	Provide Electronic Reference Service	[ ]
1.9	Provide Online access to databases	[ ]
1.10	Provide Access to Internet in the Library	[ ]
1.11	Provide Access to other library databases	[ ]
1.12	Provide Access to electronic journals service	[ ]
1.13	Provide Access to Internet resources through Library portals	[ ]
1.14	Provide Access to metadata repositories	[ ]
1.15	Any other services (Please specify)_____	

2. With the introduction of new services using IT in the library, the overall library services have (Please√):

Improved [ ] No change [ ] Decreased [ ]

7. Library Digitization Programme

1. Size of collection available for digitization (where the copyright is held by you and the collection is used extensively; please indicate in terms of numbers)

1.1. Ph.D. Theses _____
1.2. M.Phil Theses _____
1.3. Masters Degree Dissertations _____
1.4. Technical Reports _____
1.5. Journal published In-house _____
1.6. E- Journals _____
1.7. E-Books _____
1.8. Other Collections proposed for Digitization_____

2. Is your staff familiar with the steps involved in the process of digitization from data capture to making them available on the web? **Yes [ ] No [ ]**
3. Is it mandatory for research students to submit a copy of their thesis to the Library? **Yes [ ] No [ ]**
4. Does the Library receive the copy of all the theses? **Yes [ ] No [ ]**
5. Do you have plans for getting your current theses submitted in electronic form? **Yes [ ] No [ ]**

6. What is your estimate about digitization of your library? (Please √)
   - *6.1* Fully digital [ ]
   - *6.2* Partially digital [ ]
   - *6.3* In the process of digitization [ ]
   - *6.4.*Not known at this point of time [ ]
7. Is your library a part of digital network? **Yes [ ] No [ ]**
8. Does your library provide access to:
   - *8.1.* Registered members: **Yes [ ] No [ ]**
   - *8.2.* Both registered and outside members: **Yes [ ] No [ ]**

8. Human Resource Development

1. Do you have manpower trained in the use of IT tools in the library?
   Yes [ ] No [ ]
2. If *"Yes"* Please indicate number of persons trained in your library against each category.

Type of Category	*No. of Persons*
2.1 Handling Hardware	_____
2.2 Maintaining Operating System	_____
2.3 Handling Library Application Software	_____
2.4 Working of Word Processing Packages	_____
2.5 Internet Search	_____
2.6 Web Page Design	_____
2.7 Any Other (Please specify)	_____

9. Managerial Skills of the Library Professionals (Please √)

Sr. No.	Skills	Excellent	Very Good	Satisfactory	Poor
1.	**Planning & Forecasting skills**				
2.	**Independent Decision Making Skills**				
3.	**Leadership Skills**				
4.	**Self Confidence & Supervision Skills**				
5.	**Time Management**				
6.	**Authority & Responsibility**				
7.	**Directing Skills**				
8.	**Interpersonal & Human Relation Skills**				
9.	**Conflict Resolution Skills**				
10.	**Motivation**				
11.	**Problem Solving Skills**				
12.	**Co-ordination Skills**				
13.	**Developing Team Sprit**				
14.	**Motivational Skills of Superiors**				
15.	**Job Satisfaction and Recognition**				

10. Organizational Assistance / Implementation of Computerization

1. With the introduction of IT in the library, the Image of the Library has (Please √):
   Improved [ ] No change [ ] Worsened [ ]

2. How do you place the library as compared to other departments within the organization in the implementation of IT:
   Ahead [ ] Equal [ ] Behind [ ]

3. How is the organizational support towards library? (Please√)
   Very good [ ] Good [ ] Not to the extent [ ]

4. Do you find your faculty and students are in favour of increased application of IT in library? **Yes** [ ] **No** [ ]

5. Do you take users feedback regarding performance evaluation?
   Yes [ ] **No** [ ]

   If yes, what are users' views regarding library automation? (Please specify)_____

11. Preparedness and Future Plans

With the introduction of Information Technology, please indicate the following in your case **(Please√)**

1. Is library staff willing to accept the changes being brought by IT in the library?
   Yes [ ] **No** [ ] **Not to the extent** [ ]

3. Does your library have adequate trained staff to handle IT based services?
   Yes [ ] **No** [ ] **Not to the extent** [ ]

4. With existing staff structure, can you further introduce new IT tools in your library? **Yes** [ ] **No** [ ]

5. Do organization support with required resources to modernize the library?
   Yes [ ] **No** [ ]

6. Do faculty and students feel comfortable with the use of computer-based services? **Yes** [ ] **No** [ ]

7. Do you feel your library needs a person with basic degree in computer science?
   Yes [ ] **No** [ ]

8. If ***'No'*** do you feel that a librarian with professional degree in Library Science can handle IT based services in the library better? **Yes** [ ] **No** [ ]

9. Do you have the provision for publishing the Annual Report of the Library?
Yes [ ] **No** [ ]

10. Do you have the provision for upgradation of Professional/Technology skill?
Yes [ ] **No** [ ]

17. If '**Yes**' (Please specify briefly)_____

18. Does your organization have action plan for overall modernization of library services? **Yes** [ ] **No** [ ]

19. If '**Yes**' (Please specify briefly)_____

Any other (Please specify briefly)_____

12. Any suggestion (Please write, if have any suggestions)

Many thanks for taking out your time and responding.

Please send this questionnaire to:

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