Impact of Technology on Quality of Services In Technical and Management Libraries In Karnataka.

Sponsored by
Dept. of Scientific and Industrial Research, Govt. of India, New Delhi,
Under
Technology Information Facilitation Programme Scheme.

Final Report- 2007

By

Dr. Manjunatha K
Principal Investigator

Dr. Rekha D Pai
Co-Investigator

Dr. Saji K Mathew
Project Advisor

T.A. Pai Management Institute
Manipal- 576 104, Karnataka.

T.A. Pai Management Institute
Manipal – 576 104
Udupi Dist., Karnataka
Phone: 0280-2571358, 2573162
Fax: 0820-2570622
Email: tapmi@mail.tapmi.org
Website: http://www.tapmi.org

Director: Dr. Nagabrahmam, (Fellow IIMA),
Phone: 0820-2570361 Fax: 0820-2570699
Email: director@mail.tapmi.org; nagabrahmam_d@mail.tapmi.org

Project Team:

Principal Investigator
Dr. Manjunatha K
Librarian
T.A. Pai Management Institute
Manipal – 576 104
Phone: 0820-2573551
Email: manjunath@mail.tapmi.org

Co-Investigator
Dr. Rekha D. Pai
Sr. Librarian
Manipal Institute Technology
Manipal - 576 104
Phone: 0820-2571201-Ex. 24451
Email: rekha.pai@manipal.edu

Project Advisor
Dr. Saji K. Mathew
Asst. Professor
T.A. Pai Management Institute
Manipal – 576 104
Phone: 0820-2571358
Email: saji@mail.tapmi.org

FOREWORD

The research project sponsored by DSIR, New Delhi has resulted into a fine report on **"Impact of Technology on Quality of Services in Technical and Management Libraries in Karnataka".** I have gone through the pages quickly and found the methodologies of the research are robust and obviously the quality of results. Interestingly, the results have a significant bearing of both relevance and utility. It seems to me that the results could be implemented relatively easily by many of the technical and professional libraries in the country. In one sense, the report has acquired quality because of the team that has worked on it. All three of them are professionals in their respective fields and particularly the added value by the Project Advisor.

All in all, the work put in by team for this research project is commendable and hope that this report find its place for application and use. The interface of customer satisfaction, services rendered by Knowledge Centers and the impact of technology is quite evident and at the same tine interesting. The results amplify adequately the approach and the interface.

I take this opportunity to commend the efforts of the team particularly the Principal investigator whose unbounded enthusiasm and active involvement made the difference. I wish to congratulate the entire team for this quality work and the report.

Dr. D. Nagabrahmam
Director

A C K N O W L E D G E M E N T

Research is teamwork. So many have made this research possible and without their help this project would not have completed.

I express my gratitude to the authorities of Department of Scientific and Industrial Research-Technology Information facilitation cell, Govt. of India, New Delhi for awarding this project to T.A. Pai Management, Manipal (TAPMI) with financial support to be carried out in Karnataka.

This project would have been a distant possibility without the strong support of Prof. D. Nagabrahmam, Director of TAPMI who is also chairman of this project. I express my sincere thanks to him for his unwavering support and encouragement right from the initial stages of research. I thank Dr. Bino Paul (Asst. Professor, TAPMI) and Dr. Sreekumar Nair (Prof. & Head, Dept. of Statistics, Manipal University) who offered valuable suggestions and guidelines during research methodology and data analysis. I thank Prof. Vasudev Rao (Dean-Admn, TAPMI), fellow faculty members and staff who helped me in carrying out the research efficiently.

I thank the esteemed members of Project Review committee: Smt. Sreedevi Ravindran, Scientist-G, DSIR; Sri. Varun Kumar, Scientist-F, DSIR; Sri. Chikkamallaiah, Librarian, Indian Institute of Management Bangalore; Sri. Muddu Moolya, Librarian, National Institute of Technology Karnataka, Surathkal; Dr. Shivanand Bhat, Librarian, Manipal Academy of Higher Education(Deemed University), Manipal; Sri. N.C. Karishetti, Librarian, Manipal Institute of Technology(MIT), Manipal(Currently Retired); Smt. Vidya Patwardhan, Librarian, Welcome Group Graduate School of Hotel Administration, Manipal for their active participation and valuable inputs for the smooth conduct of this project.

I am indebted to project team members Dr. Saji Mathew-Project advisor (Asst. Professor, TAPMI); Dr. Rekha Pai- Co-investigator (Sr. Librarian, MIT, Manipal), Mr. Ramesh Kamath-Project associate (Documentation Officer, TAPMI) and Vasu Nayak, Muralidhara, Srinivas, Raghunath and other colleagues of TAPMI for their involvement and dedication throughout the project. My thanks are due to many professional colleagues in other reputed libraries for their suggestion and valuable inputs during Conceptualization, Questionnaire design and Pilot study.

The cooperation and support of library professionals in Technical and standalone Management Institutes in Karnataka was exemplary for providing relevant data input on their library resources and services. I thank all the fellow librarians and their authorities for their whole-hearted support and cooperation in providing the data inputs.

This study received priceless responses from users of Engineering and Management Institutes in Karnataka. I place on record my special appreciation to fellow librarians, faculty members and head of departments of respondent institutes who helped us greatly to contact cross section of library users for data collection.

The study also received valuable responses for from users of IITs and IIMs for Online-Survey. Despite technical difficulties the users particularly from Karnataka have responded to online survey indicating their concern towards the development of the library. I express my gratitude to all the respondents who have gone through each statement carefully and provided accurate data to the questions. I am grateful to all others who helped for the smooth conduct of this project. I owe my gratitude to my wife, children who gave me moral support for this research.

Dr. Manjunatha K
Principal Project Investigator

Table of Contents

Impact of Technology on Quality of Services in Technical and Management Libraries in Karnataka.

Executive Summary

Technology, in particular information and communication technology (ICT), is affecting and transforming all key functions of libraries. The tools and techniques of information gathering and delivery are undergoing sea change. The need of hour is to enhance the quality of library services by incorporating IT supported resources and services for customer service. The journey to quality starts with quality product, service-oriented personnel, excellent services and ends with equally interested customers to receive them.

The primary objective of this study is to understand the status of technology supported resources, services and customers' perceptions of quality of the same in Technical and Management libraries in Karnataka.

The research project was carried out in three phases. The first phase was related to data collection on IT supported resources and services provided by the libraries of Technical and Management Institutes in Karnataka. Of 153 libraries, the study received 116 responses resulting in 75.8% of response rate. In the second phase, data related to customer expectations and perceptions of services provided in their institute library were obtained from a cross section of users of select Technical/Management libraries in Karnataka. It also received 1697 responses from a cross section of users' community (faculty, research scholars and postgraduates) in select technical and management libraries. An attempt has been made to obtain library data from IIT/IIM websites and to obtain customers' perceptions of quality of library services from a cross section of users for the purpose of benchmarking. The study also obtained 703 responses from users of IIT/IIM libraries through web-based survey. The third phase involved analysis, interpretation and presentation of major findings of the study.

The results of the study show that there is wide gap in resources and services provided by respondent libraries in Karnataka as compared to the same available in IIT/IIM libraries. It also observed a gap in customers' perception of quality of library resources and services against their expectations. The study identifies some features that could influence customers' expectations and their perceptions of service quality. The customers' satisfaction level, past experience, word of mouth, preference attached to institute library, opinion about adequacy of resources do have positive impact on customer expectations and perceptions. More details of investigation and a few specific recommendations are presented in the body of the report.

The results of the study are revealing, and invite attention of institutions and policy makers for devising appropriate action plans. The study will be fruitful and successful if the recommendations suggested in this report are considered favourably by concerned authorities and implemented for the benefit of libraries, which in-turn support the academic community in the state/country.

Chapter 1
INTRODUCTION

1.1 BACKGROUND:

Traditionally, the library is a physical place where collection of information resources in various formats (books, journals, videos, CD-ROMs, etc.) is organized in a specific manner to meet the needs of a specific user or user groups. It is a service organisation with both tangible and intangible assets. The tangible assets constitute physical document, and the human resources. The intangible assets comprise the invaluable services rendered by the library staff. The library plays an important role in the academic world by providing access to world-class information resources and services, and stimulates academic research in the country.

Access to information is not a new phenomenon but it exists through ages. Libraries being the centre for information storage and retrieval did exist from ancient times in one form or the other. The libraries have transformed from museums to digital libraries over the time due to intervention of various technologies. The invention of ink, paper, printing technology and information and communication technologies (ICT) are the major technological milestones in the history of library transformation. The printing technology helped the mass production of books and other printed materials and brought them to the portals of the library as primary storage media. As science and technology advanced, the print media was augmented by non print media such as microfilms, audio-visual aids, magnetic tapes and CD ROMs as the medium of information storage and retrieval. Since 1950s the developments in ICT induced traditional libraries to transform to digital libraries incorporating documents available in electronic formats. The library transformation can be pictorially represented as shown in fig.1.1

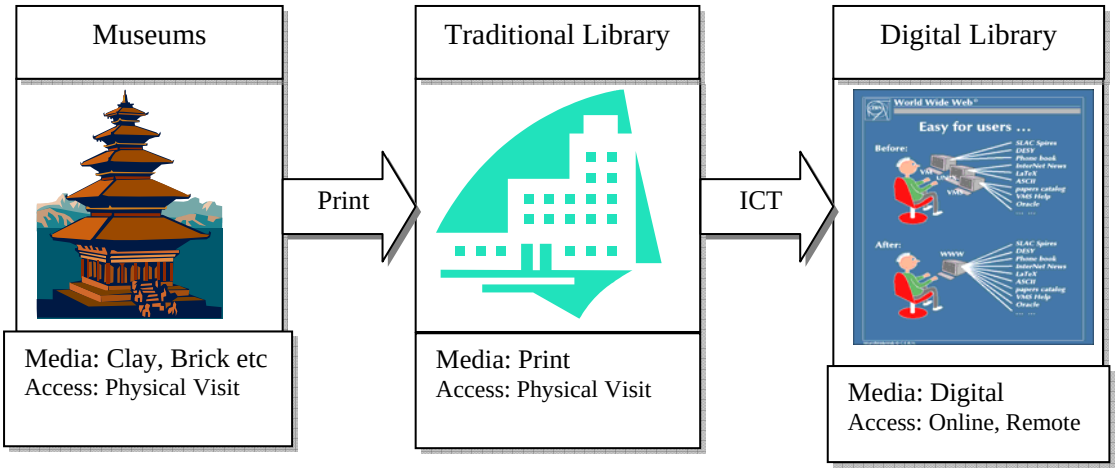

Figure 1.1: History of library transformation

1.2 CURRENT TECHNOLOGIES IN LIBRARIES:

From ancient times, library is the laboratory for testing or experimenting one or the other technology related to knowledge production, storage and processing. Duplicating/photocopying machines, book binding, open-racks, card catalog/cabinet, and card punching are some of the examples for use of technology in libraries.

Invention of computer is the great contribution to libraries and its introduction was traced in early 80's in libraries. It has transformed almost every aspect of how the library provides its services and performs its work behind the scenes. This resulted in automation of library in-house operations, open public access catalogue (OPAC), remote access, digitization, and creation of digital libraries. The issues related to current technology discussed or addressed by the present day libraries are:

- Digitization of special collections, establishing institutional depositories, Use of automated electronic collection management software,
- Implementation of wireless and mobile technologies for all time remote/campus-wide access,
- Bar-coded library transactions,
- CD mirror servers and accessing CDs available on network;
- Application of RFID in Library security systems,
- web site development, web-programming and management of the same, integration of web OPAC and integration of multi language on single platform,
- Production and Use of e-books and e-journals,
- Services for distance learning students, disabled/handicapped
- Technology education, training and instructional/education technology to support teaching and learning, and
- Development of technology centres and promotion of information literacy.

1.3 FACTORS AFFECTING THE LIBRARIES:

Many factors are responsible for a change in the landscape of libraries; a single factor cannot change the situation entirely. Libraries have changed from time to time and they have to change in the future too. Some of the important factors as illustrated in fig.1.2 that helped the libraries to change are information explosion, growth in publications, customers' expectations, rising expenditure and shrinking resources, rise of competitors, information technologies and digital based resources.

a. **Information Explosion:** Information explosion is a term that describes the rapidly increasing amount of published information and the effects of this abundance of data. As the amount of available information grows, it becomes difficult for managing and leading to information overload.
b. **Growth in Literature and Digital Resources:** The information explosion has resulted in increased production of books, journals; reports etc. these resources are being augmented and supplemented by digital resources and the publishers of such resources are forcing readers/librarians to purchase the e-resources. There is a gradual shifting of libraries towards acquiring digital resources either independently or collaboratively under consortia based agreement.

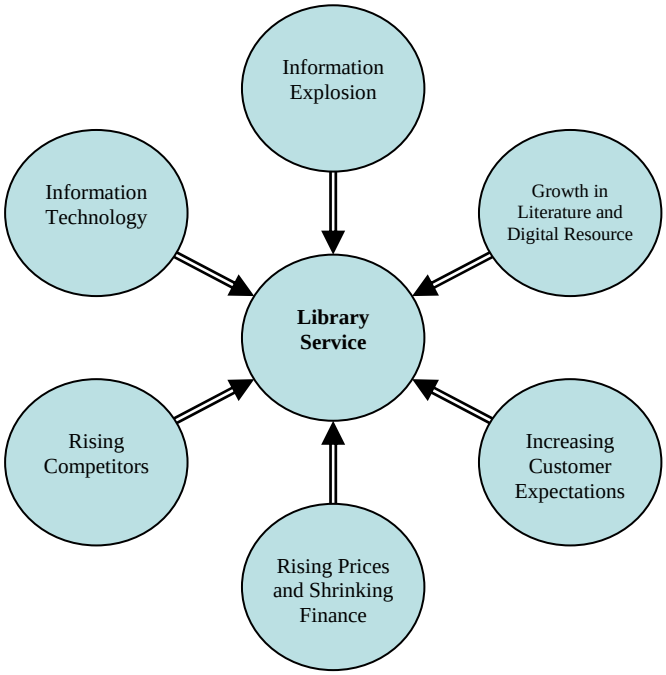

Fig. 1.2: Factors that Influenced Libraries

c. **Customer Expectation:** The customers' expectations are not static, they are ever changing. The primary objective of the library is to serve customer or user better to satisfy his/her needs. In this age of information technology the readers' priorities are shifting from the print media to electronic media, as vast information is available in electronic media accessible from remote area. Today they expect fast access to desired information, speedy retrieval and immediate response to the query.

d. **Rising Prices and Financial Stringency:** The escalating price of information products and shrinking financial resources are forcing the librarians to allocate the budget more judiciously and ensure the optimal utilization of library resources and services. This is pushing the librarians forward towards consortia, and electronic networks for effective resource sharing.

e. **Rise of Competitors:** The internet and other IT facilities on the one hand facilitate the libraries to process and retrieve information at a very fast rate. But on the other hand, the remote access has become a threat to libraries by driving customers away from the libraries. Further, the commercial and non commercial information service providers are becoming competitors to libraries.

f. **Information Technology:** Rapid advance in ICTs in the past two decades have brought revolutionary changes in the concept, organization, functioning and management of library and information systems throughout the world. The accelerating pace of technological developments has tremendously increased the ability to access, store, process, communicate and deliver information services in libraries

1.4 IMPACT OF TECHNOLOGY ON LIBRARY SERVICES :

In academic environment, library is a place of intellectual stimulation and knowledge centre. It holds thousands of results of past research studies providing scope for further research. Until 1980s, the information seekers were greatly dependent on print resources and libraries were unique places for provision of such information. The past two decades have seen a great deal of change due to ICTs resulting in a demand for new patterns of scholarly information. These technological advancements have made significant impact on the growth of knowledge and unlocking of human potential. In library environment, the impact is clearly visible on information resources, services, and people. Some of the notable impacts have been illustrated in Fig.1.3.

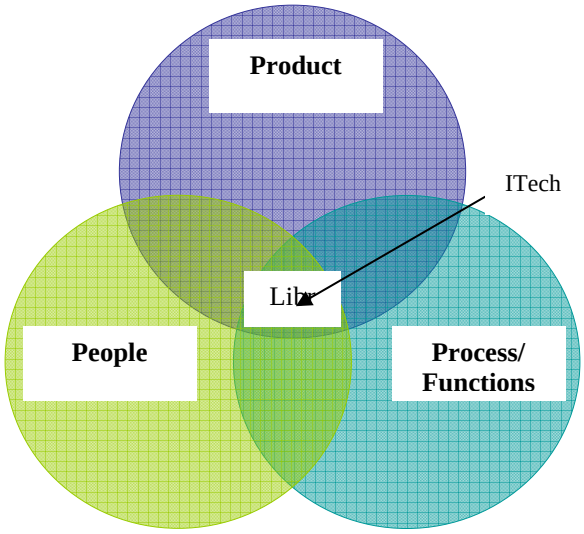

Fig.1.3: Impact of Technology on Libraries

Product:

i. **Changing document collections:** In the past the word collection referred mostly to the print materials. Today a library collection goes beyond the print materials and includes the CD-ROMs, audio videocassettes, e-books, e-journals also;
ii. **The Storage media:** The traditional paper as medium of storage is getting replaced with electronic media such as tapes, CDs/DVDs, and WebPages;
iii. **Format:** the traditional text format is being enriched by graphics and voice.

Process/ Functions:

iv. **Automation of library in-house operations:** Many in-house operations in the library like book acquisitions, processing, circulations, maintenance, reminders, and serials management are repetitive in nature. The need for automation arises as to reduce the effort and time required for these jobs. In addition to these regular functions, there are occasional functions like preparation of statistical reports. Computers are used in creating databases of information to form a basis for retrieving the relevant information when required by the user. The statistical reports related to transactions, budget expenditures, and other key issues can be generated with ease. There are many commercially available softwares for library automation;

v. **Resource sharing:** The ICT has helped in establishing networking. The library networking and resource sharing is more often carried out effectively through Internet and intranet. Library networks have expanded the limitation of the scope of resource sharing from inter library loan and document supply to sharing materials, functions, services and expertise. Many networks across the globe have been working successfully for the cause of information exchange. In India INFLIBNET, DELNET, INDEST and many regional level consortium are in action;

vi. **Reprography:** The invention and entry of reprographic or duplicating techniques into the portals of libraries made many things easier for libraries as well as the readers. This helped the readers to get the copies of the documents and to reproduce rare/torn out books. , this also helps to save the library budget spent on purchase of back issues of journals or reprints, to preserve the handwritten manuscripts;

vii. **Communication:** The advent of communication technology has revolutionized the activities of library and information system. Today the internet provides efficient means of communication and Libraries/librarians are using it extensively to communicate with vendors of library products and services, scholars, researchers, and users via email;

viii. **The Internet technology** gave birth to another powerful media called e-discussion forums. These forums connect people for networking, exchange the information and solutions to problems and navigate documents all over the world;

ix. **Search engines and instant message:** The emergence of free search engines like Google, Yahoo, and MSN, do provide wide scope for information search across the globe and connecting many people instantly;

x. **Quality of Service:** Application of information technology has contributed immensely for the improvement in provision of quick, quality services in the libraries. By providing quality service the libraries try to achieve customers' satisfaction.

People - Customers/ Users:

xi. **Choice of Sources:** The technology has enabled the users to have multiple sources of information such as internet, commercial information service providers. As a result, the library is not the only source of information provision for information seekers;

xii. **Death of Distance:** The emergence of the internet has paved the way for access to global information trespassing all geographical barriers;

xiii. **Diminishing Time-zones:** The present day information seekers can obtain the information overcoming the time barriers;

xiv. **Remote Access:** currently, information seekers can access the worldwide information across the globe through their desktops without any time limitations(24 x 7 x 365 days);

xv. **Basic Skills:** unlike in past the current users need to possess basic technical skills to access the information in electronic media;

xvi. **Online Search:** another impact is access to variety of commercial and non-commercial information sources including bibliographic and full text databases, tables of contents of primary journals, electronic and online journals, books and newsletter, library catalogues and Open Public Access Catalogue (OPAC), graphics databases etc. Now through network one can access a remote computer

and use it interactively as if the local computer were a terminal of that host machine. Automatic indexing, SDI and CAS activities are added services to the IT based library services

People - Staff:

xvii. **Duties and Responsibilities of the Library Professionals:** In this age of information technology the duties of library professionals have changed. Earlier the librarians were considered as the custodian of books or information. The changing environment forces the librarian to restructure their library to suit the requirements of their customers. Today the libraries require a dynamic librarian, who is ready to accept the changes and challenges.

Thomas Frey, Executive Director of the DaVinci Institute, Colorado (Frey, 2005) traced ten key changing trends like i) communication systems, ii) replacement of existing technology by new one, iii) size of storage device, iv) search technology, v) time compression of readers, vi) verbal society, vii) demand for global information, viii) global systems, ix) transition from product economy to experience economy, and x) library as cultural centre that are affecting the development of the next generation library. He also mentions that these are not the only trends, but ones that have been selected to give clear insight into the rapidly changing technologies and equally fast changing mindset of library patrons.

1.5 QUALITY IN LIBRARY AND INFORMATION SERVICES :

Quality is a critical factor for achieving success in any organisation. The concept of quality is not a new phenomenon for LIS professionals as it is rooted in library principles and activities. Though explicitly not stated, Ranganathan's Five Laws of Library Science, particularly the Fourth Law (Save the time of reader) implies the importance of quality in library services. The law emphasises that library administration be simple and efficient to save users' time. Knowledgeable staff provides seamless access to information regardless of format, whether the user is in the library or at a remote location.

Historically, the quality of library has been measured in terms of size- its collection, budget and manpower. Many librarians believe that quality is directly related to the size of the budget. In recent past, this concept has been changed towards the nature of service rendered by the libraries and not merely on the collection and size. However, in the present day context, listening to the voice of the customer is very important and the reliance on the traditional methods might not be sufficient to assess the quality and effectiveness of the library from customers' perspective.

Service quality is one of the most talked about topics in business as well as service sectors. In services marketing literature, service quality is viewed as the comparison of what the customer expected prior to the use of services and the perceived level of services received. The foremost principle of quality management is customer focus, which means meeting and exceeding customer requirements and expectations. Although the concept of quality is not new, measuring service quality as a management technique has gained importance over the last few decades in service industries.

The service quality measurement has greatly benefited from the marketing area and it obtained further thrust with the movement triggered off since 1980s by management experts like Gronroos, Garvin, Cronin, Taylor, Teas, Rust, Parasuraman, Zeithaml, and Berry. Their researches resulted in development of service quality models. Extensive research studies on service quality carried out by the team of Parasuraman, Zeithaml and Berry have led to the identification of five evaluative criteria or dimensions namely *Tangibles, Reliability, Responsiveness, Assurance and Empathy* that customers use in judging the service quality

Building on the concepts of service quality dimensions, Parasuraman and his team developed a model popularly known as 'gaps model', which conceptualises service quality on the basis of the difference between customers' expectations with respect to the five dimensions and their perceptions of actual services delivered. The difference between perception and expectation is characterised as a 'gap'. They devised a conceptual framework called 'SERVQUAL' - to measure these gaps. After decades of intense research in various service industries, the instrument designers suggest that SERVQUAL provides a basic skeleton and it can be adapted to any service organisation to measure service quality with appropriate supplements to fit the nature of service provided. Since its conceptualisation in 1985 and refinement in 1991, many researchers have used SERVQUAL in service industries including library services to measure service quality from customers' point of view. Studies using SERVQUAL in academic, public and special libraries have varied from testing one service (Inter Library Loan) to testing the whole range of services.

The research studies conducted in past on service quality in library setting by Francoise Hebert, Marilyn White, Eileen Abels, Danuta Nitecki, Peter Hernon, Pey Lin Tan, Schubert Foo, Ellen Altman, Christopher Millson-Martula, and Mitch Walters. Cardiff University Library, Sterling Evans Library and Virginia University Library have carried out many library user-surveys on service quality. The Association of Research Libraries (ARL), Washington, USA, has developed LibQUAL+ an adapted model of SERVQUAL and it is available for member libraries to conduct web-based surveys for assessing service quality.

The concept of service quality in Indian library scenario is still in its infancy. Pioneering work has been done by Indian Institute of Management, Ahmedabad by organising a seminar on Service quality in mid 1980s. The IASLIC conference is another landmark. Few conferences have been organised on marketing of library and information services. Manjunatha and Amrith Sherigar have conducted empirical researches on service quality in academic libraries for their doctoral degrees.

1.6 NEED FOR THE STUDY:

Today’s academic libraries are confronted with challenges on several fronts: Information availability, rising costs, mega bookstores, online information providers, multimedia products, document delivery services, and other competitive sources of information are apparently threatening their role and even their very survival. With evolving technological innovations and the variety and abundance of information that is becoming available to information users, competitive pressures will continue to intensify for academic libraries. The products/ services introduced in library should match the requirements of intended users. A research study conducted by Manjunatha (Manjunatha

and Shivalingaiah, 2000) revealed that the majority of services were introduced based on librarians' past experience. There was little attempt to assess new services from users' perspective. Thus a study on assessing the impact of IT-based services on library's efficiency would definitely be beneficial for library administrators and policy makers to adopt appropriate services in their library.

Professional education, particularly technical and management education have gained importance in India and private organizations are participating in large number to establish institutions of higher learning. Professional education does require and demand many IT supported services from libraries and studying IT based services in those libraries would clearly indicate the impact of technology and becomes model for other types of libraries too.

Currently in India, there are about 1400 engineering/technical colleges and 1000 management institutes approved by AICTE offering degree level courses in engineering and management education with an annual intake of 450,000 and 80,000 students respectively. Karnataka state with its 117 engineering colleges and 86 management institutes constitutes about 10% of total college and student population in the country. Karnataka is one of the developed states in the country and private organizations dominate the technical and management education in the state. These institutions are competing to attract more students by assuring better Infrastructure and academic facilities.

Availability of new facilities in libraries may increase the transactions and demand for services, which in turn require additional staffing, computing facilities and larger collections. Meeting future demand for library services will require careful planning. Thus an in-depth study of IT based facilities and services provided by technical and management libraries in Karnataka would indicate the status of IT and serve as model for conducting similar studies in other states as well. This proposal is an attempt to undertake an in-depth study of technology–aided services and their impact on quality of services in Technical and Management libraries in Karnataka. Currently many of these libraries have technology-aided services and demand for electronic services is high.

1.7 OBJECTIVES OF THE STUDY:

The primary objective of this study is to understand the nature of IT-supported resources, facilities and services provided in Technical and Management libraries in Karnataka and assess quality of those services as perceived by customers. The specific objectives are:

1. To understand the status of information communication technology (ICT) based resources, facilities and services provided by the Technical and Management libraries in Karnataka;
2. To Benchmark them with the facilities and services provided by national level libraries in the same field (IITs/IIMs);
3. To know the impact of IT on library functions as perceived by library professionals and users;
4. To assess customer expectations, perceptions of service quality and gaps in Perceived service quality in libraries; and
5. To suggest measures for bridging the gap.

1.8 SIGNIFICANCE OF THE STUDY

Studying impact of IT in libraries will definitely throw light on current practices in Indian technical Library setting and become a model for reengineering the individual library operations and services.

Though the intended **beneficiaries** of this project are LIS professionals in Technical and Management education, the ultimate beneficiaries are parent organisations and academic community of our nation because:

- LIS professionals will be in a better position to understand the current status of technology
- They make combined efforts to improve the technology base to provide efficient and enhanced services to their users.
- The study also leads an assessment of staffing & training needs, budget implications, policies and procedures, and building/equipment upgradations;
- It facilitates the Government authorities for formulating appropriate policies

The next chapter reviews the related literature on the topic of research.

Chapter 2

REVIEW OF LITERATURE

Today's academic libraries are confronted with challenges on several fronts: Mega bookstores, online information providers, multimedia products, document delivery services, and other competitive sources of information are apparently threatening their role and even their very survival. The new students enter the academic environment with varying library usage and information-gathering skills. Student perceptions and expectations of service from academic libraries also vary, making it imperative to understand and define specific student needs and to provide the type and level of service that meets them. With evolving technological innovations and the variety and abundance of information that is becoming available to information users, competitive pressures will continue to intensify for academic libraries. The last few decades witnessed the growing interest among the librarians to pay more attention to assess the effectiveness and quality of library resources and services focussing on customers' satisfaction.

The review of literature was carried out to understand recent developments of ICT in LIS environment, service quality and its measurements in service industries particularly libraries.

2.1 TECHNOLOGY AND ITS IMPACT ON LIBRARIES

Technology remains one of the primary drivers of change in the ways that people work, seek information, communicate, and entertain themselves. In an academic environment, no unit has been transformed by technology than library. The libraries need to reorganise their physical space to make technology-enabled resources both more readily available and widely used. The penetration of technology in libraries is more visible since the invention of computers. The progress of technology in libraries is briefly explained in the following section.

2.1.1 Brief History and Development of Technology in Libraries:

Libraries today are facing the change at a pace that is unprecedented in History. Technology is the driving force for this change. In 1960s the IBM invented computers for computing scientific calculations. Sun Microsystems (2003) in its white paper on *Information Technology Advances in Libraries* traces the evolution of library automation (http://www.sun.com/edu/whitepapers/pdf/digital_library_trends.pdf). According to this paper, the automation process started its journey in 1970s with the introduction computing machines in libraries for scientific calculations. The next phase was development of integrated library systems (ILS) to perform library functions online and ILS led the emergence of MARC. Networking became a focus during 1980s and network supported ILS softwares developed during this period. This trend required re-education of the library staff, significant cost, more powerful technologies/softwares and networking configurations that were no longer developed in-house. Libraries began utilizing new

application systems for automation of resource sharing, union catalogues and inter-library loan modules.

As the 1980s ended, libraries and computing centres were tackling communications, relational databases, and information distribution challenges. It became key for universities to provide their campuses with communication technologies that wired libraries and classrooms. Intranets provided campus connectivity using TCP/IP communication standards. This permitted interconnectivity of computing resources: servers, PC desktops, and terminals.

With the Internet becoming as defining technology, the 1990s saw greater use of campus communication infrastructures and commercial communication systems to create and store information and then to deliver it 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.

During the period 1998-2002 the Internet, the web, computer languages and tools have matured to enable creation of rapidly increasing number of digital resources that need to be controlled, served and preserved by libraries. Open archives initiative (OAI), metadata, Unicode etc. are the trends during that period. In the recent years the management of digital resources is occupying the prominent place. With resources growing at an exponential rate the ability of patrons to find what they want is more difficult. So, a well arranged collection of e-resources is very essential.

2.1.2 Current trends in Technology in Libraries

While explaining new technologies in libraries Sun Microsystems (2003, p4-6) points that the traditional ILS capabilities have been improved, at the same time entirely new technology tools have been created in response to the growth of electronic library resources. Digitisation and digital media management (DMM), expanded OPAC, virtual reference/reference linking and personalised portals are some of the enhancements of technology.

Thomas Frey, Executive Director of the DaVinci Institute, Colorado (Frey, 2005) traced ten key trends that are affecting the development of the next generation library. He also mentions that these are not the only trends, but ones that have been selected to give clear insight into the rapidly changing technologies and equally fast changing mindset of library patrons.

Trend #1 - Communication systems are continually changing the way people access information:
Trend #2 - All technology ends. All technologies commonly used today will be replaced by something new:
Trend #3 - We haven't yet reached the ultimate small particle for storage. But soon:
Trend #4 - Search Technology will become increasingly more complicated:
Trend #5 - Time compression is changing the lifestyle of library patrons:
Trend #6 - Over time we will be transitioning to a verbal society:
Trend #7 - The demand for global information is growing exponentially:
Trend #8 - The Stage is being set for a new era of Global Systems:
Trend #9 - We are transitioning from a product-based economy to an experience based economy:
Trend #10 - Libraries will transit from a centre of information to a centre of culture: It will not only serve as an information resource, but much more, with the exact mission and goals evolving and changing over time.

Breeding (2005), forecasted the following trends:

- The Integrated Library System(ILS) will be reintegrated;
- The business landscape will change;
- Players in Broader industries will become involved;
- Libraries will consolidate automation efforts and
- The products and services from commercial vendors will continue do dominate.

Davis and Stephenson (2006, p3-4) highlight that 'technological connectivity will transform the way people live and interact' and 'ubiquitous access to information is changing the economies of knowledge'. Klein's (2005) top technology trends on LITA (Library and Information Technology Association) Blog (http://litablog.org/2005/06/leo-kleins-top-technology-trends/) illustrates CMS, Customised websites, Chat e-references, web standards and dynamic web content. Similarly Morgan (2006, http://litablog.org) traced features like web-blogs, social networking, open source s/w, meta-search standards, mass digitization, digital resource management(DRM), licensed content, growing discontent with library catalogue and OCLC expansion as top technology trends for ALA 2006. Whitlatch (2006) in his paper reference futures depicted 'outsourcing, the web and knowledge counselling as future scenario for library reference services.

National Assessment and Accreditation Council (NAAC), a body constituted by AICTE for accreditation of institutions of higher education has published a manual in 2006 (NAAC, 2006) containing case studies of best practices in use of IT in Library and Information services practiced in leading libraries in India. The best practices reported in the manual are:

- Internet Access
- Broadband Internet Centre
- Dynamic Library website
- 24/7/365 access to e-resources
- Free Internet browsing/cyber cafe
- Library Homepage
- Access to digital depository through library website
- Access to internal digital documents

- LAN and Campus-wide network
- Integration of multilingual documents on web
- Membership to local industry/ entrepreneurs
- Use of Standards in database creation
- CD Mirror server
- Digitization of Manuscripts
- Electronic Surveillance
- User Feedback via library homepage
- Web OPAC
- Concession membership for outsiders
- Digital Repositories
- CD NET server
- Complete library Automation
- RFID

Besides, the following are a few of the technologies emerged in Library Management systems:

i) Interlibrary loan modules integrated into the circulation system
ii) E-checking of serials using an Electronic Packing Slip (EPS)
iii) Computer integrated telephony for sending reminders and information on reservations to users
iv) RFID for security, circulation and inventory management systems;
v) Access to OPAC's via mobile devices such as wireless PDA's
vi) CD servers to access virtual CDs on Network

2.1.3 Library Issues in Digital Era

Saurine (2000) points the new technologies and Internets have challenged traditional library services and practices. Hisle's (2002) Task Force Report illustrates that i) Recruitment, education and retention of Librarians; ii) Role of library in academic enterprise; iii) impact of information technology on library services; iv) Creation, control and preservation of digital resources; v) chaos in scholarly communications; vi) support of new users; and vii) Higher Education funding are the top issues facing academic libraries. Sun micro system's (2003) white paper lists some of the issues faced by today's libraries to provide greater information access to users. They are:

- Need for trained staff in technology and traditional library disciplines;
- Investment in continuing education and Budgetary restrictions;
- Physical and digital subscription resources are increasing in volume and cost;
- Growing popularity of Internet as research tool;
- Increased user expectation with widespread use of Internet and
- Need for library's link with other academic departments.

Loriene Roy and Bill Crowe(2006) the 2006 presidential candidates for American Library Association identified i) the need to engage library community with Google and commercial service providers, ii) the challenge of succession plan, iii) challenge of communication library stories to outsiders, iv) need for continuing education and training for library workers, v) tailoring library services to respond to user needs, vi) increasing salaries and benefits of librarians as the issues facing the library community.

Mfrisque(2006) identifies Basic IT skills for staff, knowledge of h/w ,s/w and trouble shooting, online help desk, ability to move/talk with customers, empowering staff, creating technical team, educating staff and users on use of technology and e-resources as some of the core competencies to be addressed by that the library professionals.

2.1.4 Impact of Technology on Library Services

There is no doubt that the technology in particular computers and ICTs have made the most impact on libraries in areas that require the rapid and accurate storage and processing of structured data the ability to operate for 24 hours a day, seven days a week and world wide connectivity and communication. Evans (2000) identifies key areas of recording stock (cataloguing) and its movement (circulation) as those most affected by technological change. Continuing the discussion Evans states that the next step is that of 'seamless inter-lending of material, utilizing the strengths of developing standards and faster and more efficient technologies. Hyde (1997) suggests that in the future, staff will work, not in a physical library, but elsewhere with all electronic access to collections. Debowski (1999) highlights the following key factors in his study:

- Significant advances in technology and increasing costs of journals and other print resources- massive growth in electronic services;
- Budgetary manoeuvres – staffing pared down to essential levels so that infrastructure services may be developed;
- Decreasing numbers of library visitors. Reduced coverage of service points, sustaining basic services whilst offering extended electronic access; and
- Outsourcing- Argument for a more cost effective system.

Orenstein's (2006) paper traces the history of technology movement in library field and discusses in detail the impact of technology on library functions. Few of observations and findings on impact of technology are listed below:

- Till ten years ago, libraries were book focussed institutions. Library acquisitions, cataloguing and circulations were done via or managed by using print ledgers, pens and cards. Spreadsheets, databases or other s/w was never used to manage library data.
- The first major wave came with the advent of digital storage and network technology.
- In early 1990s Public Access Terminals and OPAC became ubiquitous to share information on library holdings. The access was PC-based. Access to holding to the outside world was not shared.
- In 1990s CD-ROMs were invented and used to store large data which were inserted into single use PCs. In other words stand alone versions were prevailing.
- In late 1990s Internet became life blood of information sharing not just for libraries, but for commerce, education, government and general public. High speed networking availability facilitated instant transfer of both text and graphics from one server to another. Storage and access issues eliminated, yet it free for everyone to place anything on WWW resulting in false information.

- While Internet is a wonderful thing it is not a substitute for campus library or librarian. Librarian guide users how to find information whether print or online.
- Rate of distance users increased exponentially challenging librarians to make many resources available online.
- The role of academic librarian in the academic age is to promote access to accurate information to users. However, this role became more complex with information age.
- It is important to note that even with all technical complexity and additional responsibilities, the librarians' core role as gatekeeper of information is unchanged.
- Information searching, preparation of teaching materials, answering queries via technology is the great impact of Internet age.
- The card catalogue replaced with web-based interface as a result the maintenance information was to be handled by technically competent support staff with accurate information. The typographical errors on card catalogues were widely noticeable online. It was also important to note, the online catalogue made accessible anywhere as it is web-based.
- The library staff were identified as knowledge workers.
- One cannot have good education without libraries, and one cannot have good library without good library staff.

Schatz and Chen (1999, p45) point that the public awareness of the net as a critical infrastructure in 1990s has spurred the new revolution of technologies for information retrieval in digital libraries. Further they say that digital libraries are a form of information technology in which social impact matters as much as technological advancement. Cairncross (1997) explaining the speed of Internet and remote access highlighted the death of time and geographical barrier. Further, the open search engines like Google, Yahoo etc. have become all-time powerful search tool for information seekers across the globe.

In nutshell, the past two decades have seen a great deal of change in ICTs resulting in significant impact on information resources, human resources, financial resources, nature of service provision/delivery, user community, and authorities' attitude.

2.2 SERVICE QUALITY and its MEASUREMENT

Service quality is a matter of knowing customers, designing services to meet customers' needs, and finally managing service delivery to customer satisfaction (Brown et al, 1991: viii). Though the concept of service quality sounds very pleasant and much desirable, there is difficulty in arriving at a unified definition of service quality. The problem lies not in finding definitions, but in making sure that in any particular situation, customers and service providers understand each other's definitions. The definition may vary from person to person and from situation to situation (Haksever et al, 2000: 329).

The literature on service quality has focussed strongly on customer requirements the definition of service quality framed by the team of marketing experts Parasuraman,

Zeithaml and Berry (1985, 1988, 1991) appears frequently in service marketing literature. They define the service quality as "The extent of discrepancy between customers' expectations or desires and their perceptions" (Zeithaml, Parasuraman and Berry, 1990: 19). In other words, service quality is based on comparison between what the customer feels should be offered and what is provided.

2.2.1 Dimensions of Service Quality

Zeithaml, Parasuraman and Berry's (1990: 19-20, 26) systematic analysis of customer ratings from hundreds of interviews in several service sectors identified five broad dimensions that represent the core criteria that customers employ in evaluating service quality. Table 2.1 describes the five dimensions:

Table 2.1

Dimensions of Service Quality Defined by Parasuraman and his Team

Sl No	Dimensions		Definition and Description
1	**Tangibles**	:	"Appearance of physical facilities, equipment, personnel and communication materials". This includes service firms' physical facilities, their equipment, appearance of their personnel and appearance of communication materials used to inform about services.
2	**Reliability**	:	"Ability of the firm to perform the service promised dependably and accurately". It means that the service organization performs the service right the first time and honours all its promises.
3	**Responsiveness:**		"Willingness of firm's staff to help customers and provide them with prompt service". This refers to timeliness and promptness in providing the service.
4	**Assurance**	:	"Knowledge, competence and Courtesy of employees and their ability to convey trust and confidence in the customer towards the service firm". Competency refers to the possession of required skills and knowledge to perform the service. Courtesy involves politeness, respect, friendliness honesty and trustworthiness of contact personnel.
5	**Empathy**	:	"Caring, individualized attention the firm provides its customers". It includes the approachability, ease of contact of service providers and making of efforts to understand the customer needs.

2.2.2 Customer Expectations and Perceptions

Customer expectations and perceptions are important variables in the literature available in customer satisfaction and service quality (Nitecki, 1995, p15). They play a major role in assessing the services of an organization.

Customer Expectations: Customer expectations are partial beliefs or assumptions about products or services that serve as standards or reference points against which product's performance is judged (Olson and Dover, 1979). These expectation form on the basis of previous experience, and ideas of what organization should or will provide (Parasuraman, Zeithaml and Berry, 1988, p17; Berry and Parasuraman, 1991:57; Nitecki, 1995:16). Zeithaml, Parasuraman and Berry (1993:10) point out that three levels of expectations can be defined against which quality is assessed: the desired service, which reflects what customers want; the adequate service defined as the standard the customers are willing to accept; and the predicted service- the level of services customers believe is likely to occur.

Customer Perceptions: Perception is Customers' feeling or experience about the service provided by the organization. Individuals' perceptions of a service quality of a firm just after the service encounter are a blend of their prior expectations of what will and what should transpire during the contact and the actual delivered service during the service encounter (Boulding et al, 1993:7; Brown and Swartz, 1989: 93).

Factors Influencing Customer Expectations Many factors moderate the customers' expectations. Even when a customer has had considerable past experience with service provider, variations and contextual clues will affect customers' expectations of immediate service encounter (Bitner,1991:30, Cadotte, Woodruff and Jenkins,1987). Zeithaml, Parasuraman and Berry (1990: 19; 1993: 3; Berry and Parasuraman, 1991: 60-62) identified word-of-mouth communications, personal needs, past experience, and service communications by the provider to the user are the prime determinants that might moderate or influence customers' expectations. Further they argue that positive word-of-mouth communication elevates customers' desired and predicted expectations (1993: 9). Customers may adjust or raise their expectations based on previous experience with the service.

2.2.3 Measuring Service Quality

The studies assessing service quality are based on the disconfirmation theory that compares customer's expectations and perceptions of the service (Tan and Foo, 1999: 2). In literature of service quality the dominant approach was referred to as "perception-minus-expectation" (P-E) based service quality measuring conceptualised by the team of Parasuraman, Zeithaml and Berry in 1985 popularly known as gaps model

Gaps Model: The disconfirmation between expectations and perceptions of quality forms the basis for models of service quality, which have predominated within the literature since 1980s. The Gaps model developed by Parasuraman's team (1985) identified five key service provider gaps potentially responsible for poor service. The five gaps are or

key discrepancies between expectations and perceptions of customers and management's service specification and delivery are shown in Fig 2.1

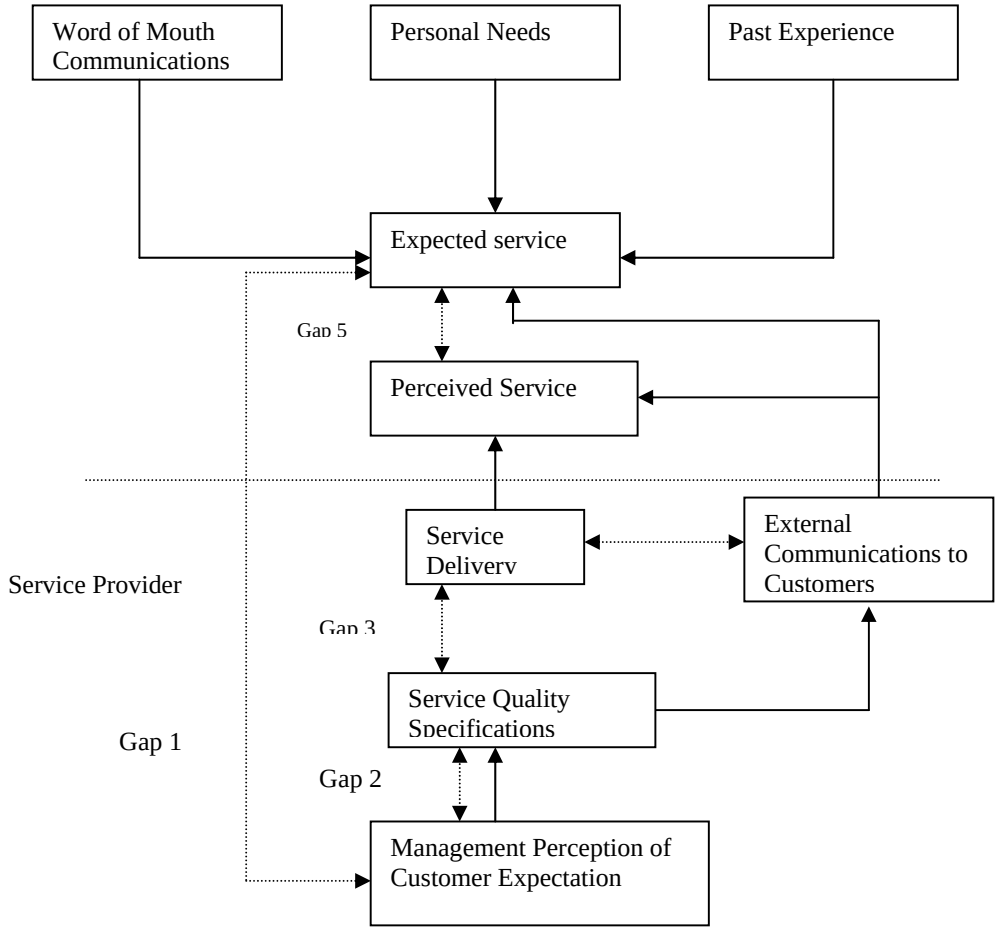

Fig. 2.1: Gaps Model.
Source: Zeithaml, Parasuraman, and Berry, Delivering Quality Service, 1991: 46

The description of these five gaps is presented in Table 2.2.

Table 2.2
Description of Five Gaps in the Service-Quality Model

Sl. No.	Gaps	Description
1	**Gap 1:**	"Not Knowing What Customers Expect": - the differences between what customers expect and what management perceives that they expect.
2	**Gap 2:**	"The Wrong Service Quality Standards": - the difference between management's perception of customer's expectations and the actual specifications they establish for service delivery.

3 **Gap 3:** "The Service – Performance Gap": - the discrepancy between service quality specifications and actual service delivery. i.e. when employees are unable and/or unwilling to perform the service at the level desired by management.

4 **Gap 4:** "When Promises Do Not Match Delivery": - the discrepancy between the service delivery and external communications has strong impact on customers' perception of service quality.

5 **Gap 5:** "Gap between customers' perception and expectation": - Viewed from customer's perspective as the discrepancy between customers' expectation and perceived service.

SERVQUAL Instrument: The major outcome of the Parasuraman, Zeithaml and Berry's research was the development of a gap model and 'SERVQUAL' – A multiple-item instrument to measure the gap between perceptions and expectations. SERVQUAL operationalises service quality by subtracting customers' expectation scores from their perception scores on the 22 items. The original model was developed in 1985 and the subsequent researches in 1988 and 1991 revised and refined the instrument.

The SERVQUAL model asks the respondents to indicate their agreement or disagreement on 7-point or 5-point Likert scale with 22 statements related to respondents' expectations of any service of the type studied. Then using the same 22 statements the respondent indicates his or her perceptions of a particular service being studied. Thus, each statement evaluating expectation in the first section is paired with statement evaluating perception. For example:

Sample Expectation Statement (E)	When excellent companies promise to do something by a certain time, they will do so
Sample Perception Statement (P)	When XYZ company promises to do something by a certain time, it does so.

The numerical differences between the scores reported for the perceptions and the expectations are calculated and it makes up the perceived quality score for the dimension being considered.

Despite criticism from marketing experts, the literature-review indicates that the instrument has gained popularity and many service organizations including libraries have used it as a valid tool for measuring service quality.

2.2.4 Customer Satisfaction and Service Quality

Satisfaction is a person's feeling of pleasure resulting from comparing a product's perceived performance (or outcome) in relation to his or her expectations (Kotler, 2000: 429). When a product or a service meets or exceeds the customer expectations, customer is normally satisfied. Satisfaction or dissatisfaction occurs when the customer encounters or interacts with the service or service staff. The dominant theory of consumer satisfaction is the disconfirmation of the expectancy paradigm (Bryant et al, 1998: 6). Applying disconfirmation paradigm to the evaluation of a service encounter suggests that the individual will compare his or her experience with some set of expectations (Brown, and Swartz, 1992: 93). The overall satisfaction is viewed as a function of satisfaction with multiple experiences or encounters with the organization (Bolton and Drew, 1991:3; Rust and Oliver, 1994.75).

Bolton and Drew (1991) used the common assumption that service quality is analogous to an attitude as a basis to suggest that satisfaction is antecedent to service quality and propose that perceived service quality is a function of consumers' perceptions of service quality from the prior period and his/her level of dis/satisfaction with the current level of service performance.

Factors Affecting Customer Satisfaction: The relationship between customers and firm affects the customer satisfaction. Goodman et al (1995) postulate that highly involved customers who are dissatisfied with the core factor in their relationship with a supplier will express greater overall dissatisfaction than customers who are less involved. Bolton's (1998: 50) study on customer satisfaction reveals that "the strength of relationship between duration level and satisfaction levels depends on the length of customers' prior experience with the organization" and "the duration of service provider-customer relationship depends on whether customer experienced service transactions or failures, where the effects of perceived loss are directly weighed by prior satisfaction and the overall service quality is positively associated with service usage rate".

2.3 SERVICE QUALITY IN LIBRARY AND INFORMATION SERVICES

The concept of quality is not a new phenomenon in library and information science field (LIS). The quality concepts are implicitly stated through Ranganathan's five laws of library science. Ranganathan's (1988: 287) fourth law in particular view quality in terms of the capability of library administration to make the process simple and efficient so as to "SAVE THE TIME OF THE READER". McNicol (1997) and Coogan (1998) also support Ranganathan's views by stressing on saving the reader's time. Coogan (1998:2) also expresses that "obtaining information quickly is the main concern of users who want their library to be state-of- the-art and responsive to their needs. Knowledgeable staff provides seamless access to information regardless of format, whether the user is in the library or at a remote location". The central theme of the viewpoints expressed by Ranganathan and Coogan focuses on saving users' time while searching/ accessing information or resources.

The dramatic changes in information technology resulted in new patterns of scholarly information available on network and instant access to information is cutting geographical and time barriers. In addition to large quantity of print media, voluminous data is available in electronic format on online as well as off-line. With the emergence of non-print materials and remote access, the concept of traditional library at one physical place is diminishing. The encounter with new formats, new media, new information and new communication channels needs restructuring of present day library facilities and services.

Hernon and McClure (1990: xv) note that there is an increasing pressure on libraries to evaluate the degree to which their services demonstrate the quality. Kyrllidow (1999: 3) also endorses the views of Hernon and McClure by expressing that the academic research libraries feel the pressure of shift from revenue based growth to a system that demands more evidence of efficiency and effectiveness. Marshall (2000: 29) articulates that a subtle but important advantage of taking a quality improvement approach is that "it eliminates any charges of being self-serving in our goals, as solely seeking to demonstrate our worth might do. The results can also create an opportunity to ask for additional resources for new products or services when the need demonstrated in evaluation. For all these good reasons we need to build approaches to measuring worth and communicating value with a quality improvement in mind". All these clearly indicate that academic libraries are witnessing greater pressure for new assessment measures of quality and accountability.

Performance-evaluation as an important management activity serves as an assessment of how the information service is performing and as an accountability factor to the stakeholders (Bryson, 1997: 401). Hebert (1994) expresses her concern that meeting internally set standards does not imply that the library is performing well in the eyes of customers.

Horowitz, et al (1998) in their 'Performance Measurement Task Force (PMTF) final report' state that the predominant reasons for putting a performance measurement programme at libraries are to improve the services and to increase the customer's satisfaction. Pritchard (1996: 572; Tan and Foo, 1999: 3) addressed the issues of quality management in academic libraries and emphasized the importance of monitoring and meeting the needs of customers.

Traditionally, the quality of academic library has been associated with its collection and assessed in terms of size indicators: size of collections, breadth of subject coverage, budget expenditure, and staff (Nitecki, 1994: 20, 1996:181, Nitecki and Franklin, 1999:1, Blixrud, 1998: 1; Tan and Foo, 1999: 1). McNicol (1997: 1) presents the same concept in the form of equation: 'bigger budget= more comprehensive collections + more well trained staff = quality of service'. The traditional measures of library performance have largely ignored the customer perspective and do not assess how well user needs or expectations are met (Hebert, 1993; Franklin and Nitecki, 1999). Libraries like banks

have an ongoing relationship with their customers. The relationship is determined during brief service encounters between customers and staff at the service counter.

Commenting on traditional methods of performance assessment, Blixrud (1998:1) says that the libraries should be encouraged to come out of a mindset that accords status by "tonnage model"- the sheer number of volumes and subscriptions a single library contains. While reviewing the literature on service quality in libraries, Tan and Foo (1999: 3) summarize that the "literature in LIS field shows that the quality assessment effort in libraries is moving from performance measures that focus on traditional input and output measures, to measures that focus on feedback from customers".

Today's customers are better educated, better informed, more knowledgeable about technology, and therefore demand more from the service providers. The technological factors and alternatives available to the customers are forcing librarians to equip their libraries with better facilities and services to attract customers and keep them satisfied. The economical factors like price rise and economic stinginess are driving many libraries to be aware of the need to measure not only the use of their resources, but also the effectiveness of their library services in order to justify their budget provisions. The impact of the library must in some way be measured in terms of user interaction with the library resources and its services, particularly how users benefit from their interaction with the library (Walters, 1999; Blixrud, 1998; Tan and Foo, 1999; Vergueiro and de Carvalho, 2000). This is especially true as technological advancements influence the perceptions of the quality. As technology changes more and more rapidly, its impact on user is obvious. It is important to recognise that perceptions of quality are as important as the product- the library service itself. The User satisfaction studies are seen as an effective way of demonstrating to users that their needs are focussed and library's commitment is meeting their needs (Cook and Heath, 2000:2).

There is no dearth of references on quality in LIS literature. However, it is difficult to arrive at a common definition on service quality. The quality as a management technique focuses on users' comfort and satisfaction. The management of quality in academic libraries, as a management method that allows the improvement of performance, has been the object of interest for the managers of these services (Vergueiro and de Carvalho, 2000:1). Tan and Foo (1999:1) argue that 'Quality management plays a part in academic and special libraries even though these two libraries seem to have captive customers. Academic libraries have to provide quality service to the academic community as the same community evaluates their worth'.

According to Clair (1997: 49) the quality in Library and information service environment is related to ' knowing what the library customers want and providing it in a manner that meets their perceptions and expectations'. This definition perfectly matches the definitions of many service marketing and LIS researchers who have defined the service quality in terms of the gap model of service quality designed by the Parasuraman, Zeithaml and Berry (Cook, 2000). Nitecki (1997:1) noticed that service quality is the most researched area in marketing research and service quality as perceived by customers, is a function of what customers expect and how well the firm performs in

providing the service. LIS researchers adhering to the desire to emphasize the user driven perspective need to focus their attention on the fifth gap of the gap model (i.e. the gap between customers' perception and expectation).

Kyrllidow (1999: 5) recommends that 'extremely important, although not as easily applicable, is the measurement of user satisfaction as a performance indicator. Its applicability across institutions needs to be further explored given variations in the services provided by each library, but it has nonetheless a critical indicator of whether users' expectations are satisfied or not. The IFLA guidelines recommend a five-point scale and suggest measuring both general user satisfaction and specific service areas. The IFLA guidelines recommend a combination of user satisfaction and importance that can help decision-making'. Blixrud (1998: 2) reminds that though there is a need to find new ways to assess library performance, some things are not measurable, irrelevant or too difficult to measure or are only meaningful in a local context. Parasuraman, Zeithaml and Berry's customer based approach for measuring service quality offers an alternative for defining quality of library services (Nitecki, ARL-1997: 2). It emphasises the service nature of libraries, in which the traditional collection based criteria of quality be part of, but not the entire component, of excellence.

The dimensions of service quality-'tangibles, reliability, responsiveness, assurance and empathy' defined by Parasuraman's team are relevant in library and information service environment also. The success of library and information services focuses on the issue of quality. In a library and information service environment the quality is linked to the delivery service to users by the staff. As the economy tightens the perceptions of the quality by users will become paramount to market the library to its users. The library users, namely teachers, researchers, students, and the authorities, play a crucial role in determining the eventual success. The ultimate objective of the libraries is to ensure customer satisfaction for the information he/she sought. The customer for library is its user/reader. Users' needs and requirements are of prime concern in collection development and service provision. The information materials are collected, organised and retrieved through intermediaries, the library staff. Quality expected out of the collection and library staff on their path to attain ultimate objective is well reflected in the dimensions of service quality, which laid the foundation for the development of SERVQUAL. Since the conceptualisation of SERVQUAL in 1985 and revision in 1991 by Parasuraman, Zeithaml and Berry, many researchers have used SERVQUAL instrument to measure customers' perceptions of service quality in a wide range of service industries such as banking, travel agencies etc. including library and information services.

2.3.1 Application of SERVQUAL in Libraries

As discussed earlier, the SERVQUAL is a diagnostic tool created by the team of Parasuraman Zeithaml and Berry to measure the service quality. It has gained popularity as a promising tool to measure the service quality with its statistical validity and ease of administering to respondents. Research studies using this instrument in libraries have varied from testing of one service (Inter Library Loan) to testing the whole range of library services. Academic, public and special libraries have used SERVQUAL. It is

generally considered to be useful in measuring library services although some reservations have been expressed regarding some of its components (Horowitz, 1998: 1). The review traced Northumbria International Conferences on Performance Measurement in libraries in 1997 and 1999, and IFLA 2005 International Conferences carried presentations on service quality and SERVQUAL. Journal of Academic Librarianship, College and Research Libraries, Libraries and Information Science Research, MIS Quarterly and ARL Website appear to be favourable journals and Website for searching articles on service quality in libraries and information services.

Hebert (1993) investigates quality of interlibrary borrowing services in public libraries in Canada from two perspectives: the library perspective based on fill rate and turnaround time and the customer perspective based on expectation disconfirmation. Expectation and perceptions of service quality in Canadian Public libraries were measured using SERVQUAL instrument. The findings of her study reveal that the participant expectations of service quality were higher than their perceptions of the quality of services received. Reliability ranked most important by participants received least score in performance. Tangibles, which ranked least important, scored above the expectation.

The research study by White, Abels and Nitecki (1994) tested the applicability and appropriateness of the SERVQUAL to measure service quality in special libraries and developed a modified version for special libraries. The results of the study showed considerable commonality between the service qualities considered important by library clients and those of SERVQUAL study.

White and Abels (1995; Tan and Foo, 1999) in another study review the service marketing literature to develop a tool to measure service quality in special libraries. They focus on two techniques; SERVQUAL, which measures service quality on the basis of expectations and performance, and SERVPERF, which is based on performance alone. The authors then assess the applicability of these methods to special libraries and information centres. They express the superiority of SERVQUAL over SERVPERF model.

Millson-Martula and Menon (1995) state that as academic libraries continue to evolve as service organizations, they should focus on their users as customers and develop programs of service that meet or exceed user expectations. The overriding goal will become customer satisfaction. Further, they discuss the elements that determine expectations as well as the existing gaps that relate to customer expectations and service performance. They advocate enhanced communication between the library and its customers and improved management as the possible strategies for narrowing these gaps.

Nitecki (1995, 1996), in her empirical study, examines the reliability validity and transferability of SERVQUAL instrument to an academic library setting. The SERVQUAL measures were applied to three library services, namely reference, reserve and interlibrary loan in an academic library. Results of her study reveal that the SERVQUAL is a reliable and valid instrument for application in the academic library setting and suggests that the tool should be used cautiously, as the factor relationship of

dimensions may not tally with the designers' original five factors. Her study implies that assurance and empathy are important but not in the same degree as are reliability and responsiveness.

Edwards and Brown (1995) compare the users' expectations with librarians' perception of the users' expectations based on SERVQUAL conceptualisation. In this case, instead of using 22 items in SERVQUAL they used quality indicators generated by librarians and users and formatted these items into Likert Scale statements modelled after the SERVQUAL questionnaire.

Pitt, Watson and Kavan (1995:173) express that the traditional goal of information systems (IS) organization is to build, maintain and operate information delivery system. However, for user, the goal is not the delivery system, but rather the information it provide. They suggest that gauging the magnitude of difference between users' expectations and perceptions provides, a superior indicator IS service quality. They assessed the suitability of SERVQUAL in three different types of organizations in three countries.

Hernon and Altman's study (1996) examines service quality standards and explains ways in which it can be assessed quantitatively and qualitatively. The study attempts to distinguish between service quality and customer satisfaction. Based on a two-year research study, this book identifies simple and practical methods to narrow the gap between library services and customer expectations.

Results of the users' survey on service quality carried out by Cardiff University Libraries in 1996 (Cardiff, 1996) record a significant improvement over 1993 survey results. The results indicate the increased efficiency of library and more favourable remarks on library staff. Interestingly, there was no significant difference between assessment of part time users and fulltime users.

Coleman, et al (1997) devised a user-survey based on SERVQUAL to measure service quality at Large Sterling Evans University Library. They express that understanding of customer expectations is a prerequisite for delivering superior service. The survey results indicated a discrepancy between the priorities or expectations expressed by the users and the quality of service delivered by the library.

Nitecki (1997), in her paper presented at 2nd Northumbria International conference on performance measurement, reviewed the results of eight academic library studies that used SERVQUAL to measure the quality of their inter-library loan and reference services, and pointed out the usefulness of the instrument in improving the service management in academic libraries (Nitecki, 1997, Franklin and Nitecki, 1999).

Studies conducted by Van Dyke, Kappelman and Prybuttock (1997), Pitt, Watson and Kavan (1997), and Kettinger and Lee (1997) in an Information systems (IS) department critically evaluate the merits and limitations of SERVQUAL. The studies indicate that SERVQUAL suffers from a number of conceptual and empirical difficulties. The authors

suggest an IS-context modified version of SERVQUAL instrument to assess the quality of services supplied by information service provider.

White (1997), comparing approaches used by libraries to measure the service quality, suggests that SERVQUAL can be used effectively in libraries to provide diagnostic data for evaluating and modifying services. Watson, Pitt and Kavan (1998), comparing the results of previous research studies (Pitt, Watson and Kavan, 1995, 1997, and Kattinger and Lee, 1997; Van Dyke, Pitt and Kavan, 1997), conducted by them to measure information system service quality observe that the first and second time measurements resulted in improvement and the third time measurement indicated that it had returned to levels of first measurement. They caution the authorities of information system department that the service quality is not a fad but an ongoing commitment and suggest that information system service quality requires action at three levels: namely, strategic, tactical and operational levels. The users who enter system afresh would consider the existing situation as minimum standard and expect more.

Service quality and users' satisfaction survey conducted at University of Virginia Library (White, 1998) reveals the usability of SERVQUAL in library setting. The results of the study highlight that the permanent staff is generally knowledgeable and helpful. The library working hours need to be extended. The transaction records should be maintained without mistakes, rectified, and the equipment needs to be widely available and it should be consistently working.

Walters et al (1999) relate their experience in using SERVQUAL in academic medical library environment and compare those results with the ones obtained with their own revised and shortened version of the instrument called ACSAHL The study found that the measurements of the quality of the customer service were similar between two instruments.

The research study on service quality assessment conducted by Tan and Foo (1999) reports the use of an adopted SERVQUAL instrument at a legal library (statutory Board library) in Singapore. The study concludes "The survival of library depends on the benefits it brings to its users. Its existence will be in question when users begin looking for alternatives. One way to show value is by providing quality service. It is therefore important for the library to be aware of changing user expectations".

Nitecki and Hernon (2000: 261), reviewing eight published applications studies of SERVQUAL in library setting, noted that “none of the library settings (provides evidence for) the five-dimension patterns approved by the SERVQUAL and state, “Although its appeal to libraries is growing, the interpretations based on the calculated dimensions should be made with caution.

Manjunatha’s doctoral research study (2002) also tested the adapted SERVQUAL instrument to measure customer expectation and perceptions of quality in academic libraries in Indian environment. The results were congruent with earlier settings and reveal the homogeneity in customer’s expectations of users of academic libraries across

the globe. Amrith sherigar's (2003) research work on quality also measures the customer expectations in special libraries in Karnataka.

Based on SERVQUAL, Association of Research Libraries (ARL) developed LibQUAL+, a web-based survey tool in 2001 to measure service quality in library setting. An initial group of 12 ARL member libraries worked with the Texas A&M University Libraries to develop a library-oriented instrument for which each library would have a customized web front end with its own logo on the page. Grounded in the Gap Theory of Service Quality and based on the SERVQUAL instrument, LibQUAL+ has been revised after interviewing 60 library users. In addition to the original 22 SERVQUAL questions, 19 other questions intended to measure service quality in access to collections and library as place were added. Both LibQUAL+ and SERVQUAL assume "...only customers judge quality; all other judgments are essentially irrelevant." Cook and Heath (2000ab, 2001abc) conducted several studies using LibQUAL+ instrument and reported the results of that are eye opening for library professionals. More details on LibQUAL+ can be obtained from http://www.arl.org site

2.3.2 Customer Expectations in Libraries

What do customers really expect from the library? The relationship between customers and the library mainly depends on the extent to which users' expectations are met. The customers' expectations featured in the previous studies have been consolidated and presented in Table 2.4.

Table 2.4
The Features Expected by the Customers in Previous Studies.

Resources and Facilities	
▸ Good collection/Variety in sources	▸ Good organization of library;
▸ Well stock of recommended books	▸ Timely delivery of photocopies
▸ Easy Access to the library	▸ Sufficient loan period
▸ Quiet place/ Silence in library	▸ Good working computers/ equipment
▸ Reduced waiting for reserved book	▸ Fairness in overdue charges
▸ More computer terminals in library	▸ Availability of up-to-date information
▸ Availability of needed information	▸ Proper arrangement
▸ Convenient location of library	▸ Longer working hours
▸ Error free circulation records,	▸ Self-reliant in document location
Staff	
▸ Willingness to help users	▸ Sincere interest to attend users problems
▸ Well behaved staff	▸ Knowledgeable, courteous,
▸ Quickness in assistance	▸ Adaptability, Kind service
▸ Providing service at promised time,	▸ Friendly, Prompt service
▸ Readiness to respond to questions,	▸ Providing right book first time
▸ Good librarian	▸ Ready to listen to users

2.3.3 Customer Satisfaction in Libraries

Though related, the concept of service quality is different from satisfaction. Hernon, Nitecki and Altman (1999; Nitecki and Franklin, 1999) point that the service quality developed over a period of time relates to customer expectation, where as satisfaction is transaction specific. Millson-Martula and Menon (1995, p33) express that as academic libraries continue to evolve as service organizations the overriding goal will become customer satisfaction and "no effort to enhance customer satisfaction will succeed unless students and faculty are convinced that library staff care about the quality of service they provide and the manner in which they do it."

Hernon and Altman (1998:182-87) convey that in library surveys user satisfaction is often considered in response to specific service encounter or series of experiences. They state: " by inference, satisfaction levels from a number of transactions or encounters that an individual experiences with a particular organization fuse to form an impression of service quality for that person. The collective experiences of many persons create an organization's reputation for service quality." (Hernon and Altman, 1998, p8).

Andaleeb and Simmonds (1998, p158-59) identified that perceived quality of library resources; the responsiveness of the library staff; perceived competence of library staff; the demeanour of library staff; and the perceived overall physical appearance of the library facilities influence user satisfactions. They hypothesise that:

- The higher the perceived service quality of library resources the greater the level of user satisfaction;
- The greater the responsiveness of the library staff, the greater the level of satisfaction among academic library users;
- The greater the perceived competency of library staff, the greater the level of user satisfaction;
- The more the positive demeanour of library staff, the greater level of user satisfaction; and
- The better the perceived overall physical appearance of library facilities, the greater level of user satisfaction.

Manjunatha(2002) in his study observed that the users of professional education experience more gaps as compare to users of general education. He also observes that perceived service quality, customer satisfaction and word of mouth are directly related. The following hypotheses found true in his study:

- The users of Professional education such as engineering or medicine will experience more gaps between their expectations and perceptions compared to the users of science and social sciences;
- As customers' perceptions of quality of library services (measured as difference between perception and expectation(Psq)) increases, their overall satisfaction(Osatis) level also increases (Psq $\propto$ Osatis)

- As overall customers' satisfaction with library facilities and services increases, the customers would be more willing to spread good words about their library with their friends(Word of mouth -Wom) (Osatis $\propto$ Wom) and $\therefore$ Psq $\propto$ Wom.

In nutshell, Technology particularly ICT is penetrating in all functions of libraries and there is no way except embracing it. Its Impact is clearly visible information resources, and services and personnel. The information resources are transforming from print to electronic media and varieties of storage media have emerged to preserve digital information. The traditional services are augmented by ICT supported facilities and services. Emergence of digital library, Remote access, wireless Internet access, federated search engines, online access to full-text databases, web OPAC, automated library operations etc are some of the noticeable impact of IT on library functions. The LIS professional also showing interest in acquiring technical skills for establishing digital libraries, institutional depositories and consortium for effective resource sharing. Unlike print resources, the users need to possess basic technical skills to use resources in digital media. User education is becoming more important particularly in the case of electronic resources.

Service quality is a measure of how well the delivered service matches customer expectations. It is not a fad but an ongoing process and a commitment from the organization. The five dimensions of service quality: namely, *reliability, responsiveness, tangibles, assurance and empathy* are identified as core criteria that customers consider while assessing the service quality. Despite many points of criticism and disagreements over subtraction method and dimensionality, SERVQUAL has become popular instrument to measure service quality in service industries with its statistical reliability and validity. Though customer satisfaction is different from service quality, it is closely related and studied as a function of perceived service quality.

Service quality in library environment encompasses the relationship between library and its users. The challenge lies in understanding what customers want and applying that knowledge to improve the service performance. The application of SERVQUAL in library environment is increasing. Modified version of SERVQUAL and LibQUAL+ developed by ARL are being increasingly used in academic, public and special library services in developed countries as it is easy to administer and convenient to evaluate the responses. Though SERVQUAL and LibQUAL+ appear to be promising tools, they need to be adjusted with minor modifications to suit in local library environment.

The next chapter explains in detail the methodology adapted by the investigator to obtain the primary data from the respondent customers.

Chapter 3

TECHNICAL AND MANAGEMENT EDUCATION IN INDIA AND KARNATAKA

3.1 TECHNICAL & MANAGEMENT EDUCATION IN INDIA

3.1.1 Growth of Technical/Engineering Education in India:

India launched a massive program for planned development soon after becoming independent. Apart from shortage of material resources, the country faced acute shortage of technicians and graduate engineers. An ambitious program of expansion of technical education was undertaken to overcome this problem. Expansion in higher technical education started in a major way during the second five-year plan (1956-1961). The government of India established five Indian Institutes of Technology (IITs) through an Act of Parliament and declaring them to be institutions of national importance. The IIT at Kharagpur was established in 1950. IIT at Kanpur, Delhi, Chennai and Mumbai were opened during 1959-1960. IIT at Guwahati started in 1994 and the University of Roorkee established in 1949 renamed as IIT in 2001. Currently, the annual intake of these institutes is about 4000 students.

Another significant development during this period was the establishment of Regional Engineering Colleges (renamed as National Institutes of Technology REC/NIT) in various states. Of the 17 NITs, 11 were established during 1959-1961 and four added during 1963-1967. NIT at Himachal Pradesh and Punjab added during 1986 and 1988 respectively. Presently, about 5100 students admit to these colleges annually.

After World War II, great advances in Science and Technology (S&T) resulted in significant changes in engineering education to adapt to the rapid developments in technology. Many new engineering colleges have established during 1950s and 1960s and the premier institutions of pre-1947 period underwent major expansion to incorporate technology and IT related courses in the curriculum. The government's expansion plan was also noticeable through encouraging Societies/Associations in private sector to establish self-financing engineering colleges. As a result, the number of institutes offering technical education significantly increased since 1990s.

In 1947, there were 36 institutions in India offering degree level engineering education, with an annual intake of about 2500 students. In contrast, there are 1346 institutes offering degree level technical education in 2005 with an annual intake of about 440,000 students. These figures are indicative of the large expansion that has taken place in engineering education over the 58 years since gaining independence. The growth of technical institutes in India for the past five decades is shown in fig. 3.1.

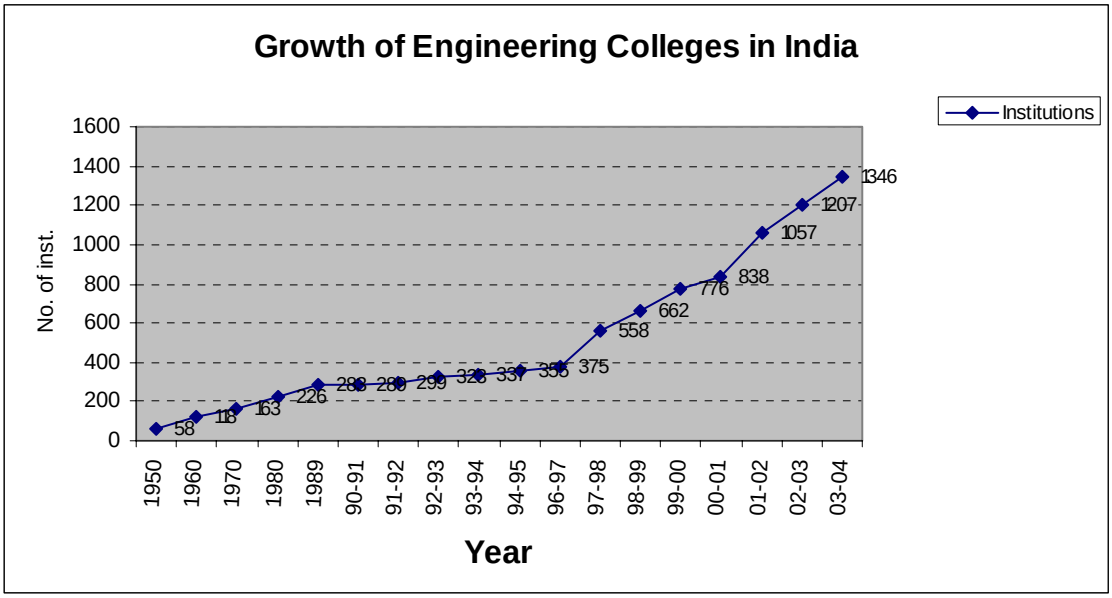

Fig. 3.1: Growth of Engineering Education in India
Note: the figure includes the statistics till 2005.
Source: ISTE handbook 2003-04, Statistical Abstract of India (1987 to 2000) and AICTE website.

A gradual increase in number of technical institutes was noticed till 1995-96 and since then the number of institutions established by private organizations has increased significantly and touched 1346 in 2005. The region-wise distribution of these colleges is presented in Table 3.1.

The figures presented in the Table 3.1 reveals that Southern states (South & Southwest) with 703 colleges hold 53% and Northern states (North& Northwest) hold 19% of total colleges in India. The West region ranked third with 12% share and remaining 16% shared equally between East and Central regions. The similar proportion is found in students' annual admission too in these regions. Tamil Nadu, Andhra Pradesh, Maharashtra and Karnataka states have more than 100 technical colleges offering degree level courses.

3.1.2 Growth of Management Education in India:

Since 1980s, the management education has gained importance as professional education in India and started attracting large number of graduates seeking postgraduate education in management. the Government of India established Indian Institutes of Management at Kolkata(1961), Ahmedabad(1962), Bangalore(1973), Lucknow(1984), Indore(1996) and Kozhikode (1996) to impart high quality management education. These institutes help to improve the management of corporate and non corporate sectors and public systems through pursuit of excellence in management education, research, consultancy and training.

Besides IIMs, there are large numbers of institutes managed by private organizations offer management education in the country. Currently in India (in 2005), about 1014 Management institutes offer postgraduate courses in management (MBA) with an annual

intake of 79,000 students. The region-wise distribution of Management institutes is shown is Table 3.1

Table 3.1
Number of Technical and Management Institutes in India

Region	State/Union Territory	Engineering		Management	
		NOI	Intake	NOI	Intake
Central	1. Madhya Pradesh	61	20,210	47	2,850
	2. Chhattisgarh	14	4,020	4	270
	3. Gujarat	37	12,965	38	2,930
	Total →	**112**	**37,195**	**89**	**7,050**
Eastern	1. Mizoram	1	120		
	2. Sikkim	1	525		
	3. West Bengal	54	15,477	22	2555
	4. Tripura	1	180		
	5. Meghalaya	1	240		
	6. Arunachal Pradesh	1	210		
	7. Andaman&Nicobar	-	-		-
	8. Assam	3	750	6	330
	9. Manipur	1	115	1	30
	10. Nagaland	-	-		-
	11. Orissa	41	13,014	27	1980
	12. Jharkhand	10	3,385	6	575
	Total →	**114**	**34,016**	**62**	**5,470**
North	1. Bihar	8	1,905	12	1,135
	2. Uttar Pradesh	89	28,953	115	10760
	3. Uttranchal	9	1,440	13	870
	Total →	**106**	**32,298**	**140**	**12,765**
North-West	1. Chandigarh	5	800		
	2. Haryana	38	12,785	23	1535
	3. Himachal Pradesh	5	1,260		
	4. Jammu& Kashmir	5	1,545	3	150
	5. New Delhi	14	4,330	34	3855
	6. Punjab	45	14,880	25	1920
	7. Rajasthan	41	15,045	30	2210
	Total →	**153**	**50,645**	**112**	**9,670**
South	1. Andhra Pradesh	236	82,970	219	13,680
	2. Pondicherry	6	2,370	2	120
	3. Tamil Nadu	254	80,417	143	8,421
	Total →	**496**	**165,757**	**364**	**22,221**
South-West	1. Karnataka	117	46,375	86	6,970
	2. Kerala	89	24,413	33	1,850
	Total →	**207**	**70,788**	**119**	**8,860**
West	1. Maharashtra	155	48,250	126	12720
	2. Goa	3	740	2	150
	3.Daman & D,Dadar,N.H.	-	-		-
	Total →	**158**	**48,990**	**128**	**12,870**
	Grand Total→	**1,346**	**439,689**	**1014**	**78,926**

Source: Figures from AICTE website: http://www.aicte.ernet.in on June 2005 and August 16, 2006
Note: NOI→ No. of Institutions; Intake→ Students' annual intake for UG courses

Since 1990s, the Government/AICTE has allowed private organizations to establish Management institutes offering postgraduate courses in Management. As a result, large number of self-financing management institutes established India and in 2005, there are 1014 institutes offering MBA courses admitting 79,000 students annually. The development of Management institutes for the past seven years is graphically shown in fig 3.2.

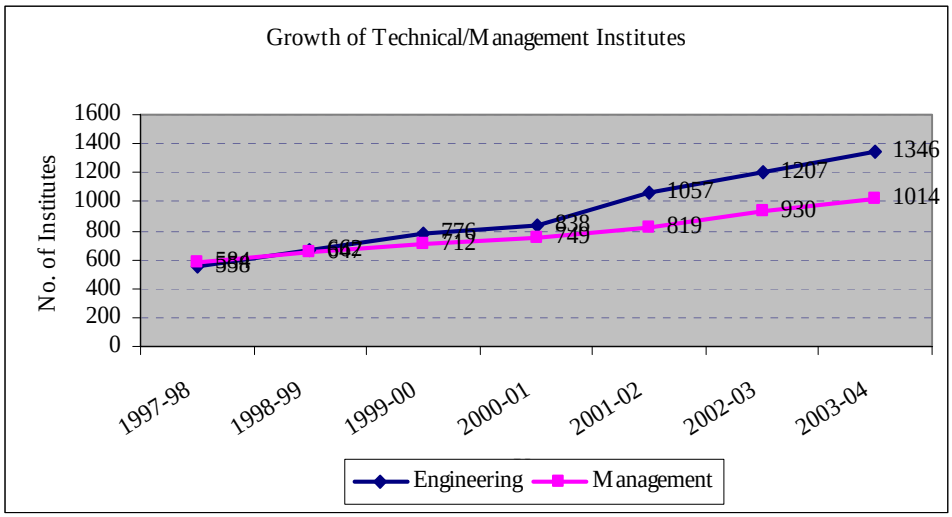

Fig.3.2: Growth of Technical & Management Institutes in India
Note: ISTE Handbook 2003-04; The 2003-04 figures from AICTE website accessed June 2005.

In 1997, there were 584 Management institutes in India and the number rose to 1014 in 2005. An examination of figures presented in Table.3.1 reveals that Southern states (South & SW) having 483 Management institutes hold the maximum share of 54.7% in management education also. North and West regions rank second (28.5%) and third (14.5%). Central and East regions hold 10.1% and 7% of college population respectively.

3.2 TECHNICAL & MANAGEMENT EDUCATION IN KARNATAKA

Karnataka is one of the developed states in the country and finds a prominent place in Technical and Management education in India. It holds 9% of Technical and 10% of Management institute population in the country. A brief historical development of Technical and Management institutes in Karnataka is given below.

3.2.1 Growth of Engineering Colleges in Karnataka:

Currently, in Karnataka (in 2005), 117 colleges offer degree level engineering courses approved by AICTE with an annual intake of 46,400 students. The private organizations dominate the Technical education in the state. The growth of engineering colleges in Karnataka established in private and government sectors is shown in Table 3.2.

Table 3.2
Growth of Technical/ Engineering Colleges in Karnataka (as on June 2005)

Decade	Esta. Year*	Number of Institutions			Cumulative Number
		Govt./Aided	Private	Total	
Upto 1950	1917, 38,46, 47	5	-	5	5
1950-1959	1951, 57, 58	2	2	4	9
1960-1969	1960, 62, 63	4	3	7	16
1970-1979	1979	-	9	9	25
1980-1989	1980, 82, 86	2	19	21	46
1990-1999	1996,97,99	-	24	24	70
2000-2005	2000-2001	-	31	31	101
	2002-2004		16	16	117
Total (Pct %)		13 (11.1%)	104 (88.9%)		117 (100.0)
Total Annual Intake of Students					46,387

Note: * specific years of establishment of colleges. Source: AICTE website and state-wise.
In addition, additional 6 private colleges have been approved by AICTE during 2005-06. Further, the AICTE has enhanced intake by adding 2000 (total) seats to the eligible colleges.

Until 1950, Karnataka had only five government-aided engineering colleges and University Visveswarayya College of Engineering (UVCE), Bangalore was the first engineering college in the state established in 1917. The next two decades saw an addition of seven Government-aided and four private colleges. Nine new private colleges added during 1979 and since then, the number of engineering private colleges significantly increased in the state. Since 2000, the state saw the addition of forty seven engineering colleges and as on 2005, the total number of engineering colleges in Karnataka is 117 and the annual intake to these colleges is 46,400 students.

The figures shown in Table 3.2 reveal that Karnataka has 89% and 11% of technical colleges in private and Government sectors respectively with almost similar proportion of student population in these sectors.

Establishment of Visvesvaraya Technological University (VTU) at Belgaum in 1998 is one of the landmark developments towards the standardization and new dimension to technical education in Karnataka. VTU has successfully achieved the tremendous task of bringing all the technical colleges affiliated earlier to different Universities, with different syllabi, different procedures and different traditions under one umbrella. The University implemented common curriculum for undergraduate courses in 1998 and revised syllabi again in 2002 for all the courses.

Institutes offering PG courses in Engineering: The University(http://www.vtu.ac.in) through its affiliate colleges conduct 28 branches of BE/BTech courses and 60 branches of ME/M.Tech courses across seven broad streams of engineering namely Civil, Mechanical, Electrical, E&C, Chemical, Mining, Textile and Architecture. In addition, the University has MBA, MCA, M.Sc. (Engg.) by Research and Ph.D programmes through affiliated colleges.

In addition to UG courses, 53 institutes (45.3%) affiliated to VTU offer ME/MTech courses. Among these, 17 colleges (32.1%) offer 4 to 18 PG courses and another 20 colleges (37.7%) offer 2 to 4 courses. The remaining 16 colleges (34.0%) conduct one PG course. These institutions admit around 5600 postgraduates annually in various technical branches. Many colleges are awaiting a formal approval from AICTE to start PG courses in different disciplines.

3.2.2 Growth of Management Institutes in Karnataka:

The demand for management graduates gained momentum since 1990s. In order to meet the demand from industries, the Universities and private organizations in Karnataka have started offering postgraduate courses in management education. All Universities in the state have separate department offering MBA course and VTU/AICTE also allowed eligible engineering and other colleges to start MBA courses in their premises. As a result, Karnataka has witnessed a significant growth in number of management institutes from 1994. It is to be noted that most of the management institutes in the state except Universities are managed by private organisations. The details of development of management institutes in Karnataka are shown in Table 3.3

Table 3.3
Institutes offering MBA/PGDM courses in Karnataka

Year	NOI	**Year**	NOI
1984	01	1998	15
1986	02	1999	15
1990	01	2001	11
1994	11	2002	04
1995	06	2003	01
1996	03	2004	07
1997	09	Total	**86**

IIM, Bangalore + NIT, Surathkal	2	
University depts, Deemed Univ. and other Govt. inst.	12	
Private Engineering Colleges offering MBA under VTU	16	
Mgt. institutes in engg. Coll campus, First Grade colleges	20	
Private organizations (stand alone full time program)	36	**86**
Annual intake of Students		6,970
Research Scholars and Faulty members(approx)		500

Note: NOI - No. of Institutions. Data as on June 2005,
Source: AIU Handbook of Management, AICTE website

Currently Karnataka has 86 Management institutes offering MBA courses with an annual intake of 7000 students. Among these institutes, 12 are University departments, 36 engineering/first grade colleges and 36 are private organisations. The state also has two national level institutes namely Indian Institute of Management, Bangalore and National Institute of Technology, Surathkal.

Until 1990, the growth of Management institutes was not very significant. Probably, T.A. Pai Management Institute, Manipal was the first institute in private sector to start AICTE

recognised standalone PG course in Management (in 1984) in Karnataka. Like engineering colleges, the number of management institutes also significantly increased in the state from 1994.

3.3 Quality Standards in Academic Institutes

Government of India constituted All India Council for Technical Education (AICTE) to monitor and standardize technical education in the country. This apex body approves new courses, new colleges and regularly monitors their operations. Further, Technological Universities have been established in several states to standardize and bring quality in technical education. These Technological Universities (like Visvesvaraya Technological University (VTU) in Karnataka) bring all engineering colleges in the state under one umbrella and streamline their curriculum.

The Government established National Assessment and Accreditation Council (NAAC) and National Board of Accreditation (NBA) to standardize the professional education in the country. These bodies assess the quality standards in educational institutions in the country. In a move to promote quality standards, the AICTE and UGC have directed all Universities and other affiliated colleges to obtain NAAC/NBA accreditation for continued financial grant from Government/UGC.

NAAC and NBA bodies included library as one of the important parameters for quality assessment in academic institutes. The peer review committee examines resources, facilities and services provided by library during its accrediting process.

To sum up, after Independence, the Government of India established IITs and NITs to promote technical education in India. Its effort further strengthened in 1990s by permitting private organizations to start self-financing technical institutes. As a result, the country has seen significant growth of technical institutes. Establishment of technological universities in different states including Karnataka was another landmark towards bringing technical institutes under one umbrella and standardization.

Similarly, IIMs established to impart quality education, training and consulting in Management in the country. Since 1990s, the active participation of private organization contributed to significant development of management institutes in the country. Besides IIMs, Universities, engineering colleges and other private organizations in the India offer postgraduate course in management education.

Currently India has 1346 technical and 1014 management institutes both in public and private sectors admitting annually 440,000 and 79,000 students respectively.

Karnataka has 117 technical and 86 management institutes with an annual intake of 46,400 and 7000 students respectively. VTU, Belgaum moderates the quality standards in technical institutes in the state.

The research methodology adopted to collect primary data from technical and management libraries in Karnataka has been discussed in next chapter.

Chapter 4
RESEARCH METHODOLOGY

4.1 RESEARCH DESIGN:

The main objective of this project is to understand the status of (information) technology resources, facilities and services provided in Technical and Management libraries in Karnataka and users' perceptions of service quality in those libraries. The institutes, included for the current study are degree granting Technical and Management institutes in Karnataka, which are approved by AICTE, New Delhi. The respondents include faculty members, research scholars and postgraduate students of those institutes. The study is carried out in three phases:

- During PHASE-I data relating to technology-based resource, facilities and services provided by libraries is collected from Technical and Management libraries located in Karnataka.

- In PHASE-II customer/users' assessment of service quality in selected libraries has been obtained and respondents include faculty members, research scholars and the postgraduate students of these institutes.

- The PHASE-III is related to data analysis, presentation of research findings and submission of final report to Department of Scientific and Industrial Research, Govt. of India for devising action plans.

This study is exploratory in nature. As the research team was desirous to draw sample from individual departments of respondent libraries, 'Convenience' sampling method has been adapted to obtain response from respondents. The study uses an adapted version of SERVQUAL instrument designed by Parasuraman, Zeithaml and Berry (Zeithaml, Parasuraman and Berry 2000) and LibQUAL instrument developed Association for Research Libraries, Washington (http://www.arl.org) for data collection. The Questionnaire has been distributed to respondents through online and self-administered. The Investigator contacted a few respondents for clarifying some doubts raised while analysing the data.

This chapter discusses the methodology adapted to obtain the data from target population, statistical tools used for data analysis and scope and limitations of the study.

4.2 PHASE – I

The first phase of research is related to status of technology supported resources and services provided libraries of technical and management institutes situated in Karnataka state. As on 2005, Karnataka has 117 engineering colleges and 86 management institutes offering degree level Technical (BE, MTech) and Management (MBA) courses approved by AICTE, New Delhi (www.aicte.ernet.in). The following Table 4.1 presents the number of institutions offering undergraduate and postgraduate courses in Technical and Management education in Karnataka.

Table 4.1
Institutes offering Technical and Management institutes in Karnataka

Education	Education	Number of Institutions			Students Intake
		Govt./Aided	Private	Total	
Technical	UG Courses	13	104	117	46315
	UG+ 1 PG Course	2	14	16	
	UG+ 2 PG Courses	1	11	12	
	UG+ 3 PG Courses	-	8	8	
	UG+ >3 PG Courses	10	7	17	
	Total (PG inst.)	**13**	**40**	**53**	**5000**
Management	MBA in Univ. Depts**	12	-	12	
	MBA in Engg and Degree Colleges.**	-	36	36	
	Stand alone MBA	-	36	36	
	(IIMB and NITK)*	2	-		
	Total	**14**	**72**	**86**	**6970**

Note: * Indian institute of Management, Bangalore and National Institute of Tech., Surathkal and data was collected from them for benchmarking purpose.
** do not have separate library. Central library facility and hence excluded from the study.
Source: AICTE website

As on 2005, the annual students' intake for undergraduate and postgraduate technical courses is around 46315 and 5000 respectively. Similarly, the annual intake for PG courses in Management institutes is around 7000 and the intake in institutes offering stand alone MBA is around 2000 students. The technical institutes are governed by VTU, Belgaum and the management institutes are governed AICTE and Universities in the region.

In order to get comprehensive picture of status of technology in management and technical libraries Karnataka, no sampling method has been adopted for data collection. The study considers all the 117 technical and 36 stand alone management libraries in the state for the current research.

The data from respondents is being collected through a questionnaire focussing on technology supported resources, facilities and services provided by libraries. After obtaining clearance from DSIR, New Delhi, the questionnaire has been mailed to all libraries considered for the study. The follow-up is done by telephone, subsequent posting and email to improve the response rate. The responses delayed due to AICTE's accreditation schedule for engineering colleges and other political disturbances in state. The response received from respondent libraries is given in Table 4.2

Table 4.2
The Responses Received from Libraries

Category	No. of Colleges	Questionnaires Distributed	Response Received	Refused@	Rate of Response#
Technical Libs.	117	117	97	7	82.91%
Management Libs.	86	36*	19	4	52.77%
Total	**203**	**153**	**116**	**11**	**75.82%**

Note: * For details see table 4.1, @ only for information and not included for study #calculated on response received.

Of 153 mailed questionnaires, the study received 116 responses resulting in 75.82% response rate, which is above the normal response rate for any mail survey. The response from engineering colleges is encouraging. The relatively less response from management libraries could be due to their location is parent engineering college campus.

4.3 PHASE – II

The second phase of the study involves obtaining responses from cross section of library users. Since the students' population of technical colleges in the state is very high (more than two lakhs), the study decides to take sample of the population.

4.3.1 Sampling Method

The methodology for obtaining data input from respondents involves i) Selecting libraries for survey, ii) Identifying the sample population and iii) determining the sample size.

4.3.1.1 Sample Institutions (i.e. Selection of Libraries)

As the undergraduate degree in engineering is a four years' course, the students use the library for four years (end of course). The postgraduate (PG) degree in engineering (ME/MTech) and management (MBA) is a two years course and Bachelor degree is prerequisite for both the courses. As compared to undergraduates, the postgraduates use the library more effectively. They use more subject books other than textbooks, look for more research papers in periodicals and therefore, they demand more service from the libraries. In view of this, the current study considers postgraduates as its respondents. The study team used the following criteria to select the respondent libraries for current research.

- The Technical institute should have technical PG courses for the past 5 years so that the library would have the experience of handling customer demands in a postgraduate environment.

- The technical institute should have more than 100 postgraduates studying in technical PG courses.

- The library building should have at least 5000 sq.ft and the print collection should be 20000 or more books and 100 or more periodicals.

- The library should have basic facilities and services like borrowing, reference, photocopying, inter library loan and IT supported resources and services.

Thus, applying the above criteria, it is observed that the engineering colleges offering one to three ME/MTech courses have less than 100 students. Finally the following technical and management libraries as presented in Table 4.3 have been selected for the study.

Table 4.3
Libraries Considered for the Current Study

Sl No	Name of College	No. of PGcourses+	Student Intake	Faculty	Research Scholars#
	Engineering Colleges (ME/MTech)				
1	P.E.S. Coll. of Engg., Mandya	4	65	211	4
2	Gogte Inst. of Tech., Belgaum	4	80	180	-
3	KLES's Coll. of Engg. & Tech. Belgaum	4	90	130	-
4	JNN College of Engg., Shimoga	4	104	200	6
5	NMAM Inst. Of Technology, Nitte	4	300	167	40
6	BVB Coll of Engg & Tech, Hubli	5	90	300	-
7	Malnad Coll. of Engg. , Hassan	5	100	140	10
8	Dayananda Sagar Coll. of Engg., Bang.	5	100	250	-
9	National Inst. of Engg. , Mysore	7	136	201	18
10	R. V. Coll. of Engg. , Bangalore	7	150	300	15
11	B.M.S Coll. of Engg. , Bangalore	8	150	280	6
12	P.D.A. Coll. of Engg. , Gulbarga	8	165	250	4
13	MS Ramaiah Inst. of Tech., Bangalore	8	150	230	45
14	BVVS's Basaveshwar EC., Bagalkote	9	200	151	30
15	Manipal Inst. of Tech., Manipal	12	323	278	32
16	S. J. Coll. of Engg. , Mysore	11	250	186	48
17	Univ Visveswaraya CE., Bangalore	15	350	200	10
	Management Institutes(MBA)*				
1	Acharya Inst. of Mgt. Sciences, Bang.	1	90	15	5
2	Administrative Mgt. College, Bangalore	1	120	10	-
3	BVV Inst. Of Mgt. Studies, Bagalkote	1	60	12	-
4	Canara Bank Inst. Of Mgt. Studies, Bang	1	60	20	-
5	East West College of Bus. Mgt. Bang.	1	60	10	-
6	KLE's Institute of Mgt. Studies, Hubli	1	60	13	-
7	M.P. Birla Inst. Of Mgt., Bangalore	1	60	16	-
8	M.S. Ramaiah Inst. Of Mgt., Bangalore	1	60	16	-
9	Sambaram Aca. of Mgt. Studies, Bang.	1	60	11	-
10	SDM IMD, Mysore	1	60	17	5
11	T.A. Pai Management Institute, Manipal	1	100	21	4
12	Xavier Inst. of Mgt & Ent., Bangalore	1	90	20	-

Note: * the criteria used for technical colleges were relaxed for management libraries.
None of the colleges have full time PhD Program. The research scholars are either faculty members or registered with faculty guides. The research scholars of some Mgt. institutes might have been indicated by the respective engineering colleges.
+ The AICTE approved students' annual intake for individual institutes is considered for authenticity and the discrepancy in responses (if any) by libraries is ignored. The faculty & researchers figures are based on the data provided respective libraries.

All the technical libraries mentioned in the above table have spacious buildings having more than 5000 Sq. ft plinth area. The print collection exceeds 20000 books and 100 periodicals. They have all the basic facilities like borrowing; inter library loan, reference, reading space, and photocopying service to their users. Besides, information-technology (IT) based facilities/services like online database search, CD-ROM, multimedia, document scanners, automated circulation, email and Internet browsing are available. The management libraries also had over 5,000 books, 50 periodicals and IT supported facilities.

4.3.1.2 Users' Population

The postgraduates, research scholars and the faculty members are the primary users of academic library and identified as user population for the current research. The following Table 4.4 shows the cumulative number of customers of the respondent libraries.

Table 4.4
Customer Population of Respondent Libraries

Education/ Library	Customers*			Total Population (Pct %)
	Faculty Members#	Research Scholars	Postgraduate Students#	
Engineering	3654	268	5606	9528 (82.97)
Management	181	14	1760	1955 (17.03)
Total Population	3835 33.40%	282 2.46.%	7366 64.15%	11483 (100.0)

Note: * Refer table 4.2 for use population of individual libraries. # Full time regular faculty members and students

The total user population of the libraries in the current study is around 11500 users distributed across 29 libraries located in Karnataka. The Population consists of 83% and 17% users from engineering and management libraries respectively. The student population constitutes the largest segment (64.1%) in the population followed by faculty member (33.4%), research scholar (2.5%) segments.

4.3.1.3 Sample Size

The research team uses 'Convenience sampling method' to determine the sample size for the current research. It was decided to consider 10% of population as target population. Thus, the target population was estimated to be around 1100 to 1200 respondents. Experts' (statistician and economist) opinion was sought regarding the adequacy of sample size and they opined that the sample size is adequate for current research.

4.3.2 Data Collection

The present study used survey method to approach the respondents through a questionnaire as an instrument for data collection. The survey instrument was an adapted version of SERVQUAL and LibQUAL instrument developed by Parasumaran and his team (Zeithaml, Parasuraman and Berry, 2000) and Association of Research Libraries (http://www.arl.org) respectively. Further, a few users were contacted for clarification of some doubts raised while analysing the data.

4.3.2.1 Survey Instrument

The questionnaire consists of **four sections** namely respondent's demographic features, expectations, perceptions and overall ratings.

The **first section** included the following variables related to customers' demographic and psychographic features.

Variables	Description
Gender/ marital status	male/female; single/married
User category	Faculty member/research scholar/postgraduate
Residence	i) background-village/town/city ii) current-Campus/outside
Experience	Years of using the library
Preferred sources of information	Ranking of sources such as Institute library, self purchase, internet, friends/colleagues/ visit other libraries
Library visit & time spent	Frequency of library visit and how much time the spend during a visit
Communication	What type of information and how it is communicated to user from the library

The **second section** contains 29 statements on key features of service quality in an ideal situation with emphasis on IT supported products and services. Respondents asked to indicate the importance of those features for a good library. For example, "The comprehensive collection of print resources like books and journals for a good library" The expectation is measured on Likert's 5-point importance scale ranging from '1' for least important to '5' for most important. An open-ended question at the end of expectation section asks respondents to mention any other services that customers feel important for a good library in their field.

The **third section** also contains 29 paired statements of previous section seeking respondent's perception of availability of those features in their institute's library. For example, "Our library has comprehensive collection of print resources like books and journals" The perceptions are measured on Likert's 5-point agreement scale ranging from '1' for strongly disagree to '5' for strongly agree. In addition, each statement included an option to indicate 'N/A' if the feature is not available in their library.

The **fourth section** was contains variables to measure respondent's overall satisfaction level, overall ratings of service quality, adequacy of print and electronic resources, IT based facilities/services, and willingness to spread word of mouth recommendations among friends and colleagues (WOM).

The questionnaire was sent to DSIR and PRC members for the review and the final version of questionnaire was printed incorporating the suggestions by the members. Further a web-based questionnaire was designed using website http://www.Surveymonkey.com for online data collection.

Pilot study: The pilot study was conducted by sending web-based questionnaire to a few respondents including PRC members. The final web-based questionnaire was prepared incorporating the suggestions from respondents.

4.3.2.2 Distribution of Questionnaires and Responses Received

Administration of Questionnaire: the questionnaire was administrated in two stages. The first stage web-based questionnaire was mailed respondents whose emails were available. In the second stage, field investigators were sent to various places to collect the response personally from library users.

In the first stage,

- the web-based questionnaire was emailed to librarians and network administrators for forwarding the link internally to faculty, researchers and PG students;

- The survey link to web-based questionnaire was e-mailed to individual faculty members (using mail-merge) whose email-id was available on their institute's website. Thanks to AICTE for its directives on mandatory disclosures. Though AICTE's mandatory disclosure norms insist all member institutes to display complete profile of faculty members on their website, many institutes did not provide emails of faculty members and none of the institutes selected for the study displayed email-ids of postgraduates and research scholars on their website.

- As 70% of the emails were bouncing with error messages like 'mail box full, account is not active, do not have account, exceeds the quota etc.', the survey link was sent repeatedly to the respondents.

In the second stage,
As email-id of postgraduates and research scholars was not available on website, field investigators were sent to the colleges with printed questionnaires for data collection. The questionnaires were administered randomly to the users who were available in institute/library at the time of distribution. Quite interestingly, the faculty members who had already responded to web-based questionnaire informed the investigators about the same when investigators approached them with print questionnaire.

Responses received from Respondents: The study received overall 1697 responses through print and web-based questionnaires. The responses are summarised in Table 4.5.

Table 4.5
Responses Received from Respondents

Institute	Responses Received (Pct%)#	Total Pct(%)
Engineering	1411 (83.15)	
Management	286 (16.85)	
Total Responses		1697 (100.0)
Total On-Line Responses	605 (35.65)	
Total Print Responses	1092 (64.35)	

Note: # As the data was collected for collective analysis, cumulative figures are provided on ethical ground.
() Figures in parentheses indicate the percentage.

.

Of the 1697 responses, The print and web-based responses constitute 64.35% and 35.75% respectively. The responses include from engineering and management library users were 83% and 17% respectively. The proportion was found almost similar in total user population also. The response database included 64% response through printed and 36% through online questionnaires.

The overall responses exceed the initially estimated sample size of 10% of respondents (i.e. around 1100). The reasons are as follows:

i) The online survey was active and the responses were not known at the time of data collection through print questionnaires. Since the responses figure was not known, the effort was made to collect requisite responses through print questionnaires.

ii) The online responses respondents contributed to the overall increase in the number of responses and the there is no duplication as the faculty members who had responded to web-based questionnaire did not fill the print questionnaire when field investigators contacted them.

iii) Thus though the responses were exceeding the estimated sample size, it was decided to include them in analysis considering their precious data support.

Besides, the study received another 433 incomplete questionnaires and most of them were web-based responses. The significant numbers of in-completed responses indicate respondents' enthusiasm and cooperation in responding to the questionnaire. However, the incompleteness was mainly due to technology related limitations like:

- Low bandwidth of internet,
- Few terminals in the department having internet connectivity,
- Problems of web browser settings/configurations to view the complete webpage. Many respondents could not see the complete questionnaire through their browser and could not navigate to next page as mandatory questions in invisible part were not answered.
- A sample of respondents' queries was like: "I cannot see the complete page", "you have mentioned four pages I cannot see the next button" when I click next button I get error message the page has incomplete question please answer, but I cannot see the incomplete question" (The questionnaire had a few mandatory questions which need to answered by respondents to move to next page); "I gave up as it is taking much time to move to next page".

The information about incomplete questionnaires is mentioned here as the incompleteness is greatly due to technology related problems. However, the incomplete responses are excluded for data analysis.

4.3.3 Responses Obtained From Users of IIT/IIM Libraries.

As mentioned earlier, the study attempted to collect information on resources and facilities provided by IIT/IIM libraries for benchmarking purpose. The websites of IITs/IIMs have been browsed for data collection and separate mails were sent to librarians for providing the relevant data. However, the data collection was mainly focussed on information available on website

Similarly, the study attempted to collect responses from cross section of users of IIT/IIM Libraries to observe any variation in customer expectations, perceptions as compared to library users of Karnataka. The IIT websites have emails of faculty members, researchers and postgraduates. The IIM websites have emails of faculty members only.

- The link to web-based questionnaire has mailed to the individual respondents (through mail-merge), whose emails are available,
- The bouncing rate is almost negligible as compared to the bouncing rate of emails to users in Karnataka;
- Though the bouncing rate was less the survey link was sent repeatedly to improve the response;
- The data collection from IITs/IIMs is limited to online survey only.

The response from IIT/IIM Library users are given in Table 4.6

Table 4.6
Responses Received from users of IIT/IIM Libraries

Institute	Responses Received (Pct%)#
IITs	562 (79.94)
IIMs	141 (20.06)
Total On-Line Responses	703 (100.00)

Note: # As the data was collected for collective analysis, only cumulative figures are provided on ethical ground. The Figures in parentheses indicate the percentage.

The responses from users of IIT/IIM libraries include 80% from IITs and 20% from IIMs. While the response from IITs includes faculty members, research scholars and postgraduates, the response from IIMs includes only faculty members. Incidentally, the distribution of responses across IITs and IIMs is almost same with distribution pattern across engineering and management institutes in Karnataka.

.

4.4 PHASE – III

The third phase of research is devoted to data analysis and presentation of research findings and submission of final report to DSIR, New Delhi.

Data Input: Response received from respondents through print and web-based surveys constitute the primary database. Separate spreadsheets have been created for responses from state and national libraries.

Data Analysis: The data is analysed using SPSS package (Statistical Package for Social Sciences). Statistical tools like, frequency distribution, cross tabulation; correlations; compare means; factor analysis, ANOVA and regression tests were used for analysing the data. The descriptions of these tools are given in the Appendix.

4.5 SCOPE AND LIMITATIONS OF THE STUDY

The present study evaluates the status of technology and service quality in technical and management libraries in Karnataka. Though the results could lead to general conclusions, it may difficult to generalise the results for other states in India and it is not purpose of this study too.

The data collected from IIT/IIM libraries for the purpose of benchmarking only and detailed study of these libraries is beyond the scope of this project. Further the data is obtained from websites of respective institutes and no attempt is made to test or validate the comprehensives and correctness of the data.

The study considers faculty members, researchers and postgraduates as its target population. Further, full time students and faculty members are selected for the survey. Part-time faculty members, large population of undergraduate students are not covered for this study. Hence the study does not reflect the performance of any specific library.

The data from individual library has been gathered for collective analysis and hence identity of any specific library is not revealed to honour the ethical values of survey research. Similar logic has been hold for responses received from Users of individual IIT/IIM libraries.

To sum up, the current research is conducted including technical and management libraries in Karnataka. The study uses census population of libraries in the first phase and convenience sampling method in second phase for obtaining response from respondents. The study received 1697 responses from users of Karnataka and 703 responses from users of IIT/IIM libraries. SPSS package is used to analyse the data.

The responses received from respondents is analysed and discussed in the next chapter.

Chapter 5

STATUS OF TECHNOLOGY IN TECHNICAL AND MANAGEMENT LIBRARIES IN KARNATAKA

As discussed in previous chapter, an attempt has been made to collect library data from 153 technical (117) and management (36) institutes located in Karnataka state. Information regarding Library resources, technology based facilities and services is obtained through a mailed questionnaire. The study received 116 responses and the same have been analysed in this chapter. On ethical grounds of survey research, the identity/individuality of respondent libraries is kept confidential and the data is used for collective analysis only.

Information on IIT/IIM Library resources and facilities has been gathered from their websites for benchmarking purposes. Separate mail also was sent to these libraries for providing information. The information on IIT/IIM library resources and facilities are also presented in this chapter.

5.1 DISTRIBUTION OF RESPONSE FROM LIBRARIES

Of 153 mailed questionnaires, the research received 116 responses resulting in 75.82% response rate. This response rate is above the normal response rate for mail survey. The distribution of responses is shown in Table 5.1

Table 5.1
Distribution of Responses from Libraries

Education/Libraries	Number of Libraries		Total Pct (%)
	Govt./Aided	Private	
Engineering	10	87	97 (83.6)
Management	1	18	19 (16.4)
Total Responses	11 (9.5)	105 (90.5)	116 (100.0)

Note: figures in parenthesis indicate the percentage

The total response consist 83.6% responses from technical and 16.4% responses from management libraries. Further, it includes 90.5% responses from private 9.5% from Govt. /aided libraries. The proportion of respondents in the response population is almost similar to the proportion in total population.

5.2 INFORMAITON RESOURCES IN LIBRARIES

5.2.1 Print Resources

The print resources include books, periodicals, reports, standards, theses/dissertations and company balance sheets. The resources available in respondent libraries are summarised below.

Books: The book collection in respondent libraries ranges from 1,460 books to 88,000 books. The distribution is summarised in Table 5.2

Table 5.2
Book Collection in Respondent Libraries (n=116)

Number of Books	Number of Libraries		Total Pct (%)
	Engineering	Management	
Below 5000	5(5.1)	3 (15.8)	8(6.9)
5000-10000	23(23.7)	11(57.9)	34(29.3)
10000-15000	25(25.8)	3(15.8)	28(24.2)
15000-20000	7(7.2)	-	7(6.0)
20000-30000	8(8.2)	2(10.5)	10(8.6)
30000-40000	8(8.2)	-	8(6.8)
40000-50000	6(6.2)	-	6(5.2)
50000-60000	9(9.3)	-	9(7.8)
Above 60000	6(6.2)	-	6(5.2)
Total	**97**	**19**	**116(100.0)**

- Less than 15000 books found in 60.4% of libraries. This group include 54.6% of technical and 89.5% are management libraries.
- The collection ranges from 15,000 to 30,000 books in 14.6% of libraries.
- 12% of libraries have 30,000 to 50,000 books and
- 13% have more than 50,000 books.
- More than 15,000 book collection is traced only in technical libraries (except two management libraries as in the table). However, it constitutes 54.6% of technical libraries.

Book Bank: It is observed that the government provides a special grant to AICTE affiliate colleges for developing book bank collection for SC/ST students. This special collection is found in 58.6% of libraries and the collection varies from 500 to 15000 books. Interestingly, this collection is reported by technical libraries only.

Periodicals: The periodicals include journals and magazines published in India and abroad. The number of periodicals subscribed by respondent libraries is shown in Table 5.3.

Table 5.3
Periodicals subscribed by Respondent Libraries (n=116)

Number of Periodicals Subscribed	Subscription to Periodicals								
	Indian			International			Total (Ind+Intl)		
	Engg	Mgt	**Tot**	Engg	Mgt	**Tot**	Engg	Mgt	**Total**
Less than 25	25	2	**27**	42	12	**54**	10	0	**10(8.6)**
25 – 50	35	6	**41**	27	1	**28**	24	7	**31(26.7)**
50 – 100	21	7	**28**	10	1	**11**	35	5	**40(34.5)**
100 – 200	13	3	**16**	7	2	**9**	20	5	**25(21.6)**
200 – 300	-	1	**1**	-	-	**-**	3	1	**4(3.4)**
More than 300	-	-	**-**	-	-	**-**	2	1	**3(2.6)**
NR	3	-	**3**	11	3	**14**	3	-	**3(2.6)**
Total	**97**	**19**	**116**	**97**	**19**	**116**	**97**	**19**	**116(100)**

The total periodicals (Indian and International) subscriptions by respondent libraries vary from 10 to 334. The total subscriptions are less than 50 periodicals in 35.1% of libraries and it varies from 50-100 in another 34.5% of libraries. Subscriptions range from 100 to 200 periodicals in 21.6% of libraries and only 7 libraries (6.0%) subscribe more than 200 periodicals.

Subscription to Indian periodicals varies from 10 to 220 periodicals. More than half (58.6%) of the libraries subscribe less than 50 Indian periodicals. About 24% of them subscribe 50 to 100 periodicals and only 14.6% of them subscribe more than 100 Indian Periodicals.

- 61.9% of technical and 42.2% of management libraries subscribe less than 50 Indian periodicals;
- 21.6% of technical and 36.9% of management libraries subscribe 50-100.
- In another words majority of respondent libraries subscribe less than 100 Indian periodicals.

Subscription to International periodicals varies from 1 to 156 periodicals. Nearly half (46.5%) of the libraries subscribe less than 25 international periodicals and another 24.1% of them subscribe 25-50 periodicals. Only 7.8% of libraries subscribe more than 100 International periodicals.

- 42.3% of technical and 63.2% of management libraries subscribe less than 25 International periodicals.
- 27.8% of technical and 5.3% of management libraries subscribe 25 to 50 periodicals.
- Only 7.2% of Technical and 10.5% of Management libraries subscribe more than 100 periodicals.

Bound volumes: The back issues of subject journals are preserved in library in bound form. There was no attempt to collect the statistics on bound volumes as significant numbers of institutes are of recent origin.

Newspapers: all the respondent libraries are subscribing newspapers including regional and national level newspapers. The collection varied from 5 papers to 20 papers.

Project Reports: Project reports are available in 71.6% of libraries and these are the reports of projects done by students and faculty members. The collection varies from 500 to 5400 reports.

Standards: About 20% of technical libraries indicated the presence of Indian standards with them. However, there is no information from them regarding International standards.

Thesis/Dissertations: Only 10(8.6%) libraries indicated the presence of theses with them but the quantity is not indicated.

Company Annual Reports: The company balance sheets are frequently used in management libraries for case discussion/analysis. More than half of the management libraries (57.9%) and 11.3% of technical libraries have Annual reports collection. The collection varies from 50 to 500 companies.

5.2.2 Non-Print Resources

Audio/Videocassettes: The audiocassette collection is found in 38.1% of technical and 52.6% of management libraries and the collection is less than 100 audiocassettes. Similarly 34% of technical and 79% of management libraries have Videocassettes and the collection is below 100 VCs.

CDs/DVDs: Of late, significant number periodicals and computer related books are accompanied with CDs. Further, many books and training materials are being published in CD format. Technology is also available for converting videocassettes into CDs. As a result, this collection is increasing in libraries. This collection is found in 82.5% of technical and 84.2% of management libraries and the collection varies from 50 to 2100 CDs. The CD collection is shown in Table 5.4

Table 5.4
CD/DVD collection in Respondent Libraries

Number of Books	Number of Libraries		Total Pct (%)
	Engineering	Management	
Below 100	3	7	10(8.6)
100-300	17	3	20(17.2)
300-500	21	4	25(21.6)
500-1000	25	1	26(22.4)
1000-1500	10	0	10(8.6)
1500-2000	3	1	4(3.4)
Above 2000	1	0	1(0.9)
NR	17	3	20(17.2)
Total	97	19	116(100.0)

Online/Offline Databases: Currently, the subscription to electronic databases is increasing either independently or through consortia. About 20% of the respondents have

indicated the presence of online databases. It is difficult to conclude on number of databases subscribed by libraries as name and numbers of databases indicated by them are not matching. A few libraries have just mentioned the number of databases without giving their names. Some have indicated DELNET as database and a few have mentioned individual e-journal as database. Five members have mentioned that they are in the process of subscribing IEL database. However, the name of electronic databases subscribed by respondent libraries are capital-line, CMIE databases **(**PROWESS, CapEx, EIS), IEL, IEEE, ACM, EBSCOhost, IBID, CRIS-INFAC, INDIASTAT.COM**,** INDLAW.COM, and ECCH.COM, The non subscription may be due to high subscription rates of online databases. Online subscriptions also depend on internet connectivity, its speed, bandwidth and financial support by the management. As per AICTE circular, Subscription to IEL online library is compulsory for all the member institutes (engineering) and they can subscribe it through INDEST availing special discount. As a result more technical libraries may subscribe IEL library in near future.

5.3 TECHNOLOGY-BASED FACILITIES IN LIBRARIES

Information on technology supported equipment such as photocopiers, scanners, digital camera and electronic burglar alarms, UPS and Generators was obtained from the libraries. The responses are tabulated in Table 5.5

Table 5.5
Technology Supported Facilities in Libraries

Slno	Facility	Availability of the Facility		
		No	Yes	**Total**
1	Photocopying	11(12.5)	105(87.5)	**116(100.0)**
2	Document Scanners	75(64.6)	41(35.4)	**116(100.0)**
3	Barcode Scanners	48(41.4)	68(58.6)	**116(100.0)**
4	Digital Camera	95(81.9)	21(18.9)	**116(100.0)**
5	Electronic burglar alarm device	106(91.4)	10(8.6)	**116(100.0)**
6	UPS	26(22.4)	90(77.6)	**116(100.0)**
7	Generator	42(36.2)	74(63.8)	116(100.0)

Photocopying: A majority of respondent libraries (88%) have photocopiers in their premises. Information regarding its charges, working hours, and operation (outsourced/managed by self) is not collected as it is sensitive in nature.

Scanners: The '*document scanners'* are used to scan the print document and preserve it in digital format. The digital copy could be made accessible on network. About 35.4% of libraries have document scanners of which, a majority of them (81.25%) are technical libraries.

'Barcode scanners' are used in automated circulation systems. It is interesting to note that more than half of respondent libraries (58.6%) have barcode scanners and a majority (86%) of them are technical libraries.

Security Systems (digital camera/electronic burglar alarm): with the advent of technology, electronic gadgets such as Digital camera and surveillance systems are used as security devises to control the unauthorised movement and minimise the loss of valuable books in the library. In Karnataka majority (81%) of respondent libraries don't

have digital camera or any other electronic devices for security purposes. Only 19% (all are technical libraries) of them indicated the presence of digital camera in their library.

Radio Frequency Identification Device (RFID) is the latest technology in library document security. Currently, it is not traced in any respondent library as it is in its initial stages and not popular among librarians community. Of late, vendors are creating awareness among librarians through seminars/conferences and personal visits.

Power Systems: Acute electric power shortage in Karnataka is resulting in frequent power shutdowns. In order to overcome the shortage problems, majority of technical and management institutes (75%) in the state have installed own generators for captive power supply during breakdowns. Further, they have installed UPS (uninterrupted power supply) system for continuous power supply to computers.

5.3.1 IT-Based Equipment & Facilities

The IT supported equipment and facilities include hardwares (computers, servers, operating systems, Printers), networks (LAN, campus), library automation softwares and Internet facility. Information obtained from respondent libraries is presented in Table 5.6.

Table 5.6
IT based Facilities in Libraries

Slno	Equipment	No	Yes	Total
1	Computers	05(4.3)	111(95.7)	116(100.0)
2	Operating System-windows	-(0.0)	91(78.5)*	116(100.0)
3	Operating System-Linux	101(87.1)	15(13.8)	116(100.0)
4	Printers (DOT, Inkjet, Laser, Network)	20(17.2)	96(82.8)	116(100.0)
5	Nature of Network-Stand Alone	89(76.7)	27(23.3)	116(100.0)
6	Nature of Network-LAN	38(32.8)	78(67.2)	116(100.0)
7	Nature of Network-Campus-wide	86(74.2)	30(25.8)	116(100.0)
8	Separate Server for Library	75(64.7)	41(35.3)	116(100.0)
9	CD-Server	101(87.1)	15(12.9)	116(100.0)
10	Internet Connection	25(21.6)	91(78.4)	116(100.0)

Note: Figures in parentheses indicate the percentage, * others not responded to this feature

Computers and Printers: Most of the respondent libraries (96%) have computers. But only 20% have indicated the number of terminals available for staff and users. In some cases (10%), the number is equal to the number of users. This could be due to the fact that many institutes are providing laptops to faculty members and insisting it compulsory for students.

Microsoft windows is the main operating system (O/S) in respondent libraries. Besides, 14% of them have Linux O/S too

Most of the respondent libraries (83%) have printers in their premises. About 45.4% of libraries have Dot Matrix printers, 33% have Dot Matrix and laser printers and 25% have Dot Matrix and inkjet printers. About 30% have printers working in network environment.

Computer Networking: About 67% of respondent libraries operate in LAN environment and 25.8% have campus-wide network. Campus network includes LAN too. Stand alone computers are found in 23.3% of libraries.

Separate Server for Library: Separate servers are available in 35% of libraries. However, location of the server and point of control/maintenance is not indicated by respondent libraries and verifying is not the purpose of this study too.

CD Server: CD server is another noticeable innovation that allows accessing virtual/mirror CDs on network. The CD Server is still in introductory stage in Karnataka and only 13% of respondent libraries have CD servers.

Internet Connectivity: A majority of respondent libraries (78.4%) have Internet connection and the computers having internet connection range from 1 to 400 terminals. It is to be noted that only 33.5% of respondents have informed the name of internet service provider and only 25.6% have mentioned the bandwidth also. BSNL is leading in internet provision and the bandwidth range from 256 kbps to 3mbps. Only 10 libraries indicated the bandwidth greater than 2mbps.

Wi-Fi technology provides campus-wide wireless internet connection. Since Wi-Fi is in initial stages, there was no attempt to obtain data from the respondents. However, 5% of them indicated its presence in their premises.

5.3.2 Library Automation

One of the major impacts of IT on libraries is the library automation. The automated library functions are Acquisition, Cataloguing, Classification, Circulation, serials control, Bill payment, budgeting, reminders and reference services. The status of library automation and year of automation is shown in Table 5.7

Table 5.7
Status of Library Automation and Year of Automation

EDUCATION/ LIBRARY	LIBRARY AUTOMATION				YEAR OF AUTOMATION				
	Yes	No	Total		1990-94	2000-01	2002-03	2004-05	Total
Engineering	74 (76.3)	23 (23.7)	97 (100.0)		3 (4.1)	8 (10.8)	27 (36.5)	36 (48.6)	74 (100.0)
Management	12 (63.2)	7 (36.8)	19 (100.0)		1 (8.3)	1 (8.3)	3 (25.1)	7 (58.3)	12 (100.0)
Total	86 (74.1)	30 (25.9)	116 (100.0)		4 (4.8)	9 (10.7)	30 (35.7)	43 (47.9)	86 (100.0)

Note: the figure denotes the number of responses and figures in bracket represent percentage

Library Automation: About 74.1% of respondent libraries are automated and of which, majority are technical libraries. Among the automated libraries, 86% are technical and 14% are Management libraries. Further, 76.3% of technical and 63.2% of management libraries are automated.

Year of Automation: Though the efforts for library automation have been traced since 1990 in Karnataka, significant implementations are traced only after 2001. About half of

the automated libraries (48%) are of recent origin (since 2004) and another ten libraries (only technical) are in the process of automation.

Software Packages: only a few commercial software Packages are in competition in Karnataka. Among the automated libraries, 61 have mentioned the software name. The packages which have more than one installation in Karnataka are Lib-Soft (19), Easylib (16), LibSys (3), Environ (3) and netlib (2). The softwares having single installation are Sanjay, WinISIS, Delplus, Libris, e-granthalaya, Slim++, Soul, and logic. Ten libraries have developed in-house software. Twenty Five libraries have not mentioned the name of software installed. Lib-Soft and Easylib are leading library softwares in Karnataka with more than 16 installations. Ten libraries stated that they are negotiating with Easylib/Lib-soft.

Automated Library Operations: The popular automated library functions are Circulation, Accession, OPAC, Cataloguing and Classification. The other automated functions but not popularly used are Serials control, Reference services, Reminders, Bills payment and budgeting. The reasons could be attributed to the different practices followed by respondent libraries.

Automated Lib. Functions	Edun_type		Total
	Engg.	Mgt.	
Circulation	65	12	77
Accessioning	60	11	71
OPAC	61	9	70
Cataloguing	55	8	63
Classification	50	8	58
Serials Control	42	8	50
Reference Service	37	6	43
Reminders	36	4	40
Bill Payment	24	5	29
Budgeting	10	1	11

5.3.3 Digital Library Initiatives

One of the great impacts of IT is the evolution of digital library. Though the library professionals love to have digital collections in their library, it is greatly dependent on infrastructure and financial support by the management. An attempt was made to obtain data on librarians' efforts on digitisation, electronic databases and the type access given to those resources. Many respondents have expressed developing digital library as their future plan

Digitisation: Only 5% of libraries mentioned their effort to digitize institute's own project and research reports and making it available on intranet. Another 5% mentioned that they have both hardcopy and soft copy of students' project reports. The CD mirror server has been installed in 15 libraries with CDs loaded on the same. Three libraries have informed that they have converted videocassettes into CDs and the same have been loaded on CD Server. Five libraries are in the process of buying Scanners for digital conversion.

E-Books and E-Journals: Only three libraries mentioned about presence of e-books. Very few have responded to this feature. The response is not clear regarding e-Journals, as 30 respondents have mentioned database name and number of journals in the database (300 journals, IEL etc).

Publications- print / electronic: About 30% of the respondent libraries stated that they publish print publications like technical journals and in-house magazine. However, none of them have indicated the availability of these publications in electronic format.

Open Digital library Softwares: Green Stone Digital Library (GSDL), dSpace, Eprints are popular open sources for creating digital library. It is encouraging to note that though only ten respondent librarians have indicated the use of GSDL or dSpace, forty members have indicated their desire to use GSDL/dSpace for creating digital library.

Access to Digital Resources/Databases: The access to digital resources through stand-alone terminals is provided by 7.8% of libraries and another 25% through LAN. The campus-wide access is provided by 18.1% of respondents. The access is through login and IP authenticated. It is observed that the access to library resources through Websites is not traced in any of the respondent libraries.

5.4 LIBRARY BUDGET, COMUNICATION AND STAFF

Library Budget: Financial support from the management plays a crucial role in library resource development and service provisions. The annual budget varies from library to library and largely depends on number of users, type of management, priorities on type of materials to be procured etc. AICTE (http://www.aicte.ernet.in) also has laid norms for library budget based on number of courses and admissions and tuition fee.

About 75% of the respondent libraries have indicated their annual budget, 10% informed that it is confidential and 2% said that there is no limit. The budget varies from 0.5 lakhs to 92.0 lakhs. The budget pattern in side table indicates that:

Library Budget (in Rs. Lakhs)	Number of Institutions		
	Engg	Mgt	Total (Pct%)
<5.0	18	9	27(31.0)
5.0-10.0	22	5	27(31.0)
11.0-15.0	11	1	12(13.8)
16.0-20.0	1	2	3(3.5)
21.0-25.0	8	-	8(9.2)
26.0-30.0	4	-	4(4.6)
31.0-40.0	1	1	2(2.3)
41.0-50.0	2	-	2(2.3)
66.0- 92.0	2	-	2(2.3)
Total	69	18	87(100.0)

- The budget is below Rs. 5.0 lakhs is in 31.0% of libraries and it varies from Rs. 6.0 to Rs. 10.0 lakhs in 31.0% of libraries;
- It ranges from Rs. 11.0 lakhs to Rs. 15.0 lakhs in 13.8% libraries and Rs. 16.0 lakhs to 20.0 lakhs budget found in 3.5% of the same.
- 9.2% have budget from Rs. 21.0 lakhs to 25.0 lakhs and the budget exceeds Rs. 25.00 Lakhs in 11.5% of libraries.
- Only 10% of respondents have budget allocation for electronic resources and it ranges from 15 to 20% of library budget. The reasons could be due to the budget proposed librarian may not include electronic resources and IT department of the institute may have separate budget allocation for electronic resources. Further probing is beyond the scope of this study.

Communication from Library: Notice Board is the common media for library to communicate with users. Besides, telephone, circulars, email are the other means of communication used by libraries. Information regarding new additions, reminders, new services and seminars/conferences are popularly communicated user community. Of late, bulletin boards, public folders and emails are increasingly used by librarians to inform the users.

The library instructions, information handbooks, rules and regulations are communicated to users through printed handbooks (65.7%) and electronic documents (22.1%). Though some responses are missing, it can be presumed that all libraries will have their information either independently or as a section in the institute's brochure.

Library Staff: Manpower in library plays a significant role in rendering quality services. The staff strength depends on size of print collection and library building. Of the 116 respondent libraries, 103 have responded to this feature. As discussed earlier, more than half of the libraries are of recent origin and the staff strength ranges from 2 to 35 members. The staff data is side table indicate that:

Library Staff	*Number of Institutions*		
	Engg	Mgt	Total (Pct%)
<5	28	12	40(38.8)
5 - 10	35	5	40(38.8)
11 - 15	11	-	11(10.7)
16 - 20	6	-	6(5.8)
21 - 25	4	-	4(3.9)
>25	2	-	2(1.9)

- Less than five members found in 38.8% of the libraries and strength varies from 5 to 10 members in 38.8% of the same;
- Staff strength above 10 found only in technical libraries.

The response is varying in information regarding technical and library professionals. The number of technical staff quoted by 15 respondents exceeds the total library staff indicating IT Professionals in the institute are common for library and other IT departments. Thirty respondents have mentioned the number of library professionals in their library as one or two indicating the library has one or two professionals and rest are skilled/semi skilled staff.

5.5 LIBRARY BUILDING and WORKING HOURS

The spacious library building is essential for holding print resources, shelves, equipment and reading space for user. The library timings play a significant role in utilisation of library resources. The spacious building with good ambience and longer working hours do motivate users to visit the library. The responses regarding library building and working hours are summarised below.

- **Library Building:** Among the respondent libraries 29% have independent building and the remaining 71% are housed in institute's main building. It is noticed that only technical libraries have independent building. Number of courses and faculty/students' strength could be the prime factor for technical colleges to have independent building. Even among technical libraries, 35% of them have independent building.
- All management libraries who have responded don't have separate building. By nature of course and users, it may not be required too.

Library Building	*Number of Institutions*		
	Engg	Mgt	Total (Pct%)
No	63 (65.0)	19 (100.0)	82 (70.7)
Yes	34 (35.0)	-	34 (29.3)
Total	97 (100.0)	19 (100.0)	116 (100.0)

Building Space: the library area varies from 2000 sqft. to 70,000 sqft.

- The plinth area is less than 5000 sq.ft. in 42 libraries and it ranges from 5000 - 10,000 sqft. in 37 libraries.
- It ranges from 10,000 – 15,000 sqft. in 15 libraries and from 15,000 - 20,000 sqft. in 7 libraries.
- The area exceeds 20,000 sq.ft in eight libraries and seven libraries have not responded to this feature.

Library Working Hours: The normal working hours are be 8-9 hours in a day (8.00/9.00 AM to 5.00/6.00 PM). Any extension may be subjected to demand from students and support from the management. Students and faculty members who stay in campus may require longer library timings. The responses received from libraries are summarized below:

Library Timings/Day	Number of Institutions		
	Engg	**Mgt.**	Total (Pct%)
8 to 9 Hours	**14**	**7**	21(18.1)
11-12 Hours	**36**	**6**	42(36.2)
14-15 Hours	**12**	**5**	17(14.7)
16-17 Hours	**8**		8(6.9)
No Response	**27**	**1**	28(24.1)
Total	97	19	116(100.0)

- 18.1% work for 8-9 hours and 24.1% not responded. A normal working hours can be presumed that the non-responding libraries also. Cumulatively, 42.2% of libraries have normal working hours.
- 36.2% of libraries work for 11 - 12 hours a day and another 14.7% open for 14 - 15 hours a day
- Only 6.9% open beyond 15 hours a day.
- 42.2% of libraries open on Sundays too and majority of them (89.8%) are technical libraries. More than 50% of technical and 70% of management libraries remain closed on Sundays.

5.6 PROBLEMS and FUTURE PLANS

The respondents were requested to narrate their problems faced with technology implementation and their future plans through open-ended questions. The responses are consolidated below.

Problems Faced by Librarians while using Technology: In addition to benefits the technology make professional panic because of its problems during installation or operations. The problems listed by respondents are given below and figures in parenthesis indicate the number of responses.

i. **Insufficient Budget (34):** This is the crucial problem that librarians are facing currently and they feel the current budget provision is not adequate to introduce any technology supported resources and facilities. They feel the budget should be enhanced to add IT equipments and e-resources.

ii. **Customisation of library Software (22):** This is another problem face by librarians as each library has its own procedure for acquisitions, circulations, payments. Inter-operability and data conversion is another issue that bothers librarians.

iii. **Hardware problem/Break-down (20):** Frequent breakdowns in hardwares, power supply disturb the transactions and fuel worries for data security. This problem is more visible in network environment and Karnataka is facing acute power shortage.

iv. **Updating Terminals (15):** Updating of old machines is another issue because many new websites, CDs do require latest PCs for proper display.

v. **Circulation (15):** Problems while books circulation in commercial softwares is frequently faced by many libraries. The problems due to software and network traffic loads. Though the commercial vendors keep updating their software features, the libraries face problems during issues and returns.

vi. **Staff Training (11):** the librarians opine that the lack of technical skills/training also becomes problem while using technology in day to day operations. They feel proper training to staff is very much essential.

vii. **Internet Speed (10):** low bandwidth of internet causing problem in speedy retrieval of information in many libraries.

viii. The other problems reported by respondent libraries are "Insufficient Building Space (8)", "Lack of Staff (7)", "Reports generation (7)", "Digitising problem (6)", "No UPS for library (5)", "Virus Attack (5)", and "reading e-books (5)".

Future Plans towards Technology Integration: The future plans or desires expressed by respondent librarians are very much encouraging towards implementation of IT supported resources and services. The desires/plans of respondents are cumulated and presented below (the features which received above 5 responses are considered and figures mentioned in parenthesis represent the number of responses).

- Developing Digital Library (60);
- Library Automation (25)
- Joining INDEST, DELNET (20);
- Bar-Coding (20)
- Internet (18);
- Library Networking (15)
- Creation of webpage for library and linking resources through web (15)
- Use of Greenstone Digital Library- GSDL (15)
- Learning dSpace (13)
- Purchasing Document Scanners (10)
- Installing CD-Server (10)
- Digitise institute and faculty publications (9)
- Subscription to IEEE (9)
- Smart card, e-campus, RFID, campus access (6 each)

The above list reflects the positive mindset of library professionals to embrace technology and to introduce IT based services in their libraries. They are also enthusiastic towards developing digital library using open source softwares such as GSDL and dSpace. However, its realization subjected to the infrastructure, equipment, administrative and financial factors which are beyond the control of librarian. Thus, the actual implementation mainly depends on the support from the top management. Despite limitations, the optimistic views of librarians towards technology are greatly appreciable.

5.7 RESOURCES AND SERVICES IN IIT/IIM LIBRARIES

One of the objectives of this study is to benchmark the library resources and services in Karnataka with the same in national level libraries such as IITs and IIMs. The library data has been compiled from their websites of IITMumbai(IITB), IITDelhi(IITD), IITGuwahati(IITG), IITKanpur(IITK), IITKharagpur(IITKgp), IITChennai(IITM), and IITRoorkee(IITR), IIMAhmedabad (IIMA), IIMBangalore(IIMB), IIMKolkata(IIMC), IIMIndore (IIMI), IIMKozhikode(IIMK) and IIMLucknow(IIML). No attempt has been made to validate the comprehensiveness or correctness of information and in-depth analysis is beyond scope of this study.

The primary objective of establishing IITs/IIMs is to impart high quality technical/management education, promoting academic research and training/consultancy services in the country. Government provides financial grant and other infrastructure facilities to these institutes. The libraries of these institutes naturally do receive attention from users and authorities and get a great deal financial and other supports from Government. On the other hand, the self-financing private organisations need to raise their own resources to provide such facilities. Hence, it is difficult and not appropriate to compare the services offered by national libraries with libraries in self-financing private institutes. However, an attempt has been made to present the consolidated picture of resources and services available in these libraries for the purpose of benchmarking.

5.7.1 Print Resources in IIT and IIM Libraries

The statistics of print materials is shown in Table 5.8

Table 5.8

Print Resources at IIT and IIM Libraries

Libs	Sp.Lib*	Books	Jnls	Bvols	TRepo	Stds	Thesis	BBank	Chl_lib+
IITs	IITB	207000	1190	96000	P	65500	3000	P	
	IITD	175135	850	78000	14430	27000	3100	P	
	IITG	75000	441	P	P	P	P	P	
	IITK	200000	1200	135000	25000	10000	15000	P	
	IITKgp	210000	1180	100000	p	P	P	P	
	IITM	200000	1200	85000	P	P	P	P	
	IITR	262000	900	48000	P	P	P	44000	
IIMs	IIMA	150000	610	45000	2000	-	200		
	IIMB	215000	900	30000	5600	-	500		
	IIMC	175000	500	40000	P	-	100		
	IIMI	15000	450	P	P	-			
	IIMK	15500	360	P	P	-			
	IIML	40000	575	14000	P	-			1000
	In addition, the IIMs have the Good collections of case Studies prepared by self and other institutes, company annual reports, faculty working papers, content pages of journals subscribed by them ,								

Note: * expansion is given in section 5.7. P-represents the presence (figures not available).
+ Only IIML has mentioned about children library but it may be present in other libraries too.
- Blank cells for want of information on webpage but may be available in the libraries.

Both IIT and IIM libraries have comprehensive collection of books, periodicals, and bound back volumes of journals. The periodicals subscriptions include significant

numbers of national and international Journals. IIT libraries have good collection of Technical reports, PhD Theses/Dissertations and Standards (Indian and International). IIM libraries also have rich collection project reports, theses, case studies, working papers and Annual reports.

5.7.2 Non-Print Resources in IIT and IIM Libraries

The non-print collection includes E-Journals, E-books, Full contents of e-journals, Audio-Visual cassettes, CDs/DVDs/CBTs. The non-print collections of these libraries are presented in Table 5.9.

Table 5.9
Non-Print Resources at IITs and IIMs

Libs	Sp.Lib	E-journals	Full Text E-journals	Microfilms & microfiches	A-V Cassettes	CD-ROMs/ CBTs
IITs	IITB	8000	√		270	√
	IITD	8000	√	2261	1064	1200
	IITG	8000	√		√	√
	IITM	8000	√	√	√	√
	IITK	8000	√		400	√
	IITKgp	8000	7000	√	√	√
	IITR	8000	8000		600	2000
IIMs	IIMA	√	√		50	650
	IIMB	1000	16000	10000	1000	5000
	IIMC	5000	√		100	√
	IIMI	1000	1000		√	√
	IIMK	900	4000		226	150
	IIML	891	√	12000	350	

Note: √-represent the presence of the feature but figure is not available on website.

IIT and IIM Libraries subscribe electronic databases through INDEST consortium. In addition, the IIM libraries have their own consortia for journal subscriptions and access to archives. The consortium subscription allows the member libraries to access archives of subscribed print journals.

Collection of micro forms such as Microfilms/ microfiches is indicated by IITD, IITM, IITKgp and IIMB only. The Micro forms have lost their significance with the emergence of CDs.

Since training and consulting are the major activities of IITs/IIMs, their libraries have good collection of audio/videocassettes and CDs/DVDs/CBTs. Besides, these libraries have CDs containing back volumes of journals.

5.7.3 Library Facilities and Services in IIT and IIM Libraries

The library facilities and services are summarised in Table 5.10. Some cells are empty for want of information on website. However, the features may be available in those libraries.

Table 5.10
Facilities & Services at IITs and IIMs

Facilities and Services	IITs							IIMs					
	B	D	G	M	K	Kg	R	A	B	C	I	K	L
Research &Reference	√	√	√	√	√	√	√	√	√	√	√	√	√
Inter-library Loans	√	√	√	√	√	√	√	√	√	√	√	√	√
T. Book & B.Bank Loan	√	√	√	√	√	√	√		√	√			
Photocopying	√	√	√	√	√	√	√	√	√	√	√	√	√
New Arrivals Display	√	√	√	√	√	√	√	√	√	√	√	√	√
Abstract/Indexing and Bibliography	√	√	√	√	√	√	√	√	√	√	√	√	√
Book Reservation		√		√					√	√			
Document Delivery				√					√	√			
Translation				√									
Journal Content				√					√				
Binding/Offset Printing		√		√									
User Education	√	√	√	√	√	√	√	√	√	√	√	√	√

Note: √-represents the presence (figures not available)

5.7.4 IT Supported Facilities and Services in IIT and IIM Libraries

The IT supported equipments and facilities and services are presented in table 5.11 and 5.12.

Table 5.11
IT supported Equipments in IIT/IIM libraries

Facility/Service	IITs							IIMs					
	B	D	G	M	K	Kg	R	A	B	C	I	K	L
Computers	√	√	√	√	√	√	√	√	√	√	√	√	√
O/S (windows/Linux)	√	√	√	√	√	√	√	√	√	√	√	√	√
Printers(Dot/laser)	√	√	√	√	√	√	√	√	√	√	√	√	√
Campus-wide Network	√	√	√	√	√	√	√	√	√	√	√	√	√
CD-Mirror Server	√	√		√			√	√	√			√	
Internet Facility	√	√	√	√	√	√	√	√	√	√	√	√	√
Document Scanners*	√	√	√	√	√	√	√	√	√	√	√	√	√
Barcode Scanners*	√	√	√	√	√	√	√	√	√	√	√	√	√
Library Automation*	√	√	√	√	√	√	√	√	√	√	√	√	√
Elec. Security System	√			√					√	√		√	
CD-ROMs/DVDs	√	√	√	√	√	√	√	√	√	√	√	√	√
UPS/Generator	√	√	√	√	√	√	√	√	√	√	√	√	√

Note: √-represents the presence (figures not available), the blank cells are due to want of information.
* the presence of features is assumed.

Table 5.12
IT supported Facilities and Services

Facility/Service	IITs							IIMs					
	B	D	G	M	K	Kg	R	A	B	C	I	K	L
Online FT Databases	√	√	√	√	√	√	√	√	√	√	√	√	√
Bibliographic Databases	√	√	√	√	√	√	√	√	√	√	√	√	√
E-Jnls Backfiles/ Archives	√	√	√	√	√	√	√	√	√	√	√	√	√
OPAC	√	√	√	√	√	√	√	√	√	√	√	√	√
Search on e-journals	√	√	√	√	√	√	√	√	√	√	√	√	√
CDROM Lit. Search	√	√	√	√	√	√	√	√	√	√	√	√	√
Techno Portals		√								√			
Library Website	√	√	√	√	√	√	√	√	√	√	√	√	√
Open Source S/W (GSDL, dSpace)	√	√		√		√						√	
Elec. Notice/Reminders	√	√	√	√	√	√	√	√	√	√	√	√	√
DELNET/INDEST	√	√	√	√	√	√	√	√	√	√	√	√	√
Note: Assumed facts, Blank cells may also present in other libraries.													

Note: √-represents the presence (figures not available)

These premier libraries must be having the IT supported equipments with latest configurations and IT supported facilities and services provided by these libraries could become model for other libraries.

5.7.5 Membership Facilities in IIT and IIM Libraries

In general, the users of academic libraries are the patrons of parent organisation and the access is restricted to the non-members. As compared to other academic libraries, IIT/IIM libraries have social obligation of serving academic needs of Indian nationals too. Hence, they accept memberships from outsiders against payment/subscriptions. The membership subscriptions are also deemed as sources of income. The categories of memberships practiced by these libraries are shown in Table 5.13

Table 5.13
Type of Memberships in IIT/IIM Libraries

Membership Category	IITs							IIMs					
	B	D	G	M	K	Kg	R	A	B	C	I	K	L
External Membership	√	√	√	√	√	√	√	√	√	√	√	√	√
Corporate/Industry	√	√	√	√	√	√	√	√	√	√	√	√	√
Academic Institutions	√	√	√	√	√	√	√	√	√	√	√	√	√
Alumni	√	√	√	√	√	√	√	√	√	√	√	√	√
Research Scholars	√	√	√	√	√	√	√	√	√	√	√	√	√
Business executives	√	√	√	√	√	√	√	√	√	√	√	√	√

The IIT/IIM libraries do get attention from parent bodies, sponsors and Government. The commercial vendors try to introduce their products to these libraries to test as well as for promotion. Thus it is assumed that the IIT and IIM libraries keep abreast of latest technology as compared to other libraries in the field.

5.8 IMPACT OF TECHNOLOGY ON LIBRARIES AS PERCEIVED BY LIBRARIANS

The objective of this research is to study the impact of technology on library functions and service quality. The study of impact requires examination of pre and post technology scenario in libraries. This necessitates the inclusion of libraries and people who have worked in manual and automated environments. In other words, the library and staff should have witnessed pre and post technology scenarios in the organisation.

The study was intended to have comprehensive coverage of libraries for proper understanding of status of technology in technical and management libraries in Karnataka. Further, it was also intended to obtain customers' assessments of service quality from cross section of faculty members, researchers and postgraduate students. The selection of libraries for measuring impact of technology at individual library level was difficult. Because:

i. More than half of the libraries are of recent origin and don't have experience of pre and post technology introduction scenarios.
ii. Many of the old libraries that have witnessed both pre and post technology periods don't have the library professionals who have experienced both in the same place.
iii. The users also need to have longer years of experience in using the library for assessing the impact. The duration of PG course is two years and students can express their view points on the current system only. Faculty members who are also employees of the institute may have longer years of experience. But obtaining responses only from experienced faculty members may be skewed (as they are also part of the system) and might not project the real scenario.

In view comprehensive coverage and representation from different categories of users, the research team decided to ask respondents librarians and respondent users to narrate their perceptions of impact of technology on library functions not limiting to their own library. The questionnaire had an open-ended question where the respondents were asked to mention the major changes happed in their library by introducing technology. Besides, many senior library professionals have been contacted to record their experiences with technology.

Interestingly, majority of the respondents (77.6%) have responded to this feature by listing the areas where they have seen or experienced visible impact of technology on library functions including their own library. Though the question was voluntary, the cooperation from library professionals to narrate their experiences is quite encouraging. The responses are focussing on impact of technology on library resources, facilities and services. The cumulative responses are described below and the figures in parenthesis denote the number of responses.

1. Library Automation (90)
    - Acquisition; circulation, OPAC, stock verification, Bar-coding, reference service, report generation
2. Digital Library (90)
    - Digitizing, online databases, e-books, e-journals,
3. Internet Facility(90)
4. Information Searching & Downloading (75)

5. Communication style (emails, internet, and mobile) (70)
6. Overall Library Management (60)
7. Providing Access to library resources on network (50)
8. Reference services (45)
9. Networking and Interlibrary Lending (40)
10. Avoiding the repetitive & duplicating work (30)
11. Pressure on budget to focus towards electronic resources (20),
12. Library staff to get acquainted and training with technology (20)
13. improved CAS and SDI services (20)

Technology becomes the prime factor for service providers to gather Information and make it accessible by users. In other words, the LIS professionals need to exploit the technology for gathering required information and make it accessible to customers at all times independent their geographical locations.

Networking with other libraries: Networking is another important area where the impact of technology is clearly visible. It has enhanced the networking capability of people for efficient service, fast retrieval of information and mutual cooperation. Networking with other libraries, associations and consortium are the economical means to provide information resources to users if they are not available in their own libraries. ILL and document delivery are the mutually accepted cooperation between the libraries. Membership to associations provides common platform for information exchange and experience sharing.

It is interested to note that about $1/4^{th}$ of respondent libraries do provide document delivery services to other libraries on Interlibrary Lending (ILL) requests. The print documents are supplied by post and electronic documents are supplied by email.

Consortium: Of late, consortium is becoming very important for an effective collective bargaining, particularly for subscription to electronic databases. The database aggregators offer attractive consortium prices for member libraries. INDEST (Indian Digital Library for Engineering, Science and Technology) is one such consortium established for by Ministry of HRD, Govt. of India (MHRD). This consortium subscribes databases and allows IITs/IIMs/NITs to access the same freely or at nominal charges. This consortium also allows other member libraries to subscribe databases at discounted rate. The IIMs have formed another consortium for cumulative subscription and access to databases/e-journals.

In the current study, the respondents were asked to indicate their membership with professional associations, other libraries and consortium. About half of the respondents have membership with association, library or consortium.

About 12% of technical Libraries have INDEST membership and another 13% are in the process of obtaining membership. Interestingly, AICTE's recent circular indicates that subscription to IEL database is essential for all member technical institutes and advises them to subscribe it through INDEST at discounted rate. As a result, the membership to INDEST is likely to be increased in near future as the member institutes may have to subscribe IEL database for their continued accreditation.

Similarly, DELNET (Developing National Library Network) is another national network, which allows its member libraries web-based access to some online databases and union catalogues of books and periodicals. It also facilitates ILL and document delivery services among member libraries. It is observed that 15% of respondent libraries have DELNET membership and another 10% are trying to obtain its membership.

In addition to INDEST and DELNET Memberships, the other memberships traced among respondent libraries are IASLIC (3), ILA (4), MANLIBNET (2), MYLISA (2), ISTE (3), and CSI (2). Besides, few libraries have taken membership to other libraries such as British Library (6), American Information Resource centre (AIRC-6), IISc, Bangalore (9) IIMB, Bangalore (5) and CMTI, Bangalore (8).

To sum up, the impact of technology is clearly visible in all functions of library. The changes are happening in a big way and it will continue. The future plans indicated by library professionals are indicative of increasing interest in implementing technology supported services to serve customers. The technical problems faced by them while adopting the technology shows the lack of their technical expertise. The Library professionals are enthusiastic on implementing digital library and becoming members of DELNET and INDEST. A majority of respondent of libraries have already started automating their functions. However, the noticeable development in library automation is observed for the past two years and many libraries. Unlike print resources, the technology supported resources and services involve lot of technical and financial issues that needs committed support from the top management.

The study received responses from cross section of library customers/users regarding their perception of service quality in libraries. The customer responses are discussed in next chapter.

Chapter 6
USERS' DATA ANALYSIS

This project is undertaken to study the quality of services of Technical and Management Libraries in Karnataka from customers' perspectives and the primary data is obtained from cross section of users through print and web-based questionnaires. The response print questionnaires have been collected through field investigators and responses to online questionnaire have been collected by sending survey links to users whose email-ids are available on institute's website. The response received from both online and print questionnaires have been analyzed in this chapter.

An attempt is also made to obtain responses from cross section of users of IIT and IIM libraries for the purpose of benchmarking and the data is collected through online survey only. The survey link was mailed to users whose email-ids were available on website. The website IITs' contains email-ids of faculty, researchers and PG students and that of IIMs' contains e-mail-ids of faculty members only. The responses from IITs/IIMs are used for comparison during the analysis.

6.1 CHARACTERISTICS OF RESPONDENTS

6.1.1 Distribution of Respondents

The current study received 1697 completed responses from users of Technical & Management institute libraries in Karnataka, which constitutes primary data for analysis and interpretation. The distribution of responses is shown in Table 6.1.

Table 6.1
Distribution of User Responses from Technical/Management Libraries in Karnataka

Discipline	Users' Responses			Total (Percent %)
	Faculty members	Research scholars	Post graduates	
Engineering	423	33	955	**1411(83.15)**
%Within Discipline	{29.98}	{2.34}	{67.68}	{100.00}
% Within User group	[89.24]	[75.0]	[81.00]	
Management	51	11	224	**286(16.85)**
%Within Discipline	{17.83}	{3.85}	{78.32}	(100.00}
% Within User group	[10.76]	[25.0]	[19.00]	
	[100.00]	[100.00]	[100.00]	
Total	**474(27.93)**	**44(2.59)**	**1179(69.78)**	**1697(100.00)**

Note: Figures in { } represent the percentage within the discipline and figures in [ ] represent percentage within user groups. The term faculty member includes Lecturer, Asst. Professor and Professor.

The response population includes 83% responses come from engineering and 17% from management disciplines. The population consist 27.93% faculty members, 2.59% research scholars and 69.78% postgraduates.

Distribution responses among Disciplines and User Categories: The proportion of responses from faculty members, researchers and postgraduates in engineering discipline

is 29.98%: 2.34%: 68.68%. Similarly, the proportion in management discipline is 78.32%: 17.83%: 3.84%.

The faculty members segment consist 89% respondents from engineering and 11% from management disciplines. The Researchers segment includes 75% respondents from engineering and 25% from management fields. Similarly the postgraduates' segment consist 81% from engineering and 19% from management disciplines.

The responses received from users of IIT/IIM Libraries are presented in Table 6.2.

Table 6.2
Responses from Users of IIT/IIM Libraries

Discipline	Users' Responses			Total (Percent %)
	Faculty members	Research scholars	Post graduates	
IITs	176	170	216	**562(79.74)**
IIMs	141	--*	--*	**141(20.26)**
Total	**317(45.09)**	**170(24.18)**	**216(30.72)**	**703(100.00)**

Note: * not received for want of email-ids on website for online survey

The responses from users of IITs and IIMs constitute 80% and 20% respectively. The response population consist 45% faculty members, 24% researchers and 31% postgraduates. Hereafter, the analysis is carried out for responses from Karnataka and data from IIT/IIM will be used for comparison wherever necessary.

6.1.2 Demographic Characteristics of Respondents from Karnataka

The demographic characteristics of respondents are described in Table 6. 3.

Table 6.3
Demographic Features of Respondents

Feature	Detail	Freq (pct%)	Feature	Detail	Freq (pct%)
Designation	Faculty	474(27.93)	Age Group	20-29 Years	1251(73.7)
	Res_scholar	44(2.59)		30-39 Years	274(16.1)
	PG Student	1179(69.78)		40-49 Years	137(8.1)
	All Users	**1697(100.0)**		50+ Years	35(2.1)
Gender	Male	1197(70.5)		**All Ages**	**1697(100.0)**
	Female	500(29.5)	Residence	Rural	355 (20.9)
	All Genders	**1697(100.00)**		Town	481 (28.3)
Experience	< 1 year	322 (19.0)		City	861 (50.8)
	1-2 years	734 (43.3)		**All Places**	**1697(100.0)**
	2-3 years	192 (11.3)	Current Residence	Campus/Hostel	523 (30.8)
	3-5 years	156 (9.2)		Outside	1174 (69.2)
	5-10 years	126 (7.4)		**All locations**	**1697(100.0)**
	> 10 Years	167 (9.8)	Marital Status	Unmarried	1208(71.2)
	All years	**1697(100.0)**		Married	489(28.8)

Age: The respondents are grouped under four age groups. The 20-29 years age group forms the biggest segment with 73.7% of the sample. This group consists most of students and junior faculty members. Respondents in the age group of 30-39 years cover 16.1% of population. The third (40-49 years) and fourth (50+ years) groups include 8.1% and 2.1% of the sample respectively.

Gender and Marital Status: The sample includes 70.5% males and 29.5% females. Further, 71.2% are Unmarried and 28.8% are married.

Residence: The respondents from city background form the largest segment (50.8%) in the sample followed by 28.3% from town and 20.9% from rural backgrounds. Further, the proportion of respondents who stay in campus and outside the campus is 30.8% and 69.2% respectively. It is to be noted that the campus stay is not compulsory in many colleges due to constraints in residential facilities.

Experience: The experience of using library is varied from less than one year to 10 years and above. The distribution is as follows:

- 19.0% of sample are using their institute library for less than one year and another 43.3% using it for 1 -2 years
- 20.5% are using it for 3-5 years and 9.8% are using the same for more than 10 years.

6.1.3 Users' Preferences towards Information Sources

Based on discussions and pilot studies, institute library, Internet, self-purchase, friends/colleagues, and other libraries are the identified as popular sources for information provision. The respondents were asked to rank these five sources according to their preferences by allotting '1' for most preferred and '5' for least preferred source. The responses are presented in Table 6.4

Table 6.4
Users Preferences on Information Sources (n=1697)

Mode	Rank1	Rank2	Rank3	Rank4	Rank5	Mean
Institute Library	**1102(64.9)**	376(22.2)	115(6.8)	67(3.9)	37(2.2)	4.44
Self Purchase	345(20.3)	**612(36.1)**	394(23.2)	247(14.6)	99(5.8)	3.51
Internet Search	143(8.4)	388 (22.9)	**570 (33.6)**	423 (24.9)	173(10.2)	2.94
Friends/Colleagues	68(4.0)	256(15.1)	505(29.8)	**709(41.8)**	159(9.4)	2.63
Visit Other Library	31(1.8)	69(4.1)	120(7.1)	248(14.6)	**1229(72.4)**	1.48
Total (pct%)	1697 (100.0)	1697 (100.0)	1697 (100.0)	1697 (100.0)	1697 (100.0)	

Note: The mean is computed by adding maximum weight (5) to rank1 and minimum weight (1) to rank5. Figures in parenthesis indicate the percentage

The figures in the above table clearly indicate customers' choices regarding information sources. In an academic library setting, the *institute library* is the most preferred source (64.9%) for customers followed by *Self purchase and Internet* as second and third preferred sources. The other two sources namely *Friends/colleagues* and *Visiting other libraries* are the fourth and least preferred sources by customers.

Libraries get financial support from their parent body for regular addition of high quality and expensive books and other reading materials for the benefit of users. The users might prefer go their library first for information and look for other sources if the required information is not available. Ranking of self-purchasing as second choice highlight customers' improved purchasing power and interest in self-buying. This could also reveal the inadequacy of demand/prescribed books in the library and users' compulsion to posses own books. Though Internet is sweeping the world of information, its ranking next to self-purchase indicate technical difficulties and inadequacies prevailing in Karnataka state. The proprietary nature of academic libraries restrains readers to visit other libraries.

6.1.3.1 Preferences for Information Sources among Library Users

An examination of ranking of information sources across user groups as illustrated in fig. 6.1 reveals some interesting information.

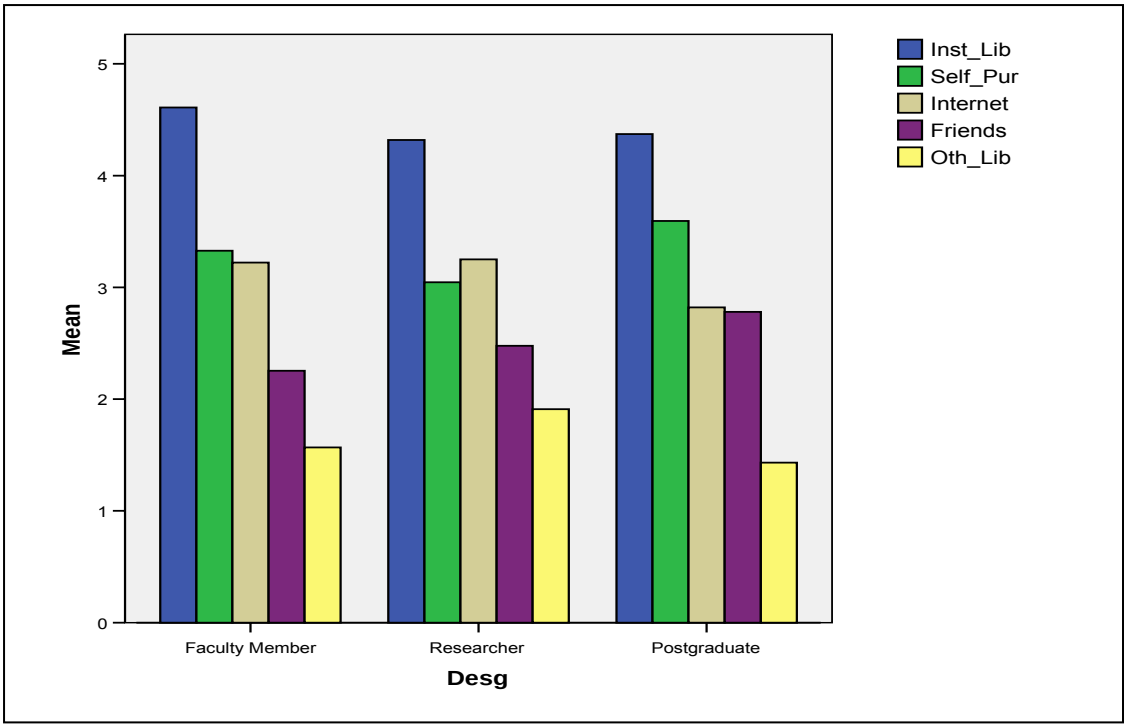

Fig. 6.1: Preferences in sources for Obtaining Reading materials (n=1697)
Note: The mean is computed by adding maximum weight (5) to rank1 and minimum weight (1) to rank5.

The ranking of information sources by faculty members and postgraduates remains same.

- The institute library is consistently ranked first source of information;
- The ranking of Self-purchase and Internet is consistent with faculty and students;
- Researchers prefer Internet and self-purchasing as their second and third choices;
- The tendency to borrow books from friends is more with students as compared to faculty members.
- Though least preferred the researchers visit other libraries more as compared to students and faculty members.

In the age of Internet, the ranking self-purchase over Internet was unexpected by research team. Hence, the team contacted a few users for clear understanding of this phenomenon and the results indicate that:

- Except major cities, Karnataka is still facing the bandwidth and other technical problems for faster access to Internet. The problem is coupled with high cost of upgrading. The numbers of computers in departments with Internet connectivity are not commensurate with number of staff members.
- The number of terminals with Internet connection available for students in library or computing centre is not adequate.
- Lack of sufficient copies of text/demand books in the library compel users to buy books.
- Some colleges insist students to purchase of textbooks and in some colleges the books are distributed to students as course materials.
- Many colleges provide academic allowances to faculty members for the purchase of books and other academic resources.
- The second-hand bookshops and circulating libraries also play a significant role in circulating textbooks among student community.
- The users opine that if the current status of infrastructure improves in Karnataka, the usage of Internet would enhance significantly. They also believe that the wi-fi installation might improve the campus-wide wireless Internet connection.

The study team was interested in understanding the nature of relationships among these sources. The Pearson's correlation test conducted to observe relationship between the variables reveals interesting inter-relationships. The relationship is illustrated in table 6.5.

Table 6.5
Pearson's correlation between sources of reading material

Correlations							
		Inst_Lib	Self_Pur	Internet	Friends	Oth_Lib	Freq
Inst_Lib	Pearson Correlation	1	-0.277**	-0.040	-0.256**	-0.286**	0.126**
	Sig. (2-tailed)		0.000	0.099	0.000	0.000	0.000
Self_Pur	Pearson Correlation	-0.277**	1	-0.376**	-0.166**	-0.228**	-0.047
	Sig. (2-tailed)	0.000		0.000	0.000	0.000	0.051
Internet	Pearson Correlation	-0.040	-0.376**	1	-0.378**	-0.168**	-0.033
	Sig. (2-tailed)	0.099	0.000		0.000	0.000	0.177
Friends	Pearson Correlation	-0.256**	-0.166**	-0.378**	1	-0.104**	-0.033
	Sig. (2-tailed)	0.000	0.000	0.000		0.000	0.179
Oth_Lib	Pearson Correlation	-0.286**	-0.228**	-0.168**	-0.104**	1	0.008
	Sig. (2-tailed)	0.000	0.000	0.000	0.000		0.745
Freq of Lib. Visit	Pearson Correlation	0.126**	-0.047	-0.033	-0.033	0.008	1
	Sig. (2-tailed)	0.000	0.051	0.177	0.179	0.745	
**	Correlation is significant at the 0.01 level (2-tailed).						

The correlation matrix presented in the above table reveals that:

- The preference attached to institute library is -vely correlated to the preference attached to self purchase, borrowing from friends/colleagues, and visit to other

library. It indicates that *"As the importance attached to institute library increases, the preference attached other information sources decreases."*

- Though preference attached to Internet searching is indicative of –ve impact on preference towards institute library, the impact is not very significant at present. The reasons could be attributed to the technical inadequacies of Internet in the state. It can also be linked use of Internet in the library and the type of material available in library and Internet.
- The –ve impact of Internet on self-purchase and borrowing from friends/colleagues is significant indicating "*As the usage of Internet increases, the tendency for self-purchase and borrowing from friends/colleagues decreases*."

Comparison with preferences of users IIT/IIM libraries: An analysis of ranking of information sources by respondents from Karnataka libraries and IIT/IIM libraries shows some interesting comparisons. The comparison is illustrated through fig.6.2

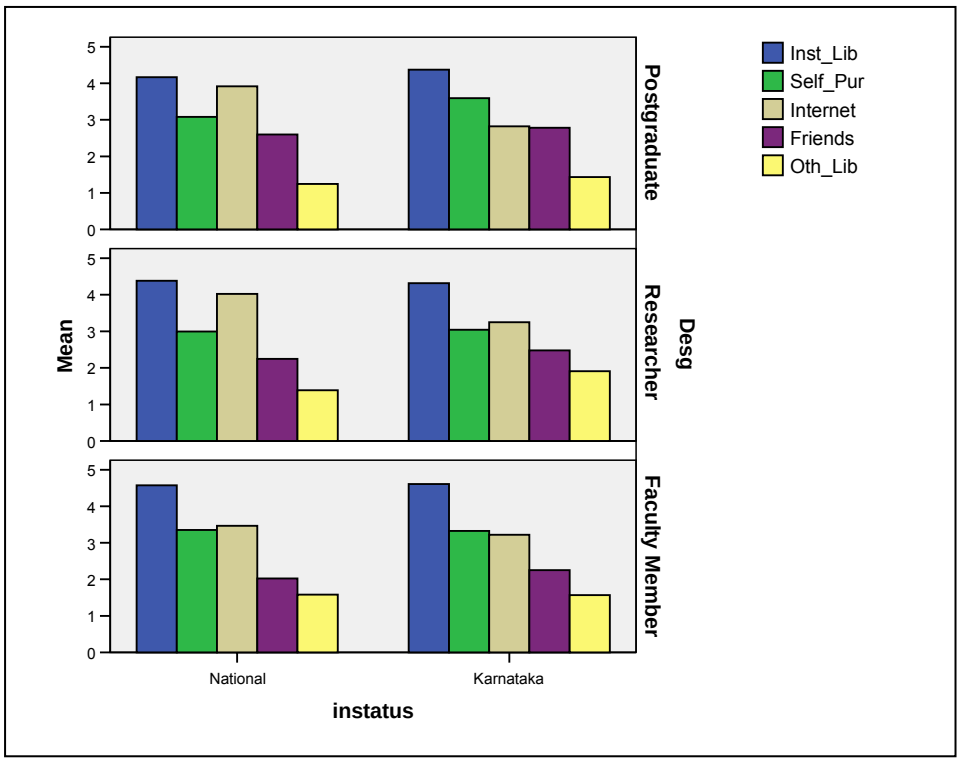

Fig. 6.2: Preference of information sources among users of state and national libraries
Note: National- IIT/IIM libraries

The pattern of ranking of information sources remains consistent among users of state and national libraries with slight deviations in Internet searching and self purchase

- The institute library is the most preferred source by users of state as well as national libraries indicating importance of library in academic institutes.
- While users of IITs/IIMs ranked Internet and self-purchase as their second and third preferred sources, the users of Karnataka engg./mgt. libraries ranked them in reverse order.
- The preference for Internet by users of national libraries is higher than their counterparts in Karnataka libraries. The high score is due to the availability of

better facilities in these institutes. The situation may become true if the infrastructure improves in Karnataka.

- The users of Technical and Management libraries in Karnataka appear to borrow from friends/colleagues more as compared to their counterparts in IITs/IIMs. This could be due to comprehensive collection available in these libraries.
- Though visiting to other libraries in least preferred source for users of state as well as national libraries, the researchers in respondent libraries in Karnataka appear to go outside more in search of literature as compared to other categories of users. It is to be noted that unlike IITs/IIMs, the respondent institutes in Karnataka are not offering full time doctoral programs in their premises.

6.1.4 Frequency of library Visit and Time Spent in Library

Frequency of Library Visit: it is observed that 42.3% of the sample visits library daily and another 31.2% visits once in 2-3 days. Further, users who visit library once in a week or fortnight constitute 15.1% and 5.9% of sample respectively. The sample also consists 5.5% of users who visits their institute library occasionally.

Library visit	*Freq (%)*
Daily	717(42.3)
Once in 2-3 days	530(31.2)
Once in a week	257(15.1)
Once in 15 days	100(5.9)
Occasionally	93(5.5)
Total	1697(100.0)

Further, the distribution of frequencies across user categories as shown in Table 6.6 unearths some interesting facts.

Table 6.6
Distribution of Frequency of library visits among User Groups

Sl No	Frequency Of Lib. Visit	Count	Tech/Mgt Libraries in Karnataka			
			Faculty	Res_Sch	PGs	Total
1	Daily (Pct. within Freq)	Count	199	16	502	**717**
		% *	(27.7)	(2.2)	(70.1)	**(100.0)**
2	Once in 2-3 Days (Pct. within Freq)	Count	145	16	369	**530**
		%	(27.4)	(3.0)	(69.6)	**(100.0)**
3	Once in a Week (Pct. within Freq)	Count	72	7	178	**257**
		%	(28.0)	(2.7)	(69.3)	**(100.0)**
4	Once in 15 Days (Pct. within Freq)	Count	27	2	71	**100**
		%	(27.0)	(2.0)	(71.0)	**(100.0)**
5	Occasionally (Pct. within Freq)	Count	31	3	59	**93**
		%	(33.3)	(3.2)	(63.4)	**(100.0)**
Total (Pct. within Freq)		Count	474	44	1179	**1697**
		%	(27.9)	(2.6)	(69.5)	**(100.0)**

Note: * % percentage within the frequency of library visit.

Postgraduates dominate in daily and once 2-3 days visits to the library, and the percentage of faculty members is more with less frequent visits. In other words, the students visit library more frequently than faculty members or research scholars. An interaction with cross section of faculty members reveals that,

- It is natural that students are learners and they need to visit library more often for academic inputs.
- Faculty members can get the library resources through their secretaries or telephonic queries. As compared to students, faculty members can borrow more books from library and they can keep them for longer periods.
- The faculty members also interested in developing their personal collection too.
- The faculty members' academic, administrative and family responsibilities might hinder their frequent visit to the library.
- As researchers tend to depend more on research papers published in periodicals, their visit might be linked to the arrival of current issues of journals. Their laboratory and experiments may hinder frequent visits to library.

The Pearson's correlations between customers' preferred information sources and the frequency of their library visit as shown in the side table indicate that:

Correlations		Freq
Inst_Lib	Correlation	0.126**
	Sig. (2-tailed)	0.000
Self_Pur	Correlation	- 0.047
	Sig. (2-tailed)	0.051
Internet	Correlation	- 0.033
	Sig. (2-tailed)	0.177
Friends	Correlation	- 0.033
	Sig. (2-tailed)	0.179
Oth_Lib	Correlation	0.008
	Sig. (2-tailed)	0.745
Freq of Lib. Visit	Correlation	1
** Correlation is significant at the 0.01 level (2-tailed).(Refer Table 6.5 also)		

- The preference attached to Institute library is positively correlated to frequency of library visits, i.e. "as the preference attached to library increases, the frequency of visit to the library also increases."
- The frequency of library visit is –vely correlated with preferences attached to Self-Purchase, Internet, friends/colleagues and visiting other library. In other words, the frequency of library visits reduces as the preference attached self-purchase, Internet usage and borrowing from others increases. Though it is difficult to generalize the observation because of insignificant correlation between the variables, it is indicative of –ve impact on frequency of visit to the library.
- The improvements in Internet connectivity in Karnataka might have significant negative impact on frequency of library visits.

Comparison with frequency of library visits by users of IIT/IIM Libraries: An examination of frequency of library visits among users of respondent libraries and IIT/IIM libraries as shown in Table6.7 reveals some interesting comparison.

The figures present in the table reveal that:

- The faculty members visit library less frequently as compared to postgraduates in state as well as national libraries.
- Comparatively, the IIT/IIM faculty members and postgraduates visit library less frequently as compared to their counterparts in Karnataka. The reasons could be attributed to their research projects, consultancy and training activities of faulty members and availability of electronic resources and their remote access. Further probing or investigation is beyond the scope of this study.

Table 6.7
Frequency of Library Visit among Customer Groups

Sl No	Frequency Of Lib. Visit	Count	Tech/Mgt Libraries in Karnataka				IIT/IIM Libraries			
			Faculty	Res	PGs	Total	Faculty	Res	PGs	Total
1	Daily	Count	199	16	502	**717**	8	6	27	**41**
	% within Freq	% *	(27.7)	(2.2)	(70.1)	**(100.0)**	(19.5)	(14.6)	(65.9)	**(100.0)**
2	Once in 2-3 Days	Count	145	16	369	**530**	71	45	74	**190**
	% within Freq	%	(27.4)	(3.0)	(69.6)	**(100.0)**	(37.4)	(23.7)	(38.9)	**(100.0)**
3	Once in a Week	Count	72	7	178	**257**	105	44	49	**198**
	% within Freq	%	(28.0)	(2.7)	(69.3)	**(100.0)**	(53.0)	(22.2)	(24.7)	**(100.0)**
4	Once in 15 Days	Count	27	2	71	**100**	55	30	24	**109**
	% within Freq	%	(27.0)	(2.0)	(71.0)	**(100.0)**	(50.5)	(27.5)	(22.0)	**(100.0)**
5	Occasionally	Count	31	3	59	**93**	78	45	42	**165**
	% within Freq	%	(33.3)	(3.2)	(63.4)	**(100.0)**	(47.3)	(27.3)	(25.5)	**(100.0)**
Total		Count	474	44	1179	**1697**	317	170	216	**703**
% within Freq		%	27.9)	2.6)	(69.5)	**(100.0)**	(45.1)	(24.2)	(30.7)	**(100.0)**

Note: * % percentage within the frequency of library visit.
Faculty: Faculty Members, Res- Res. Scholars, PG- Postgraduate students

Time Spent in Library: About 40.3% of respondents spend less than 1 hour and another 35.5% spend about 1-2 hours in the library. In other words, a majority of sample spend less than 2 hours during their visit to the library. An interaction with a few respondents regarding short duration of reading in libraries indicates that:

Time Spent	Freq	Pct (%)
less than 1 hour	684	40.3
1 - 2 hours	602	35.5
2 - 3 hours	274	16.1
3 - 4 hours	66	3.9
4 - 5 hours	58	3.4
5 + hours	13	0.8
Total (all time)	1,697	100.0

- In the age of Internet the library resources can be accessed even outside the library as more and more library resources are available on electronic media.
- Currently students are carrying laptops with them and they are constrained to use them in library premises. Hence, they may borrow the resources from library and work elsewhere.
- Most of the respondent libraries have photocopying facilities and many libraries have document scanners too. These facilities help the users to multiply or reproduce the required documents without spending much time in library.

Library goes to users in the era of networking and reduced library visits/reading timings may not reflect the under utilization of library. At the same time it is difficult to prove the effective utilization of resources too.

6.1.5 Communication from Library

Communication is the key for successful interaction between the user and the service provider. The interaction between user and library depends upon how well the library

communicates with its users. The nature of communication could be related to new additions, reminders, current awareness services, new services/developments, conferences/ seminars and response to the user queries. The medium of communication could be notice board, email and personal visit. The information collected from respondents regarding the type and medium of communication is shown in Fig 6.3

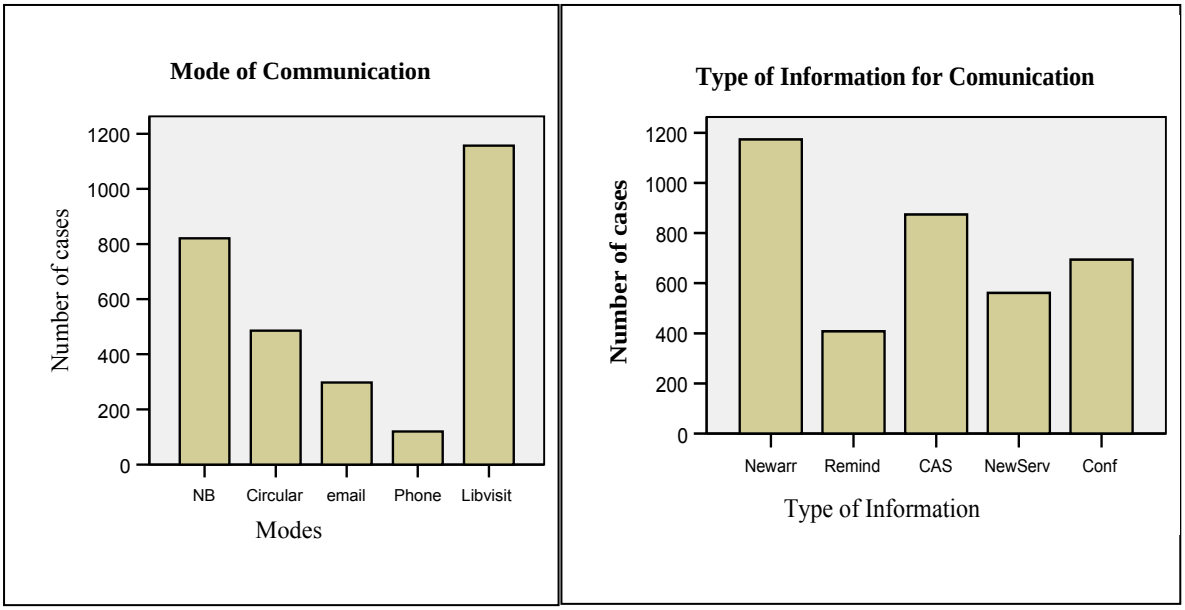

Fig. 6.3: Type and Medium of communication in libraries (n=1697)

Type of Information Communication: The fig. 6.3 depicts that the most common information that users receive from library is related to new arrivals/addition to the library followed by current information in the field, conferences/seminar, new services introduced in library and reminders to users.

Medium of Communication: The most common medium through which the user gets the information from library is through 'notice broad' and when they visit library. Besides, the faculty members also get information through telephone, emails and departmental circulars. The users (particularly new students) get educated through library orientation and training programs. Of late, the email has emerged as powerful medium of communication and it is encourage noting that many respondent colleges are already using email for communicating with users and vendors. Communicating through email may be seen in other libraries too if the infrastructure for ICT improves in the state.

6.2 CUSTOMER / USER EXPECTATIONS

6.2.1 Ranking of Expectation Statements

As explained in chapter 2, customers' expectations are the assumptions or partial beliefs about the availability of resources and services in the library. The customer expectations are measured by asking the respondents to indicate the extent to which the specific features identified for the current research are important for a good library in their field. The ratings are obtained on 5-point importance scale ranging from '1' for least important to '5' for very important. Arranging individual features on mean scores indicates the

priorities in customers' expectations. Table 6.8 presents mean scores for individual features in descending order of importance.

Table 6.8
Customer Expectations (n=1697)

St No	Feature	Mean	Std Dev
3	Convenient **library working hours**	4.60	0.77
25	Staff's **sincere interest/willingness** to help users	4.42	0.82
4	Comprehensive **Print Resources** like Books, journals etc.	4.38	0.84
12	**Internet** connectivity	4.36	0.93
29	**Knowledge/competence** of staff to answer user's queries	4.32	0.86
2	**Easy physical access** for a good library	4.30	0.86
28	Staff who **understand the specific needs of users.**	4.27	0.88
24	Library's ability to **deliver the promised services on time**	4.24	0.84
6	Proper **arrangement** of Print Resources in the library	4.23	0.94
11	**Well maintained** computer & other equipment in library	4.19	0.92
5	Good Collection of **Electronic Resources** like CDs/VCs	4.19	0.95
22	**Error free records** in the library	4.18	0.95
14	Subscription to **e-journals/full-text databases**	4.16	0.98
16	Easy-to-use library **on-line catalogue** (OPAC)	4.15	0.98
26	Provision of **"Right Document the Very First Time"**	4.11	0.90
27	Staff who instill **trust/confidence** in users	4.11	0.92
23	a**bility to promise products/services** to users by a **certain time**	4.05	0.89
1	Spacious and **modern looking library building**	4.05	1.05
17	**Remote (Campus-wide) access** to library resources	4.05	0.99
18	library resources accessible through **Website**	4.03	0.98
15	**Automated** Library operations and services	4.00	0.99
8	**Laser Printers** in the library	3.50	1.19
21	**Networking** with other libraries for interlibrary lending	3.96	0.99
7	**State-of-Art computers** in the library	3.93	0.97
20	**Speed of response** for Queries on network	3.92	1.01
13	Subscription to **statistical/bibliographical Databases**.	3.84	1.02
19	Provision for **on-line reservations/renewals**	3.82	1.08
9	**Scanners** in the library	3.54	1.12
10	**Electronic security/burglars** in the library	3.47	1.18
	Overall Exp Avg.	4.07	0.62

Note: the original statement numbers are maintained for convenience. The overall average score was derived by averaging the average score computed for each respondent.

The overall average expectation score (4.07) indicates customers' high level expectations regarding library resources and services. Among features, some are relatively high expected and some are less expected. The high expected features are as follows (mean >4.07).

- Convenient library working hours
- Staff's sincere interest/willingness to help users

- Comprehensive Print resources like books, journals etc.
- Internet connectivity
- Knowledge/competence of staff to answer user's queries
- Easy physical access for a good library
- Staff who understand the specific needs of users.
- Library's ability to deliver the promised services on time
- Proper arrangement of print resources in the library
- Well maintained computer & other equipment in library
- Good collection of CDs/DVDs/VCs
- Error free records in the library
- Subscription to full-text databases
- Easy-to-use library on-line catalogue (OPAC)
- Provision of "right document the very first time"
- Staff who instill trust/confidence in users

Similarly, the relatively less expected/desired features (mean <4.07 & > 3.6) are:

- Library's ability to promise products/services to users by a certain time
- Spacious and modern looking library building
- Remote (Campus-wide) access to library resources
- Making library resources accessible through Website
- Automated Library operations and services
- Laser Printers in the library
- Networking with other libraries for interlibrary lending
- State-of-Art computers in the library
- Speed of response for Queries on network
- Subscription to statistical/bibliographical Databases.
- Provision for on-line reservations/renewals

The least expected features (mean score <3.6) are

- Scanners and
- Electronic security/burglars in the library

6.2.2 Factor Analysis

In order to arrive at meaningful conclusions, factor analysis is carried out to consolidate individual statements into small groups. Kaiser-Meyer-Olkin measures (KMO) of sampling adequacy and Bartlett's test of sphericity have been conducted to verify the adequacy of the sampling and significant relationships among the features.

Bartlett's test of sphericity indicates whether the correlation matrix is an identity matrix, which would indicate that the variables are unrelated. The significance level gives the result of the test. Very small values (<0.05) indicate the significant relationships among study's variables. A value >0.10 or so may indicate that the data are not suitable for factor analysis. KMO value on the diagonal

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy(MSA).		**0.942**
Bartlett's Test of Sphericity	Approx. Chi-Square	19217.664
	df	406
	Sig.	0.000

of the anti-image correlation matrix shows the 'Measure of Sampling Adequacy' (MSA) for the respective item. KMO Values <0.5 may indicate variables that do not seem to fit with the structure of other variables. Such variables could be dropped from the analysis.

The current research performed factor analysis after verifying validity of KMO (0.942) and Bartlett's (0.000) values. The following methods are used for factor analysis:

- Extraction Method: Extraction communalities are estimates of the variance in each variable accounted for by the factors (or components) in the factor solution. For other extraction methods, these values are the proportion (for correlation analyses) or the amount (for covariance analyses) of variance accounted for in each variable by the rest of the variables.
- Principal components analysis, this is always equal to 1.0 (for correlation analyses) or the variance of the variable (for covariance analyses).
- Eigenvalue >1 selected, variance and cumulative variance explained for factor solution.
- Rotation: 'Varimax' with Kaiser Normalization method and the maximum number of iterations are '30' for convergence
- Sorting: Descending order of the factor score

The factor analysis generated five factors explaining 53.7% cumulative variance and the variation explained by each factor is given in Table 6.9.

Table 6.9

	Initial Eigenvalues			Extraction Sums of Squared			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.580	33.034	33.034	9.580	33.034	33.034	4.298	14.821	14.821
2	2.041	7.037	40.071	2.041	7.037	40.071	3.442	11.870	26.691
3	1.498	5.167	45.238	1.498	5.167	45.238	3.127	10.783	37.474
4	1.341	4.624	49.861	1.341	4.624	49.861	2.549	8.791	46.265
5	1.110	3.827	53.688	1.110	3.827	53.688	2.153	7.424	53.688
6	0.939	3.236	56.925						
7	0.889	3.066	59.991						
8	0.849	2.926	62.917						
9	0.823	2.837	65.754						
10	0.744	2.567	68.321						
11	0.713	2.458	70.779						
12	0.656	2.263	73.043						
13	0.631	2.178	75.220						
14	0.590	2.033	77.253						
15	0.557	1.922	79.175						
16	0.545	1.879	81.054						
17	0.523	1.805	82.859						
18	0.499	1.721	84.580						
19	0.496	1.709	86.289						
20	0.466	1.609	87.898						
21	0.464	1.600	89.498						
22	0.457	1.577	91.075						
23	0.435	1.501	92.577						
24	0.411	1.416	93.993						
25	0.399	1.377	95.370						
26	0.388	1.337	96.707						
27	0.357	1.231	97.938						
28	0.334	1.153	99.091						
29	0.264	0.909	100.000						

The system generated five factors with Eigenvalue>1 explaining 53.7% cumulative variance indicating the exclusion of some important factors. In order to improve the variance explained, the analysis was repeated with Eigenvalue <1 and the test generated 13 factors explaining 94.4% cumulative variance at Eigenvalue =0.6. As it was difficult to infer meaningful results with too many factors, the research team decided to retain the original system generated five factors and the rotated component matrix is shown in table 6.10.

Table 6.10

Rotated Component Matrix(a)

		Component/Factor				
		1	2	3	4	5
E28	Staff who **understand the specific needs of users.**	**0.753**	0.158	0.065	0.132	0.079
E27	Staff who instill **trust/confidence** in users	**0.742**	0.112	0.122	0.169	0.028
E26	Provision of **"Right Document the Very First Time"**	**0.673**	0.102	0.177	0.141	0.112
E29	Staff's **Knowledge/competence** to answer user queries	**0.666**	0.169	0.120	0.153	0.102
E25	Staff's **sincere interest/willingness** to help users	**0.656**	0.111	0.178	0.076	0.170
E24	Ability to **deliver the promised services on time**	**0.641**	0.174	0.141	0.033	0.258
E23	**Ability to promise services** to users by a **certain time**	**0.605**	0.214	0.125	0.052	0.145
E22	**Error free records** in the library	**0.569**	0.266	0.206	0.015	0.141
E19	Provision for **on-line reservations/renewals**	0.139	**0.732**	0.091	0.120	0.112
E18	Library resources accessible through **Website**	0.192	**0.723**	0.092	0.126	0.088
E20	**Speed of response** for Queries via LAN/Internet	0.236	**0.663**	0.139	0.122	0.165
E17	**Remote (Campus-wide) access** to Library Resources	0.133	**0.662**	0.259	0.208	0.100
E21	**Networking** with other libraries for interlibrary lending	0.281	**0.556**	0.221	0.101	0.100
E16	Easy-to-use library **on-line catalogue** (OPAC)	0.220	**0.529**	0.444	0.141	0.017
E14	Subscription to **e-journals/full-text databases**	0.150	0.228	**0.686**	0.094	0.125
E13	Subscription to **statistical/bibliographical Databases**.	0.137	0.221	**0.650**	0.196	0.053
E06	Proper **arrangement** of Print Resources in the library	0.246	0.060	**0.599**	0.179	0.226
E04	Comprehensive **Print Resources** (Books, journals etc.)	0.220	0.027	**0.550**	0.044	0.484
E15	**Automated** Library operations and services	0.195	0.414	**0.507**	0.144	0.060
E05	Good Collection of **CDs/VCs**	0.157	0.199	**0.506**	0.198	0.216
E12	**Internet** connectivity	0.146	0.312	**0.349**	0.287	0.335
E08	**Laser Printers** in the library	0.133	0.097	0.207	**0.820**	0.045
E09	**Scanners** in the library	0.146	0.172	0.205	**0.781**	0.021
E10	**Electronic security/burglar system** in the library	0.105	0.256	0.004	**0.565**	0.197
E07	**State-of-Art computers** in the library	0.160	0.113	0.381	**0.561**	0.155
E01	Spacious & **modern looking building**	0.116	0.144	0.056	0.227	**0.688**
E02	**Easy physical access** for a good library	0.231	0.118	0.219	0.075	**0.656**
E03	Convenient **library working hours**	0.282	0.120	0.306	0.021	**0.582**
E11	**Well maintained** computer & other equipment in library	0.193	0.317	0.197	0.369	**0.382**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

- Factor 1 (14.8% variance) relates to "Reliability and Assurance of library service"
- Factor 2 (11.9%) relates to "Access to electronic Resources"
- Factor 3(10.8%) relates to "Library Resources (print and electronic)"
- Factor 4(8.8%) relates to "IT supported equipment"
- Factor 5(7.4%) relates to "Library building and its physical access"

Reliability and Assurance: This factor explains the maximum variance. Reliability is the ability to perform promised services dependably and accurately. Assurance is described as employees' knowledge, courtesy, and ability to inspire trust and confidence. All the features (refer table 6.10) in this factor are high expected by customers.

Access to Electronic Resources is the second important factor, which user expect from the library. While OPAC is high expected, the other features like access to resources on website, Remote access, online reservations/renewals, speed of response on network and library's networking capability are moderately expected by users.

Library Resources (print and electronic) is the third important factor, which moderates user expectations. The features like full-text databases, CD/DVD collection, print resources and proper arrangement are high expected by customers. The other two less expected features are bibliographical databases and library automation.

IT Supported equipment and facilities emerged as fourth important factor that influence users' expectations. The features such as laser printers, scanners, electronic security systems and Modern computers are less expected by customer expectations indicating that they are not seriously considered by users. It might also indicate that the customers might consider these features as granted.

Library building and its physical access is the fifth factor in customer expectations. While easy physical access and convenient library timings are high expected, the library building is less expected. However, this factor explains the least variation providing clues that the users have not attached much importance to the brick and mortar of physical library.

6.2.3 Expectations among User Groups

An examination of overall expectation score and factor indices among user categories as presented in Table 6.11 indicate the presence of variation in customer expectations.

Table 6.11
Mean scores of Expectation among User Groups in Karnataka

Designation	Karnataka Tech./ Mgt. Libraries					
	Mean	Factor1	Factor2	Factor3	Factor4	Factor5
Faculty (424)	4.16	0.02	0.01	0.20	0.05	0.15
Researcher(44)	3.95	-0.45	0.12	0.25	0.09	-0.19
Postgraduate(1179)	4.04	0.01	-0.01	-0.09	-0.02	-0.05
Overall(1697)	**4.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Comparatively, the overall expectation level of faculty members is higher than postgraduates and difference is significant between the groups. The reasons could be attributed to faculty member's teaching, status and other academic assignments in the institute. The factor indices also indicate the sensitivity to designation. The +ve values of factor 2 to 5 for faculty members and –ve values of the same for postgraduates indicate the significant difference in expectations between the groups.

Comparison with User Expectations of IIT/IIM libraries: As mentioned earlier, the study collected responses from users of IIT/IIM libraries for the purpose of comparison. Factor analysis carried out separately for IIT/IIM responses and it generated five factors explaining 63.48% cumulative variance. The factors generated are congruent with the factors generated for responses from Karnataka libraries with an interchange of factor 2 and factor 3. The mapping of factors is illustrated through fig. 6.4

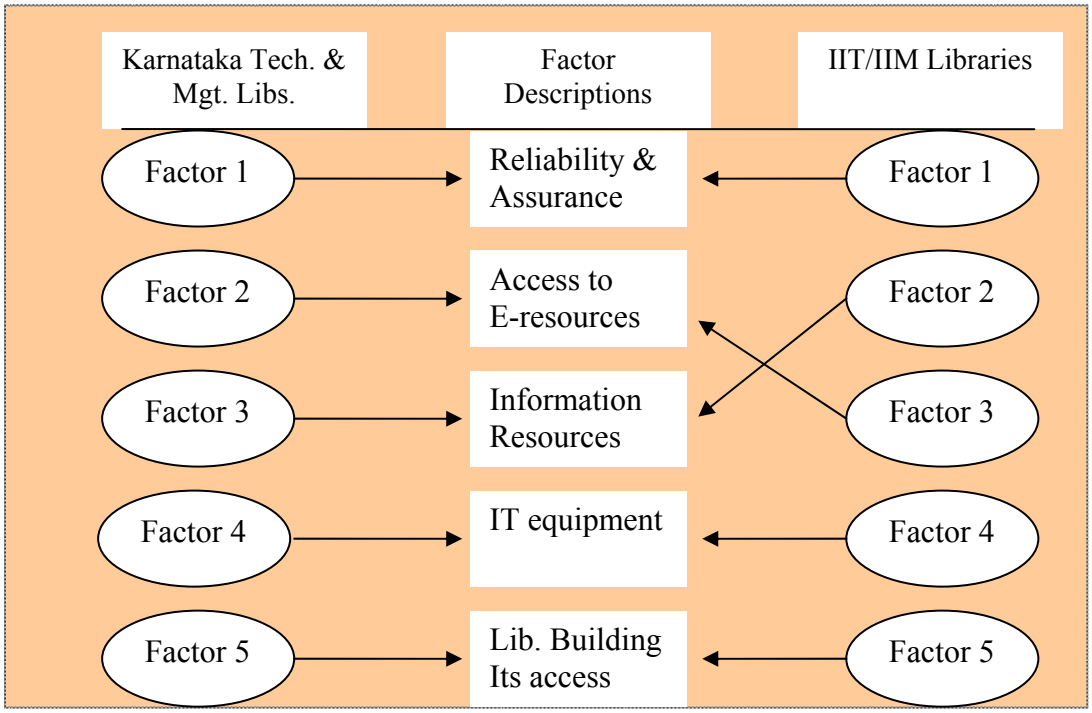

Fig. 6.4: Mapping of factors among use groups.

The variation in factor 2 and 3 could be due to the research, training and consultancy needs of national institutes and the better infrastructure facilities available in IITs/IIMs. Further, as the expectations are measured from a good library perspective, the responses are almost identical indicating homogeneity in expectations among academic fraternity. The mean values presented in Table 6.12 indicate the presence of variation among the users of IIT/IIM libraries.

Table 6.12
Mean scores of Expectation among User Groups in IIT/IIM Libraries

Designation	IIT/IIM Libraries					
	Mean	Factor1	Factor2	Factor3	Factor4	Factor5
Faculty (317)	4.27	0.25	0.07	-0.05	0.09	0.11
Researcher(170)	4.11	-0.10	-0.03	0.12	-0.18	0.00
Postgraduate(216)	4.06	-0.29	-0.09	-0.01	0.02	-0.17
Overall(703)	**4.16**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

The overall expectation level of faculty members is high as compared to that of postgraduates. The –ve indices values of factors 1, 2, 3 and 5 for students against faculty members indicate the significant differences in expectations between and faculty and

students. The indices scores for factor 4 indicate the homogeneity. This may be due the common IT support facilities available in the libraries for faculty and students.

The Overall expectation level of users of national libraries is high as compared to their counterparts in state libraries. The improvements in library resources and facilities do increase the customer expectations particularly new customers. The new customers who see the existing system assume it as minimum standard and expect more.

The expectation level of faculty members is high as compared to postgraduates in state as well national libraries. In-depth analysis within and between the groups is beyond the scope of this study.

6.2.4 Additional Features Expected by the Customers

The respondents were invited through an open-ended question to indicate other features (if any) that are important for a good library. About 100 respondents responded to this question. Though the number is small as compared to total respondents, the features mentioned by respondents are valuable for a good library and hence they are listed in Table 6.13 and the figures in parenthesis denote the number of responses.

Table 6.13

Additional Features Expected by Customers*

Document Resources • More Textbooks/demand books (85) • Latest edition and New Titles (60) • More International journals (44) • Increase Reference books (35) • More Fictions (30) • Preserve Newspapers for at least 6 months (10) **Operations and Maintenance** • All time Issues and returns (45) • Immediate shelving of returned books (30) • Strict vigilance to check mutilation or misplacement of books (15) • Prominent display of new arrivals (15)	**Physical Facilities and Services** • longer library timings (24 hours)(55) • Increase no. of books for borrow (45) • Provision for group discussion (40) • Allow own books inside library(35) • Increase of renewal time (30) • Reduction in overdue charges (15) • Television set for viewing VCs (10) • Overnight Borrowing (10) • Display of foreign univ. brochures (5) • Allow local industries to use lib.(5) • All time Internet facility (80) • E-library with LCD projector (20) • Online inter library network (10) • Reprint request and procurement facility (5)
Environment • Noise free/strict silent reading area (80) • Ban the mobile phones in library (75) • Clean Toilets (50) • Dust free Books and stacks(35) • Better lighting & ventilation in stack (34) • Snacks near library during night (30) • Comfortable and neat furniture (20) • Air conditioning (10) • Light classical music background (10)	**Library Staff** • Unbiased attitude towards all readers (20) • Cooperation with students (15) • Punctuality (15) & Qualified staff, (15) • Familiarity/ fluency in English (10) • Service minded staff (10) • One should live with books (10) • By serving, the staff should not feel that they are doing any favour to users, it is their duty (5)

Note: *for information only and further analysis is beyond the scope of this study.

6.3 CUSTOMER-PERCEPTIONS (P)

6.3.1 Ranking of Perception Statements

In service quality literature, perception is viewed as customers' experiences or feelings about the products/services provided in by the specific organization. The perception scores are measured through 29 paired statements in expectation section. The perception score is measured on 5-point agreement scale ranging from '1' for strongly disagree to '5' for strongly agree. The statement also included 'N/A' option to indicate if the feature is not available in their library. The mean rating score of each feature is presented in Table 6.14

Table 6.14
Customer Perception of Library Resources and Perceptions (n=1697)

St No	Feature	Mean	Std Dev
P03	Our library working hours are convenient to me	3.83	1.20
P02	Physical access to our library is easy	3.79	1.07
P25	Our library staff's show sincere interest/willingness to help me	3.70	1.19
P04	Our lib. has comprehensive Print Resources like Books, etc.	3.60	1.26
P01	Our Library has Spacious and modern looking building	3.55	1.20
P27	Our staff instills trust/confidence in me	3.53	1.21
P29	Our lib. staff has knowledge/competence to answer my queries	3.46	1.23
P24	Our library' has ability to deliver the promised services on time	3.45	1.19
P28	Our library staff understands my specific needs	3.44	1.23
P06	The print documents are properly arranged in our library	3.40	1.35
P23	Our library's ability to promise services to users by a certain time	3.35	1.24
P22	The records in our library are Error-free	3.28	1.28
P14	Our library subscribes to many e-journals/full-text databases.	3.21	1.55
P26	I get "right document the very first time" in our library	3.15	1.27
P05	Our library has Good Collection of CDs/DVDs/VCs	2.96	1.45
P13	Our library subscribes to statistical/bibliographical databases	2.96	1.58
P11	Computers & other equipment are well maintained in our library	2.92	1.52
P12	Our library Internet connection	2.83	1.72
P07	Our library as State-of-Art computers	2.76	1.47
P15	Our library operations and services are automated	2.74	1.58
P16	Our library on-line catalogue (OPAC) is easy-to-use	2.66	1.65
P17	Our library provides LAN/campus-wide access to its resources	2.27	1.70
P21	Our library has good networking with other libraries	2.25	1.65
P08	Laser Printers are available in our library	2.13	1.67
P18	Our library resources are available through Website	2.04	1.70
P09	Scanners are available in our library	2.03	1.66
P20	The response for my queries via LAN/Internet is very fast	1.97	1.65
P10	Electronic security/burglars system is installed in our library	1.80	1.59
P19	Our library allows on-line reservations/renewals	1.79	1.58
	Overall Perception Avg.	**2.94**	**0.94**

The respondents' overall perception score (2.94) below the expectation score (4.07) indicates that customers held low perceptions towards library services against their expectations. Though all the features are rated consistently below customer expectations, some features perceived relatively better (mean > 2.94). The high perceived features

(mean ≥ 3.6) relates to convenient library timings, Physical access to library, Print collections, Library building, Staff's sincere interest and willingness to help users, and staff who instils trust/confidence in users.

The features with moderate perception ratings (mean >2.5 and <3.5) relates to staff's knowledge/competency to answer user queries, ability to deliver the promised services on time, staff's understanding of users specific needs, properly arranged print documents, staff's ability to promise services to users by a certain time, error-free records, subscription to full-text databases, provision of "right document the very first time", good collection of CDs/VCs, subscription to statistical/ bibliographical databases, consistently working computers & other equipment, Internet connection, State-of-Art computers, library automation, and library OPAC.

The features that experienced least perception scores (mean <2.5) relates to Library's networking with other libraries, laser printers, access through website, document scanners, Speed of response on network, electronic security system and online reservation received least perception scores. The least scores also due to non availability of those features in their library.

6.3.2 Factor Analysis-perceptions

As explained the factor analysis was carried out for perception dataset too. Surprisingly, the test generated four factors explaining 58.8% cumulative variance. The Components are presented in Table 6.15.

Table 6.15
Factor Analysis- Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.111	38.315	38.315	11.111	38.315	38.315	6.225	21.467	21.467
2	3.192	11.006	49.321	3.192	11.006	49.321	4.304	14.843	36.310
3	1.428	4.924	54.244	1.428	4.924	54.244	3.850	13.275	49.585
4	1.315	4.536	58.780	1.315	4.536	58.780	2.666	9.195	58.780
5	0.977	3.370	62.150						
6	0.916	3.158	65.307						
7	0.796	2.745	68.053						
8	0.712	2.454	70.507						
9	0.651	2.245	72.752						
10	0.614	2.117	74.869						
11	0.600	2.068	76.938						
12	0.588	2.027	78.964						
13	0.556	1.918	80.882						
14	0.523	1.802	82.684						
15	0.472	1.628	84.312						
16	0.458	1.580	85.893						
17	0.427	1.471	87.364						
18	0.417	1.439	88.803						
19	0.392	1.353	90.156						
20	0.360	1.241	91.397						
21	0.349	1.204	92.602						
22	0.329	1.136	93.738						
23	0.317	1.094	94.832						
24	0.299	1.031	95.863						
25	0.287	0.991	96.854						
26	0.281	0.969	97.823						
27	0.219	0.757	98.579						
28	0.216	0.745	99.324						
29	0.196	0.676	100.000						

Factor1 explains maximum variance (21.5%) followed by factor2 explaining 14.8% variance. Factors 3 and 4 explain 13.3% and 9.2% variances respectively. The rotated component matrix is shown in Table 6.16.

Table 6.16
Rotated Matrix of components

St. No	Features	Component/Factor			
		1	2	3	4
P19	Our library allows on-line reservations/renewals	**0.804**	0.000	0.043	0.224
P20	The response for my queries via LAN/Internet is very fast	**0.760**	0.097	0.045	0.307
P18	Our library resources are available through Website	**0.757**	0.121	0.057	0.222
P17	Our library provides LAN/campus-wide access to its resources	**0.743**	0.261	0.124	0.082
P09	Scanners are available in our library	**0.688**	0.282	0.116	-0.126
P10	Electronic security/burglars system is installed in our library	**0.686**	0.124	-0.009	0.193
P21	Our library has good networking with other libraries	**0.653**	0.070	0.090	0.333
P08	Laser Printers are available in our library	**0.648**	0.325	0.130	-0.163
P16	Our library on-line catalogue (OPAC) is easy-to-use	**0.585**	0.395	0.167	0.105
P12	Our library Internet connection	**0.553**	0.486	0.173	0.010
P15	Our library operations and services are automated	**0.545**	0.408	0.227	0.081
P04	Our lib. has comprehensive Print Resources like Books, etc.	0.108	**0.631**	0.078	0.309
P06	The print documents are properly arranged in our library	0.216	**0.626**	0.234	0.140
P02	Physical access to our library is easy	0.055	**0.611**	0.228	0.336
P14	Our library subscribes to many e-journals/full-text databases.	0.333	**0.574**	0.208	0.040
P05	Our library has Good Collection of Elec. Resources(CDs/VCs)	0.324	**0.547**	0.128	0.098
P07	Our library as State-of-Art computers	0.458	**0.522**	0.162	0.012
P03	Our library working hours are convenient to me	0.027	**0.510**	0.237	0.367
P13	Our library subscribes to statistical/bibliographical databases	0.459	**0.509**	0.140	0.076
P01	Our Library has Spacious and modern looking building	0.116	**0.509**	0.094	0.453
P11	Computers & other equipment are well maintained in our library	0.463	**0.486**	0.207	0.107
P28	Our library staff understands my specific needs	0.113	0.208	**0.857**	0.171
P29	Our lib. staff has knowledge/competence to answer my queries	0.103	0.206	**0.841**	0.124
P27	Our staff instills trust/confidence in me	0.080	0.165	**0.833**	0.152
P26	I get "Right Document the Very First Time" in our library	0.164	0.183	**0.782**	0.230
P25	Our library staff's show sincere interest/willingness to help me	0.115	0.283	**0.573**	0.442
P23	Our library's ability to promise services to users by a certain time	0.230	0.211	0.333	**0.688**
P24	Our library' has ability to deliver the promised services on time	0.203	0.264	0.354	**0.677**
P22	The records in our library are Error-free	0.224	0.174	0.201	**0.644**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization. Eigen value>1
(a) Rotation converged in 7 iterations.

Factor 1 relates to "Access to resources and IT supported systems;"
Factor 2 relates to "library building and resources;"
Factor 3 and 4 relate to "Assurance" and "Reliability" respectively

Access to resources and availability of IT supported systems: This factor comprising IT equipment and access explains the maximum variance. The *access* related issues such as on-line reservations/renewals, speed of response on network, access through web site, Access through LAN/campus network, online OPAC/web OPAC and library networking received least perception scores indicate the nonavailability of those features in their library. The *IT supported systems* such as Scanners, Electronic security/burglars, Laser Printers, also received low perception scores indicating the nonavailability of the same.

The other two features Internet connection and library automation moderately rated indicating the presence of the system but with not satisfactory performance.

Library building and its information resources: explains 14.8% of total variance in users' perception ratings. The specific elements like print resources, library building, physical access, and working hours are perceived better by customers. The other features such as subscriptions e-journals/full-text databases, Statistical/bibliographical databases, and CDs/Video collection perceived moderately by users.

The "staff's assurance" to users is the **third factor** in customer perception ratings. The specific features like staff who understand user's specific needs, staff's knowledge to answer user queries, provision of 'right document the very first time' are moderately perceived. The other two features like staff's sincere interest/willingness to help users and staff who instill trust/confidence in user perceived high by users.

The "reliability" of the service figured as **fourth factor** in users' perception explaining 9.2% of total variance. The individual elements like ability to promise services by certain time, ability to deliver promised services on time, and the Error-free records received moderate perception ratings.

6.3.3 Perception scores across Customer Groups

A cross examination of overall perception score and factor indices among user groups reveals the existence of variations among user categories. The values presented in Table 6.17 indicate the presence of variation.

Table 6.17
Mean scores of Perception among User Groups in Karnataka

Designation	Karnataka Tech./ Mgt. Libraries				
	Mean	Factor1	Factor2	Factor3	Factor4
Faculty (424)	3.18	0.03	0.28	0.31	-0.05
Researcher(44)	3.06	0.01	0.35	0.16	-0.09
Postgraduate(1179)	2.83	-0.01	-0.13	-0.13	0.03
Overall(1697)	2.94	0.00	0.00	0.00	0.00

The overall perception score for faculty members is higher than postgraduates indicating faculty members perceive their library resources and services slightly better as compared to students. The reasons could be attributed to faculty member's status, power to command better service from library staff. The factors indices also indicate the sensitivity to designation. The +ve values of first three factors for faculty members indicate the significant difference with students. The –ve value of factor 4 for faculty members might indicate the urgency of information for teaching and other academic assignments that might narrow their zone of tolerance as compared to students.

Comparison with User Perceptions of IIT/IIM libraries: unlike expectations, the factors generated for two datasets are different. Interestingly, five factors generated for IIT/IIM dataset explaining 66.81% cumulative variance as against four factors generated for datasets for Karnataka libraries. The mapping of factors generated for two datasets are illustrated in fig. 6.5

Karnataka libraries IIT/IIM Libraries

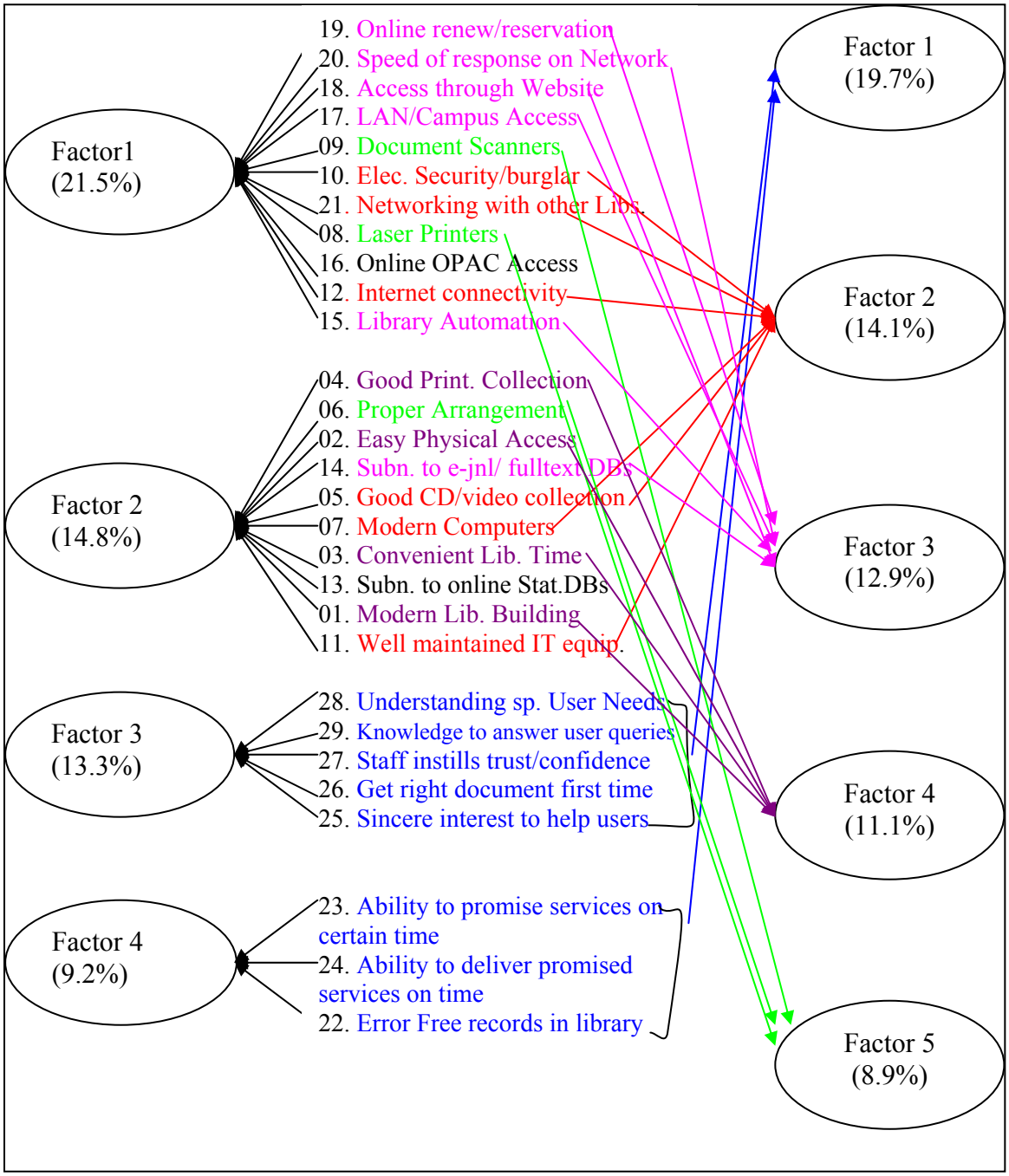

Fig. 6.5: Comparison of factors of perception across state and national libraries.

The features consolidated under each factor are different indicating some difference in perception ratings by users of national and state libraries. The "reliability and assurance" dimensions, which explained least (9.2%) variations among users of Karnataka libraries, explained maximum (19.7%) variations among users of national libraries indicating the users' concern towards these issues in national libraries. The "IT equipments" like electronic burglars, library networking, Internet connection, CD/videos, modern computers and their proper maintenance formed second important factor explaining 14.1% of variance. These features are shared between first and second factors generated

for users of respondent libraries. The access related features formed third factor explaining 12.9% of variance for national libraries. The features such as online renewal, network speed, access through website, campus access, library automation and subscription to full-text databases received better perception ratings indicating existence of all these features in national libraries. On the other hand, these features received low perception ratings by users of Karnataka indicating the non availability and inadequacy even if available.

The library building and print resources emerged as forth factor explaining 11.1% of variance and the specific features such as modern building, its access, working hours and print collection received high perception ratings. This is evident from the descriptions given in previous chapter. These features perceived better by respondents from Karnataka too.

The fifth factor related to scanners, laser printers and proper arrangement of documents explained least variance (8.9%) indicating presence of these features. This also indicates the presence scanners and laser printers in each department of IITs/IIMs, which may be true with libraries of Karnataka.

The comparison of perception ratings across user groups of national libraries as presented in Table 6.18 indicates the presence of variation among the user groups.

Table 6.18
Mean scores of Perceptions among User Groups in IIT/IIM Libraries

Designation	IIT/IIM Libraries					
	Mean	Factor1	Factor2	Factor3	Factor4	Factor5
Faculty (317)	3.35	0.22	-0.15	-0.11	-0.06	0.18
Researcher(170)	3.26	-0.24	0.13	0.03	0.18	-0.16
Postgraduate(216)	3.26	-0.14	0.12	0.14	-0.06	-0.13
Overall(703)	3.30	0.00	0.00	0.00	0.00	0.00

The overall perception level of faculty members is slightly high as compared to that of postgraduates. Though the overall difference between the users groups is not significant some differences observed in individual factors. The +ve values for factors 1 and 5 for faculty members do differ significantly with that of postgraduates. The better treatment of faculty members and availability of scanners and printers at departments might have been contributed towards +ve values

The Overall perception rating (3.30) of users of national libraries is high as compared to their counterparts in state libraries (2.94). The difference is obvious because of better resources and services available in national libraries. As the factors that affect perceptions are different in these two sets of libraries, it is difficult to compare them on similar grounds.

The perception level of faculty members and postgraduates of national libraries is high as compared to their counterparts in libraries in Karnataka. In-depth analysis within and between the groups is beyond the scope of this study.

6.4 PERCEPTIONS OF SERVICE QUALITY (P - E)

6.4.1 Gap between Customer Perceptions and Expectations

As described in chapter 2, the service quality measured as difference between customer expectation (E) and perception (P) of good/services. The magnitude of discrepancy indicates how well the facilities and services provided in the library match customer expectations. Zeithaml, Parasuraman and Berry (1990: 29) noted, "More negative the score, more the service quality shortfall in the eyes of customers." The P-minus-E (P-E) score also termed as "gap." Table 6.19 presents the mean gap scores for individual features in descending order.

Table 6.19
Gap Score between Perception and Expectation (n=1697)

St No.	Features	Exp Mean	Per Mean	Gap P-E	std Dev
SQ19	Provision for online reservations/ renewals	3.82	1.79	-2.03	1.87
SQ18	Availability of library resources through website	4.03	2.04	-1.99	1.91
SQ20	Speed of response on network/Internet	3.92	1.97	-1.95	1.90
SQ17	Remote/campus-wide access to library resources	4.05	2.27	-1.78	1.89
SQ21	Library good networking with other libraries	3.96	2.25	-1.71	1.92
SQ10	Electronic security/burglar system in the library	3.47	1.80	-1.67	1.81
SQ12	Internet connection	4.36	2.83	-1.53	1.88
SQ09	Scanners in the library	3.54	2.03	-1.51	1.87
SQ16	Easy-to-use library on-line catalogue (OPAC)	4.15	2.66	-1.48	1.83
SQ08	Laser Printers	3.50	2.13	-1.37	1.90
SQ11	Well maintained Computers & other equipments	4.19	2.92	-1.27	1.74
SQ15	Automated library operations and services	4.00	2.74	-1.26	1.73
SQ05	Good Collection of CDs/VCs	4.19	2.96	-1.23	1.71
SQ07	Modern/State-of-Art computers in the library	3.93	2.76	-1.17	1.69
SQ26	Availability of "right document the very first time"	4.11	3.15	-0.96	1.49
SQ14	Subscriptions to e-journals/full-text databases.	4.16	3.21	-0.95	1.67
SQ22	Error-free records in the library	4.18	3.28	-0.90	1.55
SQ13	Subscriptions to statistical/bibliographical databases	3.84	2.96	-0.88	1.74
SQ29	Staff's knowledge/competence to answer user queries	4.32	3.46	-0.86	1.45
SQ06	proper arrangement of print documents	4.23	3.40	-0.83	1.55
SQ28	Staff who understand specific needs of users	4.27	3.44	-0.83	1.43
SQ24	Library' s ability to deliver promised services on time	4.24	3.45	-0.79	1.43
SQ04	Comprehensive print resources.	4.38	3.60	-0.78	1.46
SQ03	Convenient library working hours	4.60	3.83	-0.77	1.39
SQ25	Staff's sincere interest/willingness to help users	4.42	3.70	-0.72	1.39
SQ23	Ability to promise services to users by a certain time	4.05	3.35	-0.70	1.46
SQ27	Staff who instills trust/confidence in users	4.11	3.53	-0.58	1.47
SQ02	Easy physical access to library	4.30	3.79	-0.51	1.28
SQ01	Spacious and modern looking building library	4.05	3.55	-0.50	1.52
	Avg_mean	4.07	2.94	-1.17	1.03
	Median	4.00	3.00	-1.00	

Note: 1. St.No. = Statement Number. 2. The original statement number is maintained for convenience.
3. The mean score based on a 5-point scale: 1 = Strongly Disagree…5 = Strongly Agree

The overall gap score (mean -1.17) below the median score (-1.00) indicate the shortfalls in existing library resources and services against customer expectations. Though all the

features experienced noticeable gaps, about half of the features experienced high gaps by customers inviting attention of service providers. The features experienced high and low gaps are given below.

High Gaps (gap > -1.0)	Low Gaps (gap < -1.0)
Online Reservations/ Renewals	Error-free records in the library
Access to library resources via Website	Subscriptions to stat./biblio. DBs
Response speed on network	Staff's knowledge to answer user queries
Remote/campus-wide access	proper arrangement of print documents
Networking with other libraries	Staff understanding of specific needs of users
Electronic security/burglar systems	Ability to deliver promised services on time
Internet connection in the library	Comprehensive print resources.
Scanners are available in the library	Convenient library working hours
On-line lib. catalogue (OPAC)	Staff's sincere interest to help users
Laser Printers in the library	Ability to promise services to users by certain time
Well maintained IT equipment	Staff who instills trust/confidence in users
Automated lib. operations & services	Easy physical access to library
Good Collection of CDs/VCs	Spacious and modern looking building library
Modern computers in the library	
Getting right document first time	
Subscriptions to e-journals/full-text DBs.	

The features that experience high gaps are related to IT supported resources and facilities. The higher –ve scores also indicate that those features may not be available in their library or inadequate to users even if available. The high gaps also indicate the need for immediate attention by service providers.

The features that received relatively fewer gaps are related to library print resources, services and staff attitude. However, these features also received –ve values and cannot be ignored by service providers. They also indicate that users are acknowledging the improvement and suggest for further enhancement.

6.4.2 Factor Analysis

As explained earlier, the factor analysis was carried to consolidate the individual statements into broader factors and interpret the results meaningfully. The total variance explained along the factors is shown in Table 6.18

Five factors generated explaining 57.8% cumulative variance. Factor1 explains 15.7% variance followed by factor2, - 12.7%, factor3, - 12.2%, factor 4, – 9.5%, and factor5, - 7.7%.

Table 6.18
Factor analysis for P-E Features

Component	Initial Eigenvalues			Extraction Sums of Squared			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.415	35.914	35.914	10.415	35.914	35.914	4.542	15.662	15.662
2	2.557	8.819	44.733	2.557	8.819	44.733	3.682	12.697	28.360
3	1.431	4.936	49.668	1.431	4.936	49.668	3.550	12.242	40.602
4	1.270	4.379	54.048	1.270	4.379	54.048	2.752	9.489	50.091
5	1.097	3.784	57.831	1.097	3.784	57.831	2.245	7.740	57.831
6	0.961	3.313	61.145						
7	0.834	2.876	64.021						
8	0.752	2.594	66.615						
9	0.740	2.551	69.166						
10	0.692	2.386	71.552						
11	0.629	2.170	73.722						
12	0.602	2.077	75.799						
13	0.595	2.052	77.851						
14	0.555	1.914	79.766						
15	0.534	1.842	81.608						
16	0.514	1.771	83.379						
17	0.476	1.640	85.019						
18	0.468	1.615	86.634						
19	0.455	1.569	88.202						
20	0.424	1.461	89.664						
21	0.423	1.457	91.121						
22	0.391	1.348	92.468						
23	0.370	1.275	93.743						
24	0.355	1.223	94.966						
25	0.341	1.176	96.142						
26	0.327	1.127	97.269						
27	0.276	0.950	98.220						
28	0.263	0.908	99.128						
29	0.253	0.872	100.000						

Extraction Method: Principal Component Analysis.

The Rotated component matrix of five factors is illustrated in Table 6.19 and the five factors are described as follows:

- Factor 1 Access to electronic resources (15.7%)
- Factor 2 Library resources & arrangements (12.7%)
- Factor 3 Staff Assurance (12.2%)
- Factor 4 Computer and other equipments (9.5%)
- Factor 5 Reliability of the service (7.7%)

Access to Electronic Resources is the primary factor, which explains the maximum variation (15.7%) in the gaps perceived by customers. All the features consolidated under this factor received significant gaps. The features like access to library resources through website, online reservations/renewals, remote/campus-wide access, speed of response on network, OPAC, networking with other libraries, automated library operations and Internet received significant gaps against customer expectations.

Table 6.19
Rotated Component Matrix (a)

St.no		Component				
		1	2	3	4	5
SQ18	Access to library resources through Website	**0.736**	0.105	0.052	0.259	0.168
SQ19	Online Reservations/ Renewals	**0.735**	0.041	0.043	0.213	0.271
SQ17	Remote/campus-wide access	**0.715**	0.174	0.116	0.277	0.074
SQ20	Speed of Response on Network	**0.713**	0.111	0.079	0.162	0.317
SQ16	Easy-to-use OPAC	**0.626**	0.336	0.184	0.157	0.010
SQ21	Networking with other libraries	**0.599**	0.157	0.133	0.145	0.295
SQ15	Automated library operations and services	**0.559**	0.369	0.247	0.179	-0.022
SQ12	Internet connection in the library	**0.450**	0.419	0.207	0.352	-0.040
SQ04	Comprehensive Print Resources.	0.112	**0.677**	0.075	0.056	0.236
SQ02	Easy physical access to library	0.071	**0.609**	0.119	0.132	0.285
SQ03	Convenient library working hours	0.124	**0.574**	0.191	-0.005	0.208
SQ06	proper arrangement of print documents	0.165	**0.567**	0.205	0.232	0.127
SQ14	Subscriptions to e-journals/full-text DBs.	0.433	**0.528**	0.187	0.056	-0.065
SQ01	Modern looking building library	0.059	**0.498**	-0.001	0.154	0.384
SQ05	Good Collection of CDs/VCs	0.264	**0.471**	0.192	0.293	0.032
SQ11	Well maintained IT equipment	0.318	**0.459**	0.211	0.417	0.055
SQ13	Subscriptions to statistical/biblio.	0.444	**0.456**	0.180	0.137	0.013
SQ28	Staff understanding of specific needs of users	0.175	0.162	**0.835**	0.035	0.127
SQ29	Staff's knowledge to answer user queries	0.124	0.173	**0.812**	0.056	0.092
SQ27	Staff who instills trust/confidence in users	0.079	0.114	**0.797**	0.090	0.151
SQ26	Getting "Right Document the Very First Time"	0.114	0.183	**0.733**	0.096	0.214
SQ25	Staff's sincere interest/willingness to help users	0.134	0.223	**0.546**	0.149	0.428
SQ08	Laser Printers are available in the library	0.220	0.165	0.088	**0.811**	0.066
SQ09	Scanners are available in the library	0.301	0.121	0.095	**0.784**	0.109
SQ10	Electronic security/burglars system in the library	0.339	0.106	-0.025	**0.600**	0.239
SQ07	Modern/State-of-Art computers in the library	0.248	0.418	0.186	**0.496**	-0.010
SQ24	Ability to deliver promised services on time	0.191	0.251	0.325	0.132	**0.686**
SQ23	Ability to promise services to users by a certain time	0.206	0.223	0.286	0.124	**0.684**
SQ22	Error-free records in the library	0.279	0.195	0.236	0.010	**0.554**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 10 iterations.

Library resources, arrangement and working hours have emerged as second factor in service quality gaps explaining 12.7% of variance. The features like comprehensive print resources, easy physical access, convenient working hours, proper arrangement of documents, subscriptions to full-text databases received relatively lesser gaps giving scope for further enhancement. The other features in this factor such as modern looking library building, good collection of CDs/VCs, well maintained equipment, subscriptions to statistical/ bibliographical databases also received –ve scores, but their impact is not significant for customer assessments.

Staff's Assurance is the third important factor in customer's perception of service quality gaps. The specific features such as staff understanding of specific needs of users, staff's knowledge/competence to answer user queries, staff who instills trust/confidence in users, getting right document the first time, staff's sincere interest/willingness to help users perceived better from customers eye. This also indicates the users' acknowledgement of staff help and attitude in getting the document in the library.

The IT Equipment in the library emerged as forth factor explaining 9.5% of variance has unearthed as fourth important factor in customer's assessment of service quality. All the features in this factor namely availability of laser printers, scanners and electronic security/burglars, and state-of-art computers experienced significant gaps by customer assessments. Though all the features experienced noticeable shortfalls, their impact on customers' assessments are not very significant. The –ve scores indicate the nonavailability and invite attention of library authorities.

Reliability of the service is the fifth important factor in service quality gaps explaining least variance (7.7%) in customer assessments. The features like ability to deliver promised services on time, ability to promise services to users by a certain time and error-free records in the library have received relatively lesser gaps leaving scope for improvement.

Interestingly, the reliability and assurance, which have clustered under single factor in customer expectations, emerge as independent factors in perceived gaps.

6.4.3 Comparison of Gap scores across User Groups

An inter group comparison of overall gap score and factor indices as presented in Table 6.20 indicates the presence of variation.

Table 6.20
Mean scores of Gaps in Service Quality (PSQ) among User Groups in Karnataka

Designation	Karnataka Tech./ Mgt. Libraries					
	Mean	Factor1	Factor2	Factor3	Factor4	Factor5
Faculty (424)	-1.03	-0.04	0.08	0.28	0.10	-0.08
Researcher(44)	-0.95	-0.16	0.27	0.35	0.10	0.12
Postgraduate(1179)	-1.23	0.02	-0.04	-0.13	-0.04	0.03
Overall(1697)	-1.17	0.00	0.00	0.00	0.00	0.00

Postgraduates experienced maximum gaps against their expectations as compared to faculty members. The differences could be supported by –ve indices for students towards library resources, staff assurance and IT related equipment (factors 2-4). However, faculty members also experienced significant gaps against their expectations. Access and reliability factors (1 & 5) experienced –ve values by faculty members as compared to students. The faculty members' urgency of information for teaching and other academic assignments reasons narrow the zone of tolerance as compared to students.

Comparison of Gaps in Perceptions of service quality with User of IIT/IIM libraries: the 'factor analysis' generates seven factors explaining 69.95% cumulative variance as against five factors generated for dataset from respondents libraries in Karnataka. The mapping of factors generated for two datasets are illustrated in fig. 6.6

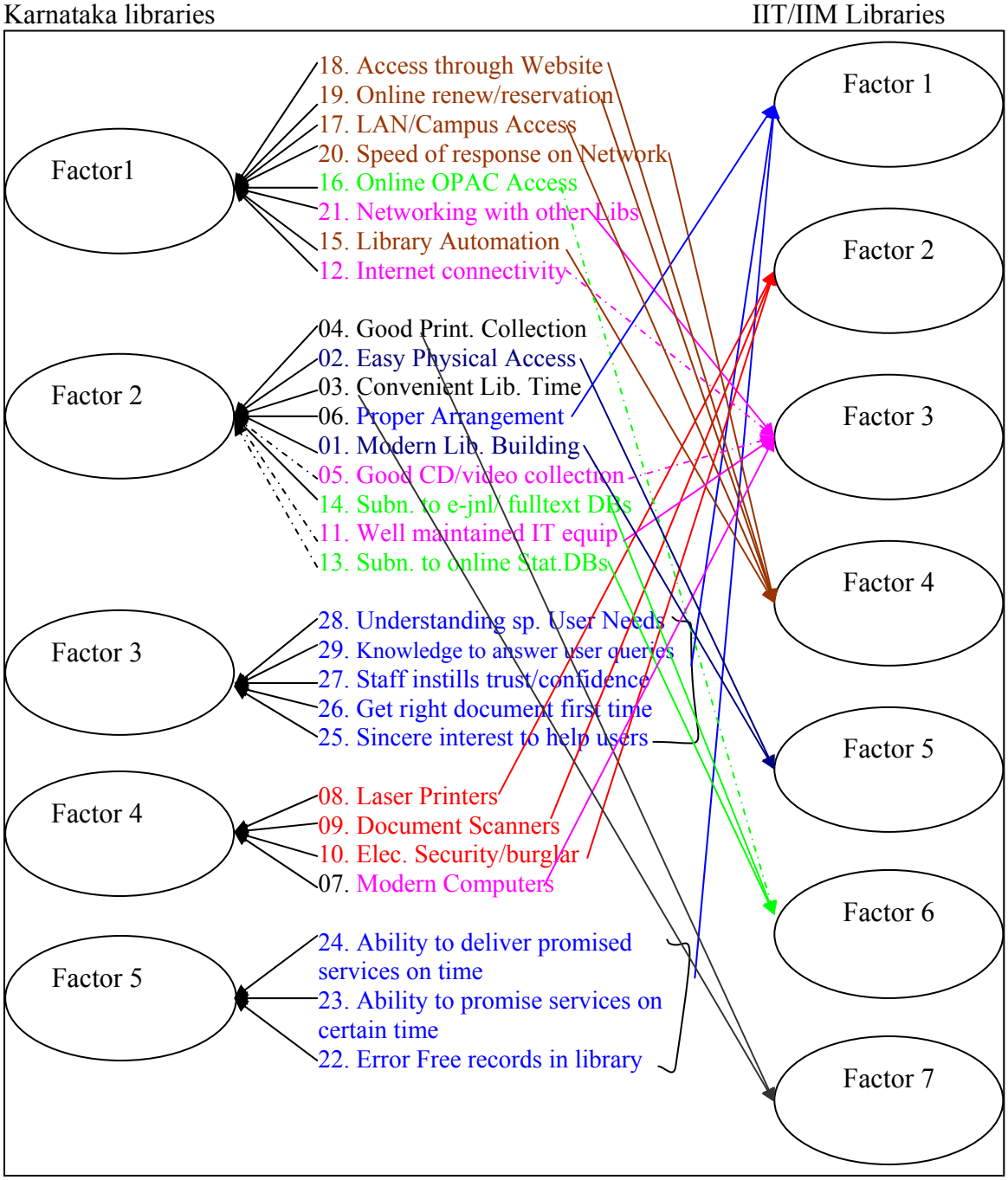

Fig. 6.6: Comparison of factors of PSQ across state and national libraries.
Note: -·-·-·-▸ indicate factor loading < 0.5 (can be excluded from the analysis)

It is evident from the fig. 6.6 that the factors, which explain maximum variations for users of state library, have minimum variations for IIT/IIM library users and vice versa. The seven factors emerged for users of IIT/IIM libraries are as follows.

- Factor 1: Assurance and reliability of service (19.4% variance)

- Factor 2: IT equipment (printers, scanner, security) (10.3%)
- Factor 3: IT support services (network, computers and their maintenance) 9.9%
- Factor 4: Access to e-resources (9.6%)
- Factor 5: library building and its physical access 8.1%
- Factor 6: Electronic databases(full text & bibliographic) 7.0%
- Factor 7: Print resources & working hours 5.6%

The "**assurance and reliability**" factors that explain maximum variations (19.4%) in user assessments for national libraries, explain least (12.2%, 7.7%) variations of the same for Karnataka libraries.

The "IT equipment" and IT support services are the second and third important factors in customer's assessments of library quality explaining 10.3% and 9.9% of variances respectively.

The A**ccess to electronic resources**, which is the least impacting factor (9.6%) for users of national libraries, is the most impacting factor (15.7%) for their counterparts in Karnataka libraries. The features such as online renewal, network speed, access through website, campus access, library automation and subscription to full-text databases received better perception ratings indicating existence of all these features in national libraries. All these features received low perception ratings by users of Karnataka indicating the non availability and inadequacy even if available.

Factors 5 to 7 (building, physical access, print and electronic resources and library timing) explain the least impact in national libraries. All IIT/IIM libraries have spacious independent library building, comprehensive print collection, consortium subscription to large number of electronic databases and longer library timings make users more comfortable as compared to users of Karnataka libraries. This is evident from the descriptions given in previous chapter. However, these features perceived better by users of Karnataka too.

Further, the inter group comparison of gap scores and indices of factors across users of national libraries reveal some variations in quality assessments. The mean values are presented in Table 6.21.

Table 6.21
Mean scores of PSQ among User Groups in IIT/IIM Libraries

Designation	IIT/IIM Libraries							
	Mean	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7
Faculty (317)	-1.00	0.07	0.05	-0.03	-0.16	-0.20	-0.12	0.10
Researcher(170)	-0.88	-0.17	-0.02	0.08	-0.01	0.31	0.04	-0.06
Postgraduate(216)	-0.83	0.03	-0.06	-0.01	0.24	0.05	0.15	-0.10
Overall(703)	-0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The figures in the above table indicate the significant gap experienced by all the user categories. Though the overall difference among the users is not significant some differences exist in a few factors. The –ve indices values of factors 4, 5 and 6(IT

resources and facilities) for faculty members indicate and +ve values of those factors for students indicate difference among user category. The IT equipment/facilities and print resources received –ve factor indices values by students and +ve values by faculty members. The availability of better IT facilities for faculty members at departments might have been contributed to the +ve values

The Overall gap experienced by users of respondent libraries in Karnataka is larger than their counterparts of IIT/IIM libraries. Though the perception rating by faculty members of national libraries in high (3.30) as compared to perception rating by their counterparts in state libraries (2.94), the gap score is almost same, because of high expectation level by users of national libraries. The gap is more visible in student community. The students of state libraries experience more gaps as compared to their counterparts in national libraries. As the factors that affect perceptions are different in these two sets of libraries, it is difficult to compare them on similar grounds. In-depth analysis within and between the groups for national libraries is beyond the scope of this study.

6.5 OVERALL RATINGS OF SATISFACTION, QUALITY, RESOURCES, AND WORD OF MOUTH

Customers' Satisfaction or dissatisfaction arises during customers encounter with the system. The perception of service quality is the customers' overall impression developed over a period of time. As discussed earlier, the customer satisfaction is viewed, as a function of service quality. The current study uses two approaches to assess the overall service quality of academic libraries from customers' perspective. The **First** approach is to measure the service quality as the difference between customer perceptions and expectations (P-E). The **Second** approach is the direct measure of overall customer satisfaction through a question. The respondents requested through a set of SIX questions to indicate their overall satisfaction/judgement level and overall ratings on resources and services and word of mouth on a five-point scale. The response is summarised in Table 6.22. (The overall ratings are analysed for Karnataka dataset only)

Table 6.22
Overall Customer Satisfaction, Quality and WOM (n=1697)

Features	1 (Pct%)	2 (Pct%)	3 (Pct%)	4 (Pct%)	5 (Pct%)	Mean* *Std Dev*
F01-Overall Users' Satisfaction (1-Highly Dissatisfied; 5- Highly Satisfied)	70 (4.12)	156 (9.19)	585 (34.47)	625 (36.83)	261 (15.38)	3.50 (0.99)
F02- Overall Service Quality (1- Very Poor;… 5- Very Good)	48 (2.83)	134 (7.90)	575 (33.88)	704 (41.48)	236 (13.91)	3.56 (0.92)
F03-Adequacy of Print Resources (1- Not at al adequate; 5 – Highly Adequate)	184 (10.84)	310 (18.27)	620 (36.54)	439 (25.87)	144 (8.49)	3.03 (1.10)
F04- Adequacy of Elec. Resources (1- Not at al adequate; 5 – Highly Adequate)	220 (12.96)	418 (24.63)	526 (31.00)	378 (22.27)	155 (9.13)	2.90 (1.16)
F05- Overall opinion on IT Services (1- Very Poor;… 5- Very Good)	235 (13.85)	370 (21.80)	555 (32.70)	372 (21.92)	165 (9.72)	2.92 (1.17)
F06- Word of Mouth Recommendations **(1- Absolutely No; 5 - Definitely Yes)**	87 (5.13)	136 (8.01)	437 (25.75)	503 (29.64)	534 (31.47)	3.74 (1.14)

Note: *figure in parenthesis in last column indicate the std. deviation. Figures in parenthesis in columns 1-5 indicate the percentage.

Overall Satisfaction and Assessment of Service Quality: The respondents indicate their moderate level of overall satisfaction with their library system (mean 3.50). Half of the respondents (51.21%) express their overall satisfaction with the available library facilities and services. About ⅓ of the respondents (34.47%) are somewhat satisfied and the remaining 13.31% dissatisfied. Similar trend is observed with customer's ratings of overall service quality too. In other words, significant number of user's requirements needs to be considered by the library authorities.

The overall P-E gap score indicates the significant gap (-1.17) between their expectation and perceptions. However, the non availability of many technology based facilities and services may not have much impact on their overall perceptions of the quality of the existing services. The –ve value also indicate their desire to improve the existing system.

The inter group examination of rating scores as shown in Table 6.23 indicate that postgraduates are least satisfied as compared to faculty and researchers. The picture is same with user's judgement of overall quality of services too.

Table 6.23

Overall Satisfaction Ratings across User Groups

User Category	Overall Satisfaction	Overall Assessment of Quality
Faculty (424)	3.77	3.83
Researcher(44)	3.68	3.73
Postgraduate(1179)	3.39	3.44
Overall(1697)	3.50	3.56

Adequacy of Print and Electronic Resources: The overall rating for print (3.03) and electronic resources (2.90) as shown in fig 6.7 indicate the moderate level of satisfaction towards the same.

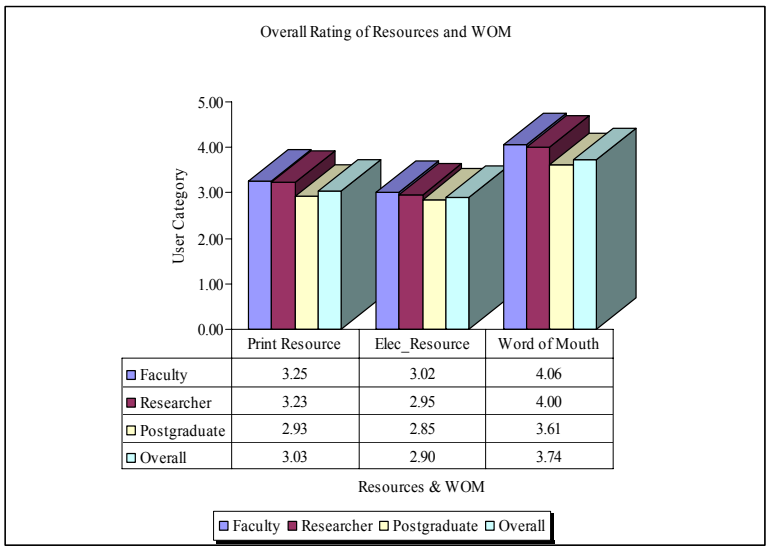

Fig. 6.7: Overall Ratings of Adequacy of Resources and WOM among Users (n=1697)

The frequency distribution figures as presented Table 6.22 shows that about ⅓ of the respondents are satisfied leaving ⅔ of respondents either somewhat satisfied or dissatisfied. The percentage of dissatifiers is more for electronic resources inviting the attention of library authorities towards improving the same in particular full-text online databases on priority basis.

An examination of ratings between the groups indicates that postgraduates are least satisfied as compared to faculty members and researchers. Similarly, the overall assessment of electronic resources by postgraduates is least as compared to others.

Word of Mouth Recommendations/Appreciations (WOM): A satisfied customer speaks good words about his/her library among friends, colleagues and relatives. The word-of-mouth recommendations depend on the level of his/her satisfaction with library transactions. The positive word-of-mouth recommendations will not only promote the utilization but also boost the image of the library.

The mean score (3.74) as shown in fig 6.7 indicates the respondents' willingness to speak good words about their library. The frequency distribution figures as presented Table 6.22 indicates that more than half of the respondents (61.11%) express their willing to speak good words about their library and other 13.14% of them express their reservations about the same. About ¼ of respondents (25.75%) feel somewhat good about their library.

The inter group comparison of mean scores presented in above figure highlight that the postgraduates express their uncertainties more towards word of mouth as compared to faculty members.

Despite shortcomings in library resources and services, the customers' better ratings for word of mouth indicate that the respondents do not hate their institute library. The shortcomings expressed by them are mainly in technology related issues and the organization need to address these issues. The better ratings of WOM also indicate that the users do understand the limitations of librarians particularly regarding technology implementation in the library. However, students' voice needs to be heard by the library authorities.

6.6 RELATIONSHIP BETWEEN OVERALL RATINGS AND PERCEIVED SERVICE QUALITY

The Pearson correlation test was carried out to examine the relationships between overall ratings and overall service quality score computed as P-E. The correlation matrix presented in Table 6.24 reveals interesting relationship among the variables.

Fig. 6.24
Correlations between Overall Ratings and Gaps in Perceptions of Service Quality

Overall Ratings		F01	F02	F03	F04	F05	F06	AvgSQ
F01	Pearson Corr	1	.742**	.527**	.562**	.557**	.627**	.440**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
F02	Pearson Corr	.742**	1	.540**	.559**	.556**	.632**	.423**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000
F03	Pearson Corr	.527**	.540**	1	.620**	.551**	.447**	.395**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
F04	Pearson Corr	.562**	.559**	.620**	1	.716**	.494**	.468**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
F05	Pearson Corr	.557**	.556**	.551**	.716**	1	.516**	.465**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000
F06	Pearson Corr	.627**	.632**	.447**	.494**	.516**	1	.377**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000
AvgSQ	Pearson Corr	.440**	.423**	.395**	.468**	.465**	.377**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	

** Correlation is significant at the 0.01 level (2-tailed).

Note: F01- Overall satisfaction, F02- Overall Quality, F03- Adequacy of print resources, F04- Adequacy of electronic resources, F05- Overall assessment of IT support services, F06- WOM, AvgSQ- overall P-E score.

The figures presented in above table reveals some interesting relationships:

- The significant positive correlation between AvgSQ and F1 and F2 indicates that as the customers' perception of service quality increases, their satisfaction level also increases. In other words, as the gap between customers' expectations and perceptions (P-E) decreases, the satisfaction level and perceptions of quality of services increases. {r(AvgSQ, Osatis) = .440**) and r(AvgSQ, quality) =.423**}. In service quality literature, customer satisfaction is viewed as function of service quality.
- As customers' sense of adequacy of print and electronic resources increases, their perceptions of service quality also increases. {r(AvgSQ, Print) = .397**) and r (AvgSQ, Elec) =.442**}.
- As the customer's perceptions of service quality increases, his willingness to spread word of mouth among friends and colleagues also increases.
- The +ve and significant correlations between F01 to F06 also shows the direct and positive relationship with each other.

The internal relationships among different key features have also been examined by cross tabulating the responses. The results cross tabulation also support the direct/positive relationship between the key features. The cross tabulation figures shown in Table 6.25

Table 6.25
Cross Tabulation among AvgSQ and other key Features

		F01	Overall satisfaction				Total
AvgSQ		1	2	3	4	5	
	-5	0	0	0	0	2	2
	-4	10	4	1	0	2	17
	-3	15	57	59	18	2	151
	-2	20	46	240	115	8	429
	-1	10	27	211	301	89	638
	0	12	19	67	179	140	417
	1	2	2	7	10	17	38
	2	0	1	0	2	1	4
	3	1	0	0	0	0	1
Total		70	156	585	625	261	1697

		F02	Overall Quality				Total
AvgSQ		1	2	3	4	5	
	-5	0	0	0	0	2	2
	-4	5	6	2	2	2	17
	-3	16	33	77	22	3	151
	-2	13	50	220	136	10	429
	-1	5	26	199	339	69	638
	0	8	17	70	190	132	417
	1	0	2	7	13	16	38
	2	0	0	0	2	2	4
	3	1	0	0	0	0	1
Total		48	134	575	704	236	1697

		F03	Adequacy prn_resource				Total
AvgSQ		1	2	3	4	5	
	-5	0	0	0	0	2	2
	-4	8	3	3	0	3	17
	-3	53	42	40	13	3	151
	-2	67	114	171	70	7	429
	-1	34	108	269	193	34	638
	0	20	42	127	147	81	417
	1	1	1	9	14	13	38
	2	0	0	1	2	1	4
	3	1	0	0	0	0	1
Total		184	310	620	439	144	1697

		F04	Adequacy_Elec.resource				Total
AvgSQ		1	2	3	4	5	
	-5	0	0	0	0	2	2
	-4	9	3	2	1	2	17
	-3	61	59	23	6	2	151
	-2	89	144	145	43	8	429
	-1	39	175	233	148	43	638
	0	22	33	116	161	85	417
	1	0	3	6	17	12	38
	2	0	0	1	2	1	4
	3	0	1	0	0	0	1
Total		220	418	526	378	155	1697

		F05	Overall IT services				Total
AvgSQ		1	2	3	4	5	
	-5	0	0	0	0	2	2
	-4	10	2	2	0	3	17
	-3	70	37	35	8	1	151
	-2	87	136	160	41	5	429
	-1	50	155	222	171	40	638
	0	18	36	126	140	97	417
	1	0	2	10	11	15	38
	2	0	1	0	1	2	4
	3	0	1	0	0	0	1
Total		235	370	555	372	165	1697

		F06	WOM Recommendation				Total
		1	2	3	4	5	
AvgSQ	-5	0	0	0	0	2	2
	-4	7	4	3	1	2	17
	-3	18	40	57	25	11	151
	-2	24	42	180	113	70	429
	-1	24	33	139	230	212	638
	0	14	15	52	120	216	417
	1	0	1	5	12	20	38
	2	0	0	1	2	1	4
	3	0	1	0	0	0	1
Total		87	136	437	503	534	1697

Note: 1- minimum value…. 5- maximum value for key features and AvgSQ is computed P-E score.

6.7 IMPACT OF TECHNOLOGY ON LIBRARY RESOURCES/ SERVICES AS PERCEIVED BY CUSTOMERS

The research team attempted to obtain librarians opinion about their experiences on impact of technology on library services. Similarly, as attempt has been made to obtain customers' perspectives on impact of technology on library resources and services. It is to be noted that the impact study involves pre and post technology observations. It involves set of respondents who has seen/experienced both traditional and automated systems in their library. In other words, the users who are using the library for the past many years need to be contacted. The postgraduate course in Technical and Management education spans for two years and naturally the postgraduates will have one to two years of experience in using the library. They may not be able to judge the impact of technology already implemented in the library. Since the faculty members are also the employees of the organisation they may have longer years of experience and witness the changes in the library environment. The feedback from senior faculty members also may not give the real picture of research study and there could be some bias in responses.

As mentioned earlier, the study was intended for comprehensive coverage of Technical and Management libraries in Karnataka with proper representation from different categories of users. Hence, the research team decided to contact cross section of current faculty members, research scholars and postgraduates in the libraries considered for the current research independent of their experience in using their institute library. It was also assumed that the users have witnessed the impact of technology on library and information resources in general and an attempt was made to understand their viewpoints on impact of technology on information resources and services.

An open-ended question was included in the questionnaire through which, the respondents were asked to indicate the areas where they could see the visible impact of technology on library resources and services not limiting to their institute's library. About 1000 respondents responded to this question. For convenience, the responses have been consolidated on various three important areas like impact of technology on

i. Access to library resources,
ii. IT supported facilities and services and
iii. Other technology supported operations.

The specific features identified by respondents within these broad areas are described below (Figures in parenthesis represent the responses received and they have been rounded off to near 10). As the features are identified by users, no attempt has been made to twist or change the concept with literature support. Instead, the features are explained with the help of user interactions, literature support and self experience. Further, no attempt has been made to amend the features which are not listed by respondents.

6.7.1 Access to Information Resources:

The most important impact of technology from customers' perspectives is the means and methods of access to information resources. The specific features identified by respondents are:

i. **Access to information resources through Internet and intranet (510):** The access to information has crossed all geographical barriers. The technology particularly the ICT has transformed the physical access to information resources to remote access. As the library transformed from 'Museum → traditional library → digital library' due to technology advances, the access to its resources also transformed from 'physical visit' → 'online visit'. In the current Internet age searching for global information on any topic of interest is not at all difficult.

ii. **Emergence of digital library (500):** The ICT advances resulted in emergence of digital library where the information resources are stored in digital format.

iii. **Availability and access to e-books and e-journals (460):** The technology has facilitated the availability of published books and journals in electronic format. Large number of printed books and journals are now available in electronic media and they can be access my multiple users simultaneously.

iv. **Availability and access to Electronic databases (390):** The Emergence of electronic databases which contains indexes, abstracts and full-text of scholarly publications in digital format.

v. **Access to archives of journal articles (350):** The research papers published in journals and their back volumes can be accessed online either through commercial databases or individual websites. Publishers of many scholarly journals like sage, Elsevier, Harvard business school, MIT Sloan management, Blackwell etc., allow their print copy subscribers to access the journal archives through website.

vi. **Access to e-materials on CDs (320):** The great contribution of technology is the invention of compact disks. This has revolutionized the media of information storage and retrieval. This resulted in miniaturization of information storage and carrying large data on CD.

vii. **Increased publication of book and journals in print format (270):** The technology has benefited the production of print documents. The desktop publications facilitate mass production of documents at reduced time and cost. The printing press has incorporated all digital technology for fast printing of documents with more clarity and variety. The readers also motivated to buy books and other reading materials as they are available at affordable price.

viii. **Availability of resources at an early time (230):** The availability and access to required material is much faster as compared to traditional modes.

ix. **Access to Online Publications (220):** the Information can be access instantly from website from users' desktops/laptops. Many publications are available in digital format which can be accessible online.

x. **Speedy Access to Books (100):** The ICT has enabled the information seekers to obtain the information regarding books much faster as compared to physical search in through card catalog in libraries. Many online book stores have emerged to cater to needs of tech-savvy readers through online catalog and online trading.

xi. **Digital library's assistance in preparing technical research papers (90):** the digital library containing e-resources has become handy for readers particularly students and research scholars to prepare research reports.

xii. **Library networking through DELNET (50):** The technology has improved the networking of libraries for effective resource sharing and mutual cooperation. DELNET (DEveloping Library NETwork) is one such attempt initiated by government of India to bring together large number of libraries approved by AICTE and UGC.

xiii. **Getting the needed articles through DELNET (40):** DELNET has prepared union catalog of books and periodicals available in member libraries. It acts as a

nodal agency for interlibrary lending and document delivery services to member libraries.

xiv. **Subject-wise databases in the library (10):** The IT has enabled libraries to develop in-house subject databases or to subscribe subject specific databases.

6.7.2 Technology Supported Facilities and Services

The ICT has empowered libraries and information centres to serve users with more sophisticated technology supported facilities and services. The second important area where the library users find the visible impacts of technology is related technology supported facilities and services provided by libraries. The specific features that identified by the respondents are described below.

i. **Internet (500):** Internet is the greatest boon of technology for search, access and retrieval of information.
ii. **Ease of searching a specific book (420):** The information about specific available with library or book vendors is much easier as compared to pre-technology periods. All commercial publishers and online book stores publish book catalog on their websites with reviews. In addition the information seekers can search online book catalog of many leading institutions around the globe.
iii. **OPAC (library catalogue (350):** Online Public Access Catalog is another great gift of library automation technology. The OPAC allows users to search online book information either within the library or outside through LAN, campus-wide networks. Web-based library catalog is the reality.
iv. **Printers, Scanners and CD writers (100):** The reproduction or multiple copies of the documents are possible through reproduction technologies like photocopiers, printers, scanners or digital storage devices like CD writers.
v. **Quick Information Retrieval (50):** Instant access to information and fast retrieval of required information are resultant of ICT advancements.
vi. Digital Cameras (10): digital cameras are the security devices for protecting institution properties. It records the moments of library users and helps the library staff to identify the users who exhibit undesirable behaviour.
vii. **Wi-Fi in the Library (10):** wi-fi provides campus-wide wireless connection to Internet and network operations. It is a big leap towards achieving remote access across the campus.

6.7.3 Automated Operations- Library Automation

The third area which users notice the visible changes is in library automation. Many software developers developed commercial softwares to automate the library operations. The library software automation software helps libraries to automate library circulations, acquisitions, serial management, inventory management and reference services. The operations could be carried out either stand-alone or network environments.

i. Book transactions (improved Issues, returns and renewal of books (50)
ii. Bar-coded library transactions(40)
iii. Inquiry processing, (10)

The popular services which are noticeable by users are circulation, bar-coding, OPAC, and information enquiry.

iv. **Preservation of books in e-format (35):** Digitization is another major impact of technology to preserve the print documents in digital format. These digital resources can be multiplied or accessed at multiple locations easily.
v. **More transparent (30):** with the introduction of technology the systems and operations in library have become more transparent, which was difficult in traditional systems.
vi. **Air-conditioning (10); UPS Systems (10) and Improved lighting (5):** the other significant development supporting library environment is in lighting, air-conditioning and continuous power supply.

To sum up, in an academic institute, the customers attach primary importance to their institute library for obtaining information. The other preferred sources of information are self purchase, Internet searching, borrowing from friends and colleagues and visiting other libraries in the decreasing order of preference. Since the improved infrastructure is in place with national level institutes like IITs/IIMs, the Internet has become second most important source of information.

The study observed High level of customer expectations towards library resources and services. The expectation levels of students are less as compared to faculty members and researchers. The expectation level of users of IIT/IIM libraries is high as compared to their counterparts in Karnataka.

The respondents' perceptions of existing library resources and services are consistently low across all the key features of service quality. Comparatively, the perception level of faculty members is slightly high that that of students. Further the perception level of users of national libraries is high as compared to their counterparts in Karnataka.

There exists a gap between customer expectations and perceptions. The gaps are very significant in technology supported resources and services. The postgraduates experience more gaps as compared to faculty members. The users of Karnataka experience more gaps as compared to their counterparts in IITs/IIMs.

Overall postgraduates are less satisfied as compared to faculty and researchers both in IITs/IIMs and Technical and Management institutes in Karnataka. The customers' ratings of adequacy of print and electronic resources are moderate. Despite shortcomings, the customers' willingness to spread word of mouth is commendable and clearly indicates the customers' understanding of infrastructure and other difficulties, which are beyond the control of library staff.

The customers' perception of service quality measured as P-E score is positively related to their overall satisfaction level, comprehensive print and electronic resources, IT based facilities and word of mouth.

The impact of technology on library functions as perceived by customers are related access to electronic resources, technology supported facilities and services and library automation.

The next chapter explains the major findings of this study.

Chapter 7
RESEARCH FINDINGS

In the first phase, an attempt was made to understand the nature of technology supported resources and services provided by Technical and Management libraries in Karnataka. In the second phase, customers' expectations and their perceptions of quality of resources and services in their library was measured by using modified SERVQUAL instrument. The study was also intended to observe any variations in expectations or perceptions among customers of IIT/IIM and State libraries. The study's findings are presented in this chapter on themes like *Status of Technology in Technical and Management libraries in Karnataka, Customers' Visiting Pattern to the Library, Customer Expectations, Customer Perceptions, and gaps in Customers' Perceptions of service quality.*

7.1 STATUS of I.T. RESOURCES & SERVICES in TECHNICAL/ MANAGEMENT LIBRARIES in KARNATAKA.

The study received excellent cooperation from fellow professional colleagues in Technical and Management libraries in Karnataka. Of 153 libraries considered for the study, 116 libraries have responded resulting in 75.82% response rate. The sample consists 83.6% technical and 16.4% management libraries.

7.1.1 Information Resources in Library

The holdings of the library include information resources available in print and electronic media. The print resources include books, periodicals, standards, Theses, dissertations, and reports. The non-print resources include A-V cassettes, CDs/DVDs, Online/offline Databases. As explained in earlier chapter, there is wide gap between the information resources available respondent libraries in Karnataka and IIT/IIM libraries. The summary of resources available in these libraries is presented in Table 7.1.

Table 7.1
Summary of Information Resources available in Karnataka & IIT/IIM Libraries

Resources	Technical and Management Libraries in Karnataka	IIT/IIM Libraries
Books	The book collection ranges from 1,460 books to 88,000 books. 36.2% of libraries have <10,000 books 24.2% have 10000 to 15,000 books, and 13% have more than 50000 books	IITs collection >175,000 IIMs collection > 150,000 except IIMK and IIMI
Book Bank	58.6% have this collection. Traced in technical libraries only.	100%
Periodicals	The subscription varies from 10 to 334 periodicals and subscription ranges from 1-156 for international journals. Indian periodicals: 35.3%<50, 34.5% 50 to 100, 6% more than 200 periodicals International: 46.6%<25, 23.3% 25 to 50, 9.5% 50 to 100 and 8%>100 periodicals	Total subscriptions: IITs >1000, IIMs>600 International journals: > 400

Bound Volumes	Not collected	IITs>100000, IIMs>30000
Standards	20% of Technical Libraries(Indian)	IITs-100% (Indian & Intl)
Annual Reports	Tech. Lib -11.3%, and Mgt. Lib- 57.9%	IIMs- 100%
Videocassettes	34% of Tech & 79% of mgt libraries have VCs and the total collection is <100	100% IITs >400 IIMs>150
CDs/DVDs	84% have collection and it varies from 100 to 2000	100% figure n/a
Online/offline Databases	Very small number, Databases range from 1 to 10	Large number Individually and through INDEST consortium

Books: The book collection in 60% of the libraries is <15,000 books (54.6% of technical and 90% of management libraries). The collection is nowhere comparable to the comprehensive collection of IIT/ IIM libraries.

The Government funded *book bank* collection for SC/ST students is found in 58.6% of libraries particularly in technical libraries only. It is not clear from responses that to what extent this facility is available for Technical PG courses. As it is a Government's scheme, this facility might be available in IIT/IIM libraries too.

Periodicals: About 70% of the respondent libraries in Karnataka subscribe less than 100 periodicals (Indian and international). On the other hand, the subscriptions go beyond 600 periodicals including substantial number of international journals in IIT/IIM libraries. Further, a large collection of back volumes of journals is available in these libraries.

It is to be noted that AICTE has already laid standards (http://www.aicte.ernet.in) for member institute libraries regarding size of building, number of books and number of Indian and international journals, and annual additions. As per the norms "The library in a technical institute having three engineering branches with an annual intake of 240 students, should have minimum 400 sqmt carpet area, 4000 initial book stock {1000 (250 titles with 4 copies each) for each branch and 1000 for non technical courses}, 36 journals(6 Indian+6 international for each branch). The number of journals though preferred could be relaxed if the institute is offering only UG courses. The annual addition should be 1 title/student admitted/branch and 0.2 title /student/year and the library should work for 12 hours." However, there are no norms stated for replacement of old editions and addition of reference books.

Technical/Project/Annual reports: 71.6% of libraries indicated that they have reports (technical reports in tech. libs/project reports in mgt. libs) varying from 500 to 5400. This number is no way comparable with such collection available in premier libraries.

More than half (57.9%) of management and 11.3% of technical libraries have company annual reports. The collection varies from 50 companies to 500 companies. All IIMs have sizeable collection of annual reports.

Standards Thesis/Dissertations: While 20% of technical libraries of Karnataka have small collection of Indian standards, all IIT libraries have large collection of Indian and international Standards.

As none of the technical/management institutes in Karnataka have full time doctoral degree programs, the theses collection is not traced in most of the libraries. On the other hand, IIT/IIM libraries have substantial numbers of Theses/dissertations

7.1.2 Technology Supported Facilities & Services in Libraries

The technology supported facilities and services include photocopiers, scanners, burglar alarm, computers, networks, Internet and document delivery services. The consolidated picture is presented in Table 7.2

Table 7.2
Technology Supported facilities/services

Facility/Service	**Technical and Management Libraries in Karnataka**	**IIT/IIM Libraries**
Photocopy	88% have photocopiers	100%
Document scanners	34.5% have scanners	100%
Barcode Scanners	58.6% have bar-coded transactions	100%
Digital Camera	18.9% have digital camera	N/A (May be existing)
Electronic burglar alarm	8.6% have the system.	RFID- may be available. But information is n/a on web
Computers	95.7%	100%
Linux o/s	13.8%	100%
Network-LAN	67.2%	100%
Network-Campus	25.8%	100%
CD Server	12.9%	N/A (May be available)
Internet	78.4% (1 to 400) BSNL, 256 kbps to 3mbps	100% Must be large number
Wi-Fi	5% (though feature was not included in the questionnaire).	N/A (May be available)
ILL-Document Delivery Services	Yes {Print + electronic (few)}	Yes (Print + Electronic)

Photocopying: Most of the respondent libraries have photocopiers in their premises. Outsourcing is the current trend but the information in this regard is not collected from respondent libraries in this regard as it is sensitive in nature.

Scanners: While barcode scanners are available in 59% of libraries, the document scanners are available in 35% of the same.

Security Systems: The digital camera or any other electronic security devices are not available in most of the respondent libraries. However, 19% of them have digital camera. RFID is the latest technology for security purpose and none of the sample libraries in Karnataka have implemented it.

Computers: Computers are available in almost all the libraries. However, the number of computers available for library staff and user is not clear from responses. Of late, the laptops are becoming compulsory for students in many technical institutes and they are supplying them to students at a discounted rate. This trend might reduce the need for full-fledged central computing lab or providing several computers in the library.

Printers: A majority of libraries (83%) have printers. The types of printers are DOT matrix, inkjet and laser printer operating on LAN or Campus-wide network. About half of the libraries have laser printers working in network environment.

Nature of Networking: About 67% of respondent libraries operate on LAN and 26% have campus-wide networks. About 14% of libraries have Linux operating system too.

CD Server/CD Mirror Server: The CD Server concept is still in its introductory stage in Karnataka and only 13% of respondent libraries have installed CD servers.

Internet Connectivity: A majority of libraries in Karnataka have Internet connection and the computers with Internet connection range from one terminal to 400 terminals. BSNL is the major service provider in the state. Dial-up, leased line, ISDN and Broad band connections are in place with bandwidth range from 256 kbps to 3mbps. Only 10% of the libraries in the state have bandwidth more than 2mbps.

Wi-Fi is the latest technology to provide campus-wide wireless Internet connection. Though not requested, 5% of libraries have indicated the presence of Wi-Fi in their premises.

All the above mentioned IT support facilities are available in IIT/IIM libraries and may be with latest versions of the same. They have campus-wide network. They may be having Wi-Fi connection too.

7.1.3 Status of Library Automation

Library Automation: It is observed that 74.1% of the respondent libraries in Karnataka have automated their library operations. Further, 76.3% of technical 63.2% of management libraries are automated using commercial or in-house software. Though the efforts for automation could be traced in 1990s, significant implementations are traced after 2001. About half of the respondent libraries started the automating their operations since 2004 and another 10% are in the process. The IIT/IIM libraries are automated since 1990s.

Software Packages: Commercial softwares such as Lib-Soft (19), Easylib (16), Libsys (3), Environ (3), and netlib (2) have been traced in Karnataka. Lib-Soft and Easylib are the leading in the state. Libsys is the leading s/w in IITs/IIMs. However, IITM, IITB, IITK have developed in-house software.

Automated Library Operations: The popular functions that are automated by respondent libraries are bar-code supported Circulation, OPAC, Acquisition, and Classification. The other automated functions, which are not so frequently used, include Serials Control, References, Reminders and Bills payment. This could be due to the different practices and systems prevailing individual organisations.

7.1.4 Digital Library Initiatives and Access to Digital Resources

Open Source Digital library Softwares: Though, currently a few libraries (9%) use GSDL, significant number of libraries (38%) indicate their desire to use GSDL/dSpace

for creating digital library. The implementation of Open sources requires infrastructure and training. IIMK is using both GSDL and dSpace and conducting regular short-term training programmes in this regard.

Digitisation: digitisation is not seen as significant activity in most of the libraries as 5% of them have started digitizing internal reports and another 3% have converted videocassettes into CDs. About 13% of them have loaded CDs on CD server and a few of them are in the process of buying scanners. Of late, many institutes insist that students submit project reports in digital format. .

Databases-Online & Off-line: A few technical libraries in the state are subscribing Online/offline databases like IEEE, IEE, IEL and ACM databases. Similarly, very small percentage of management institutes in the state are subscribing EBSCO, CMIE, Capital Line, IBID, Indiastat.com, CRIS-INFAC databases. These databases are not comparable to large number of databases subscribed through INDEST and IIM consortia. Similarly, INFLIBNET also subscribes many databases and allow Universities to access them through e-consortium.

Recently AICTE has centrally subscribed "IEL Online" and insisting all technical institutes to subscribe it at discounted rate. Though not officially announced, IEL library subscription is becoming of the norms for AICTE's accreditation.

Publications: about 30% of the respondents stated that they publish periodicals including academic journals and in-house magazines.

Access to Databases: About 25% of libraries provide access to databases through LAN and 18% of them through campus networks. The access is enabled through login and IP authentication. However, none of the respondent libraries provide web-based access to their resources. The users of IITs/IIMs do access library resources through campus-wide network and website. They have web OPAC and database access through login and IP authentication.

Networking with other libraries and Consortia: Demand for INDEST and DELNET membership is increasing among Technical and Management libraries in Karnataka. INDEST allows its members to subscribe online databases at discounted price. About 12% technical Libraries have already joined the INDEST consortia and another 13% are in the process of joining INDEST. Similarly, DELNET allows its members to access union catalogue of books, journals and some databases on its website. Currently, 15% have DELNET membership and another 10% are in the process of obtaining the same.

7.1.5 Library Budget, Staff, Communication, and Building

The current status of Library budget, manpower, library space, and communication in respondent libraries and IIT/IIM libraries is summarised in Table 7.3

Library Budget: While ¾ of respondent libraries indicated their budget, 10% said that it is confidential and 2% said there is no limit. The budget ranges from Rs.50,000 to Rs. 9200,000. However, a very few librarians have indicated the approximate percentage of budget allocation for electronic resources.

Table 7.3
Library Budget, Manpower, Communication and Building Staff,

Feature	**Technical and Management Libraries in Karnataka**	**IIT/IIM Libraries**
Library Budget	Range from Rs. 50,000 to Rs. 9,200,000 31.0% have budget <Rs.5.0 lakhs, 31.0% have it from Rs. 5.0 -10.0 lakhs, 17.3% have it from Rs.10.0-20.0 lakhs, Exceeds Rs. 25.0 lakhs in 11.5% libraries.	Both IIT/IIM libraries have budget in Rs. Crores (exact figure is not available on website)
Communication	Media: Notice board and email Type: New Additions, reminders, CAS, new developments, seminars/conferences Handbook- print dominate	Same through print, email and website
Library Staff	Less than five members in 38.8% libs. 5-10 members in 38% libs. More than 20 staff in 6% libs.	More than 20 staff (Figures are not available on web for all the libraries.)
Separate Library building	29% (all tech libraries)	100%
Library Timings	8-9 hrs in 18.1% libraries; 11-12 hrs in 36% libraries; 14-15 hrs in 15%; & >15 hrs in 7% Libs.	IITs 15-24 hrs IIMs 15-24 hrs
Sunday opening	Yes in 42.2% of libraries	Yes 100%
User Membership	Regular members of the institute (students, faculty members, researchers etc.)	Regular members, + others like external researchers, institutes, alumni, business executives, corporates, and public.
Institution Membership	INDEST - 12%, DELNET- 15% & 13% are in the process, Other: IISc, AIRC, British Lib. CMTI, IIMB, ISTE, CSI, ILA/IASLIC	INDEST, DELNET, IIM consortia

Library Staff: The staff strength range from 2 to 35 members. About 40% of the libraries have less than 5 members and another 40% have 6 to 10 members. Only technical libraries have more than 10 members. Most of the management libraries (80%) have less than 5 staff members.

Library Building and Working Hours: About 29% of the respondent libraries in Karnataka (all technical libraries) are housed in independent. The library area varies from 2000 sq.ft to 72,000 sqft.

About 42.2% of libraries have normal 8-9 hours library timings and 36.2% of libraries work for 11 - 12 hours a day. 14.7% work for 14 – 15 hours a day and only 6.9% work beyond 15 hours.

7.1.6 Problems experienced by Library Professionals while using Technology and their Future Technology Plans

Problems related to Technology: The problems experienced by librarians are related to Budget restrictions, customisation of s/w, lack of skilled staff/training, hardware

breakdowns, circulations, report generations, Internet speed, virus attack, and e-book reading.

Future Plans: The future plans or desires expressed by respondent librarians are very much encouraging towards implementation of IT supported resources, services and developing digital library. They would also like to use open sources, complete the automation, subscribe to DELNET/INDEST membership, design library websites, and implementing RFID/smart card technology. However, the realisation of plans is subjected to the financial and other support from the parent organisation.

7.2 CUSTOMER EXPECTATIONS AND PERCEPTION OF SERVICE QUALITY IN TECHNICAL AND MANAGEMENT LIBRARIES IN KARNATAKA.

7.2.1 Customers' Preferred Sources of Information

In an academic environment, the customers attach primary importance to their *institute library* for seeking information followed by *self-purchase, Internet, borrowing from friends/ colleagues* in that order of preference. *Visiting other libraries* is the least preferred source by the users of academic libraries.

While Internet and Self-purchase are second and third preferred sources by users of IIT/IIM libraries, the order is reversed for users in Karnataka libraries indicating the bandwidth and other technical inadequacies in the state.

The ranking pattern of information sources remains consistent (Inst_library→Self-purchase→Internet→Friends/Colleagues→visit other libraries) across user groups (faculty members, research scholars and postgraduates)

The results of correlation test reveal that "As customers' preference attached to institute library increases, their inclination towards self-purchase, Internet and borrowing from friends/colleagues decreases."

Though preference attached to Internet is indicative of –ve impact on preference attached to institute library, the impact appears to be insignificant at present indicating technical problems of using Internet.

7.2.2 Customers' Visiting Pattern to the Library

It is observed that about 42% of respondents visit library daily and another 31% visit once in 2-3 days. The remaining 27% visit once in a week/fortnight or occasionally. Presently, as more and more library resources are accessible on network, users may use the online resources, which may not insist physical visit to the library.

Comparatively, postgraduates visit library more frequently than faculty members. The reasons could be related to faculty members' teaching, academic assignments, online resources, power to borrow more books for longer periods and family matters.

Like faculty members, researchers also visit the library less frequently. As they prefer to read more research papers in journals, their visit to library might be linked to the arrival of current issues of periodicals.

Factors that Influence the Customers' Visit to the Library: ANOVA and Multinomial Logistic Regression tests have been conducted to verify the factors that might influence library visit. The results are summarised below. (Since the full text of analysis is very lengthy, it is not provided in the report)

- Customers' preference attached to *institute library* has positive impact on library visits. On the other hand their preferences attached to *self-purchase, Internet* and *borrowing from friends/colleagues* have -ve impact on library visits. However, currently the –ve impact of Internet is not very significant on library visits in respondent libraries in Karnataka. The impact is already visible in IIT/IIM campuses where better infrastructure is available. Perhaps the same scenario would emerge if the current status of infrastructure improves in the state (other than major cities, where the situation is already improved).
- Customers' demographic characteristics such as *educational background nature of institute working (in particular national institutes); status, age, and length of experience* do have impact on frequency of library visit. "As the customer's age increases the frequency of visits to the library decreases." The other characteristics like *gender and residence* do not appear to have any impact. The marital status is indicative of possible –ve impact, but the results are not supporting the generalization of the notion.
- The **time spent** by customers in the library has positive impact on library visits.
- **Satisfaction level of users** regarding library services, their **perception of quality of library materials/services**, and **word of mouth** do indicate the possible positive impact on library visits.

7.2.3 Customers' Expectations on Library Services (E).

The respondents' expectation level is high (mean 4.07 on 5-point scale) regarding library resources and facilities. The high level could be due to enhanced awareness and technology facilitation. The five key factors that could explain the priorities in customer expectations in descending order of variance are i) Reliability and Assurance; ii) Access to electronic Resources; iii) Library resources (print and electronic); iv) IT support equipments and v) Library building.

Reliability and Assurance are the most important dimensions in customer expectations indicating customers' requirements go beyond the technology per se. The specific features consolidated under this dimension are related to expectations on staff's sincere interest/willingness to help users; staffs' ability to provide the promised service on time and error free records.

Access to electronic resources is the second important factor from customer perspectives. Remote access and OPAC are the high expected features. Web access, online reservations/renewals and speed of responses through Internet are the moderately expected features.

Library resource (print and electronic) is the third important factor that users expect from the library. Majority of respondents expect comprehensive collection of books, journals, full text electronic databases, CDs/VCs and their proper arrangement in their library.

IT-based equipment/facilities: This is the fourth important factor that influences users' expectations. Internet connectivity and consistently working computers are the high expected features. The other features like modern computers, electronic security systems, document scanners, and laser printers are less expected by users indicating that they are not seriously considered or taken for granted.

Library building and its Access is the fifth factor that that explain least variation in customer expectations. While easy access to library is highly expected, the physical library building is less expected. This indicates that the users have not attached much importance to the brick and mortar of physical library.

Comparison of expectations among user groups: The expectations of faculty members are high as compared to the expectations of postgraduates. The difference between them appears to be significant. Though there appears to be some difference in expectations of postgraduates and researchers, and researchers and faculty members, it is not very significant. The indices of five factors also indicate the sensitivity to designation indicating the differences in expectation of faulty members and students are significant.

The expectation level of users of national institutes is high as compared to their counterparts in Karnataka. The customers, particularly new customers who see the current systems and consider them as accepted level and expect more from the system. Thus the existing better facilities will raise the customers' minimum expectation level and prompt them to demand more. The factors generated for dataset from libraries in Karnataka are congruent with the results of IIT/IIM datasets too except factor 2 and factor 3.

Factors that Influence Customer Expectations: Besides the five factors, the other features that might impact customer expectations are:

1 The **overall customer satisfaction** positively influences the customer expectations, implying that increased customers' satisfaction with library transaction could enhance customer expectations, which is an encouraging signal for further improvement.
2 The customers' **subject of studying,** academic status and nature of institute do influence their expectations.
3 Customers' **demographic characteristics** such as sex, marital status and geographical background do not have any influence on customer expectations. But a combination of these could influence expectations.
4 Customers' preference attached to the **institute library** (IL) and **past experience** positively influences their expectations.
5 The customers' **age** might have negative impact on expectation indicating as age increases the expectation level may decrease slightly.
6 The preferences attached **Internet usage** might have -vely impact expectations.
7 The **adequacy of print and electronic resources** might have +ve impact on customer expectations.

7.2.4 Customers' Perceptions of Library Services (P)

The respondents' overall perceptions (mean 2.94) fall short of their high expectations (4.07). All the features are consistently rated below customer expectations indicating greater scope for development.

The factors that explain maximum to minimum variances are 1) Access to electronic resources and IT systems; 2) Library building and resources; 3) Assurance; and 4) Reliability in that order of variance.

Access to electronic resources and IT systems: The "*access"* related issues such as on-line reservations/renewals, speed of response via network, access through web site, remote access, online OPAC and library networking received least perception scores indicating the non availability or insufficiency even if available. The "*IT systems*" such as scanners, electronic security, laser printers, also received low perception scores indicating the non-availability or inadequacy of the same. The other two features such as Internet connection and library automation are moderately rated leaving scope for improvement.

Library building and its information resources: The specific elements like print resources, library building, physical access and working hours are perceived better by customers. The other features such as subscriptions to full-text databases, Statistical/bibliographical databases, and CDs/Video collection are perceived moderately by users signalling need for improvement.

Assurance: The specific features like staff who understand user's specific needs, staff's knowledge to answer user queries, provision of 'right document the very first time' are moderately perceived. The other two features like staff's sincere interest/willingness to help users and staff who instil trust/confidence in users rated high by customers.

Reliability: The individual elements like ability to promise services by certain time, ability to deliver promised services on time, and Error-free records received moderate perception ratings.

The last two factors, which explain maximum variance in customer expectations, explain minimum variance in customer ratings indicting the consistency in users' perception of the same.

Comparison of perceptions across user groups: Comparatively, the overall perception scores of faculty members are high (3.18) than postgraduates (2.83) and the difference is significant. The indices of four factors also support the significant difference in perceptions between faculty members and students.

Interestingly, unlike customer expectations, the factors generated for perception ratings by users of Karnataka and IIT/IIM libraries are different. The factor analysis generated five factors for IIT/IIM library responses as against four factors generated for dataset of Karnataka indicating the differences in perception ratings by users of national and state libraries.

The "reliability and assurance" dimensions which explained least variance for users of Karnataka libraries explained maximum variance for users of national libraries indicating

the users are very much concerned about these issues in national libraries as they received low perception ratings.

The 'IT equipment' such as electronic burglar alarm, library networking, Internet, CD/videos, modern computers and their proper maintenance emerged as second important factor for IIT/IIM libraries. These features are shared between first and second factors generated for state user ratings.

The 'access to electronic resources', which explained maximum variance for state library responses has become the third factor for national libraries indicating the existence of those features with them. While the specific features received better ratings from users of national libraries, it received lower ratings from users of Karnataka libraries.

The library building and print resources and IT equipments like scanners and printers emerged as forth and fifth factors explaining least variances. The reason is quite obvious for users of national libraries and the scanners and printers may be available in each department of IIT/IIMs. The building and print resources are better perceived by users of Karnataka too.

The overall perception level of faculty members is slightly as compared to that of postgraduates. Though the overall difference among the users is not significant some differences exist in a few factors. The +ve values for factors 1 and 5 for faculty members do differ significantly with that of postgraduates. The better treatment of faculty members and availability of scanners and printers at departments might have been contributed towards +ve values

The Overall perception level (3.30) of users of national libraries is high as compared to their counterparts in state libraries (2.94). The difference is evident from the resources and services available at national libraries. As the factors that affect perceptions are different in these two sets of libraries, it is difficult to compare them on similar grounds.

7.2.5 Gaps between Customer Perceptions and Expectations (P-E) / Perceptions of Service Quality.

There exists a gap between customer expectations and perceptions. The –ve values indicate magnitude of gap in customers' assessments. Though all the features experienced considerable gaps, noticeable gaps are observed in half of the key features on service quality inviting more attention from service providers.

The respondents experience significant gap against their expectations of library resources and services. The overall gap score of -1.17 on five point scale signifies the gap. Though all the features experienced noticeable gaps against customer expectations, about half of the features experienced significant gaps in customers' perceptions inviting attention from service providers.

Features with high gaps (>-1.00):

- *Access related issues:* Online reservation/renewals; web access, response speed on network; remote/campus-wide access; networking, and OPAC.

- *IT equipment/facility:* Electronic burglar alarm, Internet, Scanners, Laser printers, connection, modern computers, their Well maintenance, and Library automation.
- *Electronic resources* like CDs/DVDs,
- Provision of *right documents* the first time, and error free records.

Features with moderate gaps (<-1.0>-0.6):

- *Reliability and Assurance:* Getting right document first time, Ability to promise and provide promised service on time, knowledge and competence to attend user queries, sincere interest to help and ability to understand specific needs of users.
- *Print and E-resources/databases:* Subscription to full-text and statistical databases, comprehensive collection of books and periodicals and their proper arrangement.

Features with Least Gaps (>-0.6):

- *Physical Building:* Modern looking building and easy physical access.
- Staff who *instil trust and confidence* in users

The factor Analysis generated five factors namely i) Access to electronic resources ii) Library resources and arrangements; iii)Assurance; iv) Computer and other equipment; and v) Reliability.

Access to electronic resources is the primary factor that explains the maximum discrepancy in the customer perceived gaps. The individual features experienced significant gaps against customer expectations. The non-availability of the features also plays a dominant role.

Library resources, arrangement and working hours have emerged as second important factor in service quality gaps. Comprehensive print resources, easy physical access, convenient working hours, proper arrangement of documents, subscriptions to e-journals/full-text databases received relatively lesser gaps giving scope for further enhancement.

Staff's Assurance related features such as staff understanding of specific needs of users, staff's knowledge/competence to answer user queries, staff who instil trust/confidence in users, getting right document the first time, staff's sincere interest/willingness to help users perceived better by customers. This also indicates the users' acknowledgement of staff help and attitude during library transactions.

The IT Equipment such as laser printers, scanners, electronic security, and state-of-art computers experienced high gaps by customers. The –ve scores could be due to nonavailability also.

Reliability of the service is the fifth important factor in service quality gaps explaining least variance (7.7%) in customer assessments. The features like ability to deliver promised services on time, ability to promise services to users by a certain time and error-free records in the library have received relatively lesser gaps leaving scope for improvement.

Comparison of Gap scores across User Groups: Postgraduates experienced maximum gaps against their expectations as compared to faculty members. The differences are

significant in factors 2, 3 and 4 (library resources, staff assurance and IT related equipment) as the factor indices are sensitive to customer category. However, faculty members also experienced significant gaps against their expectations. The gaps are mainly in IT equipment and electronic resources and access to them. Access and reliability (factor 1 & 5) experienced –ve values by faculty members as compared to students indicate faculty members' urgency of information for teaching and other academic assignments.

Comparison of Gaps in Perceptions of service quality with IIT/IIM library Users: on similar lines with perception ratings, the factor analysis for gap scores for IIT/IIM responses exhibited difference between the results obtained for responses from Karnataka. The 'factor analysis' generates seven factors for responses from IIT/IIM as against five factors generated for responses from Karnataka.

The factors, which explain maximum variations for library users in Karnataka, explain minimum variations for IIT/IIM library users and vice versa. The seven factors emerged for users of IIT/IIM libraries are 1) Assurance and reliability; 2) IT equipment (printers, scanner, security); 3) IT support services (network, computers and their maintenance); 4) Access to e-resources; 5) Library building and its physical access; 6) Electronic databases; 7) Print resources & working hours.

The *Assurance and reliability*, which explain maximum variances in IIT/IIM user assessments, explain least variations for respondents' assessments in Karnataka.

The "IT equipment" and IT support services are the second and third important factors in customer's assessments of library quality.

The *Access to electronic resources*, which explain least variations for users of national libraries, explains maximum variation for their counterparts in Karnataka libraries.

Factors 5 to 7 (building, physical access, print and electronic resources and library timing) explain the least variance for national libraries. All IIT/IIM libraries have spacious independent library building, comprehensive print collection, consortium subscription to large number of electronic databases and longer library timings make users more comfortable as compare to users of Karnataka libraries.

Further, the inter group comparison of gap scores and indices of factors across users of national libraries reveal some variations in quality assessments. Though there appear some difference in perceptions of service quality among users of IIT/IIM libraries, the difference is not very significant. However, the difference exists in some individual factors. The –ve indices values of factors 4, 5 and 6(IT resources and facilities) for faculty indicate the difference with the +ve values for students. The –ve indices Factor 2 and 7 (IT equipment and print resources) and +ve values for faculty members do indicate the difference.

The Overall gap score for users of Karnataka libraries is higher compared to the users of national libraries. Though the perception rating by faculty members of national libraries is high, their expectation is also high as compared to their counterparts in state libraries. The gap is more visible in the student community. The students of state libraries perceived more gaps as compared to their counterparts in national libraries. As the factors that affect

perceptions are different in these two sets of libraries, it is difficult to compare them on similar grounds. In-depth analysis within and between the groups for national libraries is beyond the scope of this study.

Factors that Influence Customers' Perception of Service Quality: The factors that might influence the customers' perception of service quality are given below.

a. The **six factors** explained earlier directly influence customers' perceptions.
b. The customers' perceptions of quality are positively related to their **overall satisfaction level** implying satisfactory perceptions with library transaction could enhance customer perception of quality.
c. The customers' **subject background** does have impact on their perceptions.
d. As perception of quality is dependent on customers' experience of service deliveries against their expectations, it is individual/personal and **designation/status** might not have any influence on them.
e. Customers' **demographic features** such as sex, marital status and geographical background do not have any influence on customer perception also.
f. Customers' **longer experience**s might influence their overall perceptions.
g. Perception of **adequacy of print and electronic resources** also might have +ve impact on customer perceptions of quality
h. The **word of mouth** recommendations/appreciations do have direct bearing on perceptions of quality. The satisfied user will be more willing to talk about good words about their library among friends/relatives.

7.2.6 Overall Assessments by Customers

Overall Satisfaction and Assessment of Service Quality: The overall assessment of service quality and customer satisfaction is moderate indicating wide scope for improvement. The overall P-E gap score also indicates the existence of gap between their expectation and perceptions.

Comparatively, postgraduates are less satisfied than faculty and researchers. The picture is same with user's judgement of over all quality of services in libraries.

Overall Adequacy of Print and Electronic Resources: The overall scores for print and electronic resources indicate the moderate level of satisfaction towards the same. The percentage of dissatifiers is more for electronic resources inviting the attention of library authorities to improve the same.

Word of Mouth Recommendations/Appreciations (WOM): Interestingly, despite moderate ratings for quality of resources and services, the users feel good about their library and do speak well about their library. The better ratings indicate users understanding of issues beyond the control of library but they would like to bring it to the notice of concerned authorities as the shortcomings are mainly in technology related issues. The postgraduates appear to have more uncertainties as compared to faculty members for WOM. Their voice needs to be heard by the library authorities.

Relationship between Overall ratings and Perceived Service Quality: The results of correlations between customers' perceptions of service quality (PSQ) computed as P-E and other overall ratings reveal that:

- Customers' Psq $\propto$ Osatis and Psq $\propto$ Oqual i.e. "As customer's PSQ increases, their satisfaction level and judgement of overall quality of resources and services also increases." In other words, as the gap between customers' expectations(E) and perceptions(P) decreases, the satisfaction level and better quality assessments increases(Psq $\propto$ 1/P-E). In service quality literature, customer satisfaction is viewed as function of service quality.
- Psq $\propto$ Oadqr i.e. "As the customers' impression of adequacy of print and electronic resources increases, their perceptions of quality also increases;"
- Psq $\propto$ Wom i.e. "As customer's PSQ increases, their willingness for word of mouth appreciation also increases."
- The overall ratings of key features (F01 to F06) are positively correlated to each other.

7.2.7 Impact of Technology as Perceived by Librarians and Users

The advancements in technology particularly ICT have changed the academic world drastically, they are changing constantly and will continue to change in future too. It is a challenge and opportunity for all library professionals to keep adapting to the new technologies. The impact of technology is clearly visible in all functions of library. The technology intervention is clearly visible through Library automation, digitisation, storage media and the mode of providing access to resources in digital media. The most common functions/areas that effected by ICT are automated library transactions, creation of digital library, transformation from physical access to online/remote access, revolution in storage devices, diminishing geographical barriers and time zones, enhanced professional capabilities, changing formats of information resources, changing needs of customers and great pressure on financial allocations.

As described in previous chapters, the response from library professionals reveals that their experiences/perceptions of impact of technology on libraries focus on production/operations side of ICT. On the other hand customers' perspectives on impact of technology focus on access related issues of ICT. In other words, while librarians' perceptions of impact of technology concentrate on technology and its operations/services (information gathering), customers' perceptions of the same focus on access related issues (information delivery– the resultant of technology).

St. Clair (1997) in his book Total Quality Management in Information services also highlights this aspect. He argues that technology becomes the prime factor for service providers at Information gathering and making information/services accessible by customers. On the other hand, access to information or information delivery is very important for customers. In other words, the LIS Professionals-service providers need to exploit the technology for information gathering and make it accessible to customers at all times independent of their geographical locations. St. Clair's (1997, p15) model is graphically represented in Fig.7.1.

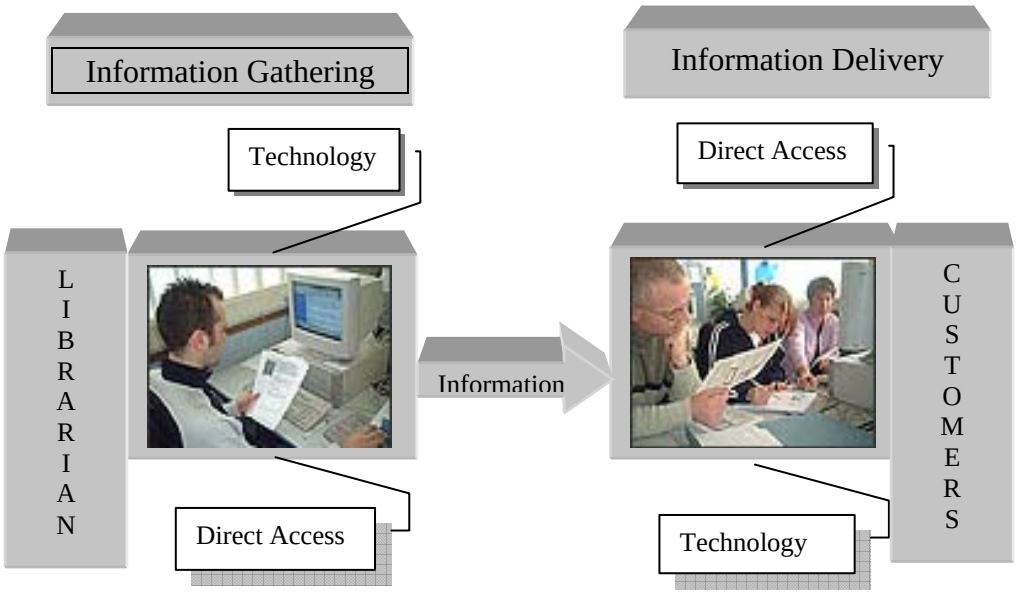

Fig. 7.1: St. Clair's Model of Information Gathering and Information Delivery
Note: the original model by Clair is text based. Only graphics are incorporated to the model without any change in the text. However, the book may be referred for the original model.

To sum up, this chapter explains in detail customer expectations, perceptions and perceived gaps in service quality. It also examines the factors that influence them. Further, it verifies the existence of any difference between user categories.

The summary of findings along with specific recommendations is presented in the next chapter.

Chapter 8
CONCLUSIONS AND RECOMMEDATIONS

The earlier chapters of this report discuss in detail the objectives the study, review of past researches, research methodology, data analysis and major findings of current research. This chapter presents summary of the research findings followed by specific recommendations for devising appropriate action plans.

8.1 CONCLUSIONS

The current study investigates the status of technology in Technical and Management libraries in Karnataka and customers' perceptions of service quality in select libraries. It received 116 responses from respondent libraries in Karnataka. It also obtained library data from IIT/IIM websites for the purpose of benchmarking. It received 1697 responses from cross section of library users (faculty, research scholars and postgraduates) in select Technical and Management libraries to elicit their expectation and perception of service quality in libraries. The print and web-based questionnaires have been used to collect responses from respondent libraries in Karnataka. Besides, the study also obtained 703 responses from users of IIT/IIM libraries through web-based survey for the purpose of comparison.

8.1.1 STATUS OF TECHNOLOGY IN TECHNICAL AND MANAGEMENT LIBRARIES IN KARNATAKA.

In chapter 5, the print and electronic resources, IT supported facilities and services, manpower in libraries in Karnataka are discussed in detail. They are summarised below.

Print resources the book collection in 60% of the Technical and Management libraries in Karnataka is less than 15,000 books. About 58% of them have government funded Book Bank collection. The subscription to periodicals in 82% of respondent libraries is less than 100 periodicals and 70% of the same are subscribing less than 50 international journals. The technical/Project report collection is found in 72% of libraries and it varies from 500 to 5400 reports. A small number of Technical libraries have Indian standards and 60% of management libraries have company annual reports.

All these collections are not comparable with the comprehensive collection of books, periodicals (Indian and International), reports and standards available in IIT/IIM libraries. Comparing self-financing state libraries with government funded national libraries is like comparing "Apples with Oranges." Though it is not appropriate to compare these two sets of libraries, the resources and facilities of national libraries provided in this report may serve as guidelines for augmenting resources in respondent libraries in Karnataka.

Digital resources and access to those resources: Very few libraries in Karnataka are in the process of *digitising* their internal reports. A few of them have converted the videocassettes into CDs. The *online and offline electronic databases* like DELNET, IEEE, IEE, IEL and ACM are subscribed by a few Technical libraries. Similarly, a few Management libraries in the state subscribe EBSCO, CMIE, Capitalline, IBID, Indiastat.com, Indlaw.com, capitalline, ISI Emerging markets and CRIS-INFAC databases. The number of databases varies from one to ten. On the other hand, IIT/IIM

libraries subscribe large number of databases and back-files of individual e-journals through INDEST and IIM consortia. The digital resources subscribed by national libraries are not comparable to the same by libraries in Karnataka.

About ¼ of the respondent libraries in Karnataka provide *access to databases* through LAN and campus-wide networks and none of them provide web-based access to their resources. On the other hand, IIT/IIM libraries provide access through campus-wide network and websites.

The *Open Source Digital library Softwares like* GSDL and dSpace are currently used by some libraries (9%), but it is encouraging to note that 38% of respondent librarians are enthusiastic to implement GSDL/dSpace in their library. Interestingly, the demand for DELNET and INDEST membership is increasing in Karnataka and there is wide scope for establishing consortium for effective resource sharing.

Technology supported facilities & services in libraries: A majority of respondent libraries have *photocopying* facility at their premises. *Bar-code and Document scanners* are available in 59% and 35% of the libraries respectively. A majority of them don't have *digital camera or any electronic* security device and none of them have implemented *RFID* in their premises.

It is satisfying to note that, almost all libraries have *computers and printers.* Though the specific number of computers available for staff and users is not specified, the situation may be improved as laptops are available at lesser cost and are becoming mandatory for the student community. The printers include Dot Matrix, inkjet and laser printers working in standalone or network environments. About ⅔ of libraries work in *LAN* environment including ¼ work on *campus-wide* networks. It is good to note that a majority of libraries have Internet facility and the number of computer with internet connectivity range from 1 to 400 terminals with bandwidth range from 256 kbps to 3mbps. Interestingly, about 13% of libraries have already installed *CD server* for accessing virtual CDs on network and many others are showing interest to adapt wi-fi technology in their campus.

It is encouraging to note that majority of libraries have *automated* their operation partially or completely with commercial or in-house software. However, the library automation software installations are noticeable in significant numbers since 2004 (47 installations). Library Softwares such as Lib-Soft and Easylib are leading in Karnataka followed other softwares like Libsys, Environ, and Netlib. The popular automated functions are bar-coded circulation, OPAC, acquisition and classification. The less used automated functions are Serials control, Reminders and Bills payment.

All these technology supported facilities are available in IITs/IIMs most probably with latest technology. They have campus-wide network and web access. Libsys is the popular s/w in IITs/IIMs but IITM, IITB, IITK have developed in-house software.

Library budget, staff, communication and building: There is large discrepancy in *annual library budget* as it varies from Rs.0.5 lakh to Rs. 92.0 lakhs. It is less than Rs. 5.0 lakhs in 31% of respondent libraries and it varies from Rs.6.0 to 10.0 lakhs in another 31% of libraries. On the other hand, IIT/IIM libraries have budget in crores (exact figure is not available on website).

The *staff strength* in respondent libraries ranges from 2 to 35. It is less than five members in 40% of libraries and it varies from 6 to 10 members in another 40% of libraries. The strength of technical/professional staff in these libraries is very less. The IIT/IIM libraries have more qualified staff as compared to state libraries.

Besides notice board, email is emerging as powerful medium for communication. However, a majority of libraries are yet to adopt email as main medium of communication perhaps due to lack of required infrastructure in their institute. The email is the main medium of communication in national libraries as they are well equipped

While only 29% of the respondent libraries (all Technical libraries) in Karnataka are housed in separate building, all IIT/IIM libraries have independent building. The normal working hours 8-9 hours is found in 42% of respondent libraries in Karnataka and another 36% keep open for 11 - 12 hours a day. Very few libraries work beyond 15 hours per day. About 42.2% of them open on Sundays/ holidays too. On the other hand, IIT/IIM libraries open beyond 15 hours daily including Sundays.

Problems experienced by librarians during technology adoption and their future plans: The problems experienced by librarians are budget restrictions, customisation of software, lack of training/skilled staff, hardware breakdowns, trouble (h/w & s/w) during transactions and while generating reports, Internet speed, virus attack, and e-book reading.

The future plans or desires expressed by respondent librarians are very much encouraging towards implementation of IT supported resources and services. The desires/plans expressed by respondents relate to developing digital library, using open sources, complete automation, web designing and installation of RFID. However, the realisation of the same is subjected to the financial and other support from the parent organisation.

8.1.2 CUSTOMER EXPECTATIONS AND PERCEPTIONS OF SERVICE QUALITY

Customers' preferred sources of information: In an academic environment, institute library is the most preferred source of information by customers. The other sources are self-purchase, Internet, borrowing from friends/colleagues and visiting other libraries in that order of preference. The ranking pattern remains consistent across faculty members, researchers and postgraduates. In view of better infrastructure available for IIT/IIM libraries users, the Internet has become second important source followed by self purchase.

Customers' Visiting Pattern to the Library: About 42% of the customers visit their library daily. Presently, use of library resources on network may not insist customers' physical visit to the library. While the preferences attached to *institute library* has +ve impact, the preference attached to *self-purchase and Internet* have –ve impact on library visits. Customers' age, past experience, time spent in library, and word of mouth does influence their visit to the library. Currently, the –ve impact of Internet on library usage is not significant, but the threat may be significant as the in infrastructure situation improves in Karnataka.

Customers' Expectations (E): The expectations of customers of Technical and Management libraries in Karnataka are high towards resources and services. The key

factors in customer expectations are Reliability and Assurance of library service followed by Access to electronic resources, Library resources (print and electronic), IT supported equipment and Library building and its physical access in that order of priority. Comparatively, students' expectations are less than faculty members and researchers. In addition to the above factors, customers past experience, satisfaction level, preference attached to institute library and word of mouth influence customer expectations.

Customers' Perceptions (P): Customer's perceptions of existing library resources and services in their institutes are consistently below their expectations. Comparatively, the perception level of faculty members is slightly high than students.

Gap between Perceptions and Expectations (P-E): A significant gap is observed between customer perceptions and expectations. The gaps are significant in access to resources and IT support equipment/facilities. The postgraduates experience more gaps as compared to faculty members. Faculty members also experience shortfalls in their expectations. The key factors that impact customer assessment of service quality in libraries are i) Access to electronic resources ii) Library resources and arrangements; iii)Assurance; iv) Computer and other equipment; and v) Reliability.

Comparatively, the expectation levels of users of IIT/IIM libraries are higher than their counterparts in select libraries in Karnataka. As they enjoy better resources and services, their perception level also is higher than their counterparts. Still, they too experience gaps in their expectations. Unlike results from Karnataka, the gaps are more in reliability, assurance and resources. However, the gaps experienced them are fewer and compared to their counterparts in Karnataka. Postgraduates of technical institutes in Karnataka experience maximum gaps as compared to other users.

Overall: The overall satisfaction, judgement on quality, adequacy of print and electronic resources and IT facilities received moderate ratings from users indicating that the library needs to consider them seriously. The overall customer perceptions of service quality computed as P-E also supports the overall ratings. Interestingly, the high ratings for word of mouth clearly indicate the customers' understanding of technological and other issues beyond the control of library professionals.

The customers' perception of service quality measured as P-E has positive relationship with customers' overall satisfaction level and word of mouth. In other words, "As customers' perceptions of service quality increases, their satisfaction level and willingness to spread word of mouth also increases." The sense of adequacy of resources (print and electronic) and IT facilities also has direct impact on customer satisfaction and perception of quality.

The impact of technology on library functions as perceived by customers are related access to electronic resources, technology supported facilities and services and library automation. While the impact of technology on libraries as perceived by library professionals' focus on technology related issues, the customers view perceptions focus on access related issues.

8.2 RECOMMENDATIONS

The results of this study indicate the customer priorities and the areas for improvement. Improving performance requires paying attentions to the key features by which customers assess the service quality and it involves commitment from management and library staff. Based on findings, this study recommends a few measures to improve the service efficiency of libraries in Karnataka. However, the recommendations are subject to the scope and limitations of the study as explained in chapter 4.

8.2.1 Managing Customer Expectations

The results of the current study show a mismatch between the customers' expectations and perceptions of library resources and services. Customers' perceptions get affected if there is a mismatch between what is communicated to them and practiced. This study recommends that:

- The libraries should not raise the customer-expectation levels with high promises that cannot be achieved. The new customers should be properly educated for clear understanding of library resources/services.
- AICTE and VTU should include library orientation/training/book review sessions as compulsory courses in engineering and management education curriculum so that the students are educated systematically for optimal utilization of library resources.

8.2.2 Improving Performance

Enhancing performance requires paying attention to the dimensions or key factors by which, customers measure service quality. Based on results, a **Perception/Expectation Matrix (P/E)** has been prepared and the same is shown in Table 8.1.

The features presented in each quadrant are self explanatory and addressing those issues would yield better results. Though it is possible to suggest corrective measures by quadrant analysis, the study suggests specific measures keeping in mind the objectives of the study and internal relationship among various features. The recommendations are proposed under broad areas namely *managing technology* (access, Internet, equipment, e-resources and networking), *managing reliability/responsiveness* and *managing resources (*Document, Human and Finance).

Table 8.1: Perceptions - Expectations Matrix

EXPECTATIONS	PERCEPTIONS: Low		PERCEPTIONS: High	
High	Remote/campus-wide access to resources	(-1.78)	getting "Right Document the Very First Time"	(-0.96)
	Access to lib. resources through Website	(-1.99)	Subscriptions to e-journals/full-text DBs.	(-0.95)
	Internet connection in the library	(-1.53)	Error-free records in the library	(-0.90)
	on-line library catalogue (OPAC)	(-1.48)	Staff's knowledge to answer user queries	(-0.86)
	Well maintained IT equipment	(-1.27)	proper arrangement of print documents	(-0.83)
	Automated library operations and services	(-1.26)	Staff understanding of specific needs of users	(-0.83)
	Good Collection of CDs/VCs	(-1.23)	Ability to deliver promised services on time	(-0.79)
			Comprehensive Print Resources.	(-0.78)
			Convenient library working hours	(-0.77)
			Staff's sincere interest/willingness to help users	(-0.72)
			Ability to promise services to users by certain time	(-0.70)
			Staff who instils trust/confidence in users	(-0.58)
			Easy physical access to library	(-0.51)
			Spacious and modern looking building library	(-0.50)
	QUADRANT - 2 (*High-Expected But low-Perceived*)		**QUADRANT - 1 (*High-Expected and High-Perceived*)**	
Low	Online Reservations/ Renewals	(-2.03)		
	Speed of Response time on network	(-1.95)		
	Networking with other libraries	(-1.71)		
	Electronic security/burglar systems	(-1.67)		
	Scanners are available in the library	(-1.51)		
	Laser Printers are available in the library	(-1.37)		
	Modern computers in the library	(-1.17)		
	Subscriptions to statistical/bibliog. DBs	(-0.88)		
	QUADRANT - 3 (Low-*Expected Also Low-Perceived*)		**QUADRANT - 4 (Low-*Expected but High-Perceived*)**	

Note: 1. Expectation Median: 4.00; Perception Median: 3.00 2. The matrix is based on BCG's Growth-Share Matrix.
3. Figures in parenthesis represent "P-E"/gap scores. The statements are arranged in descending order of magnitude of gap.

8.2.2.1 Managing Technology

Access: The features in second quadrant (Table 8.1) such as OPAC, remote/campus-wide access, access through website experienced significant gaps. The study recommends that:

- AICTE has already issued directives for mandatory disclosures. It is desirable that AICTE's directives should include providing access to library resources (OPAC, journals, reports) through LAN, campus-wide and Institute's website.

Though AICTE norms insist publishing mandatory disclosures on institute's website, it is not updated regularly for example; the email-ids of majority of faculty members are inactive. Thus, this study recommends that:

- AICTE should insist all member institutes to update their websites regularly and device a mechanism to monitor them closely. Further, like IITs, it is desirable to display email-ids of postgraduates and research scholars on Institute's website.

Internet connectivity: The Internet connection is available in majority of the respondent libraries and customers do acknowledge the same. But at the same time they are unhappy about the nature of bandwidth and number of computers having Internet connection. Thus this study recommends that:

- AICTE should prescribe standards for bandwidth requirements and number of computers with Internet connection for member institutions. It can also consider providing Internet connection at subsidised rates for the benefit of academic community.

- As users expect all time campus-wide Internet access, the institutes can think of installing Wi-Fi technology, which might address these issues bothering users particularly students who are using laptops increasingly.

Equipment: The IT equipment like modern computers, electronic security/burglar systems, laser printers, Scanners, and their proper maintenance have low expectations but rated poor indicating non availability too. The low expectation gives a clue that such facilities are taken for granted by users. Hence it is suggested that:

- The library authority should attempt to provide the above mentioned facilities for users. RFID is the current technology for security and libraries can think of implementing the same as it controls unauthorised book movements in the library.

- Of late, business process outsourcing is gaining importance in business circles and it could be the solution for proper maintenance and efficient operations of IT equipment.

- Library Automation is high expected but poorly rated feature in respondent libraries in Karnataka. Librarians have experienced problems in customization, report generation and serials control activities in commercial packages installed in their libraries. A regular user-vendor meet could solve such problems.

E-Resources: Full-text databases are highly expected but poorly rated by users. AICTE has taken initiatives to subscribe IEL online database and directing member institutions to subscribe it through INDEST at discounted price. In order to enhance the access to online full-text databases it is suggested that:

- AICTE should subscribe more databases centrally for Technical and Management field and facilitate member institutions at discounted rate.
- AICTE could encourage teachers in premier institutes to develop computer-based training materials (CBTs) and provide them to the faculty members in member institutes for effective teaching and library could be repository of such CDs. Besides, libraries need to acquire CBTs developed by other professional bodies too.
- CD server is the latest technology to access virtual/Mirror CDs on network. Libraries can think of installing CD server to save the original CDs from damage.

Networking/Consortia: Networking is essential for effective resource sharing among the libraries. The study recommends that:

- A consortium of Technical and Management libraries in Karnataka which could lead to:
  a. development of Union catalogue of books and periodicals;
  b. development of institutional repository including library resources, faculty publications, working papers and other valuable institute resources; and
  c. Inter library lending/exchange.
  d. Organise user-vendor meets regularly
- The consortium would definitely empower self-financing private institutes for collective bargaining with Database and vendors and book suppliers.
- AICTE should establish a nodal centre at VTU or other organisation in Karnataka for effective resource sharing.

Technology Facilitation cell: Significant number of librarians indicated their desire to create digital library using open source sofwares. But they lack training and technical skills for the same. The Study recommends that:

- AICTE should setup technology facilitation cell at VTU/nodal centre to:
  - Conduct regular workshops to train librarians on using open sources like GSDL and dSpace;
  - Act as advisory body for librarians in the process of selection and installation of automation software and other technologies in libraries
  - To act as repository of demo packages of all leading library automation packages.
  - To act as catalyst between librarians and software vendors.
  - To facilitate institutional repositories.

8.2.2.2 Managing Reliability/Responsiveness

The 'Reliability' factor experienced significant gap in customer expectations. The study recommends that:

- The library should go for complete automation to provide online reservation, timely information and maintaining error-free records.

8.2.2.3 Managing Resources

Print Resources: It is observed that the AICTE standards (http://www.aicte.ernet.in) for print resources are not strictly followed in member institutes in Karnataka. Thus it is recommended that:

- AICTE also should amend its existing standards to include norms for new editions, book replacements and reference books and strict vigilance on adherence of its norms by member institutes. Besides, the libraries also should augment their collection with latest edition books, more international journals and reference books on top priority.

- The libraries could think of adding classic fictions as it is expected by customers for light reading.

Government is already providing grant for book bank collection to help SC/ST students. It will beneficial if the facility extended to the students in other weaker sections too. This study suggests that:

- AICTE could enhance its grant to extend the book bank facility to other weaker sections also. As this facility is reported only by Technical libraries, the grant should be extended to Management libraries too. The grant could cover PG courses too.

- The institutes could encourage the students to buy the textbooks. Alternatively they can distribute textbooks to students as course materials.

Proper arrangement of documents is another important issue raised by customers. It is suggested that:

- The library should consider shelving as an important activity. The returned books should go back to respective shelves quickly and regular shelf-reading is necessary to arrange the misplaced books in their original location.

Human Resources: Based on the results of this study and the experience gained while interviewing a cross section of library customers, it is recommended that:

- The management should motivate the library staff to improve their education level to become competent enough to respond to user-queries. It should provide opportunities for job-rotations, on-the-job training, and deputation to workshops/training courses. It should also devise a system for reward and

recognition. AICTE could oversee the salary and other benefits given to library staff in technical/management institutes.

- The front-line personnel provide valuable information about the users' requirements. Hence, the library management should listen to their views and create an impression among the employees that their suggestions are also valuable for decision-making process.

Financial Resources: The annual library budget varies from Rs.0.5 lakhs to Rs. 92.0 lakhs. Though AICTE has laid norms for library budget, it appears that the standards are not complied by many member institutes in Karnataka. It is recommended that:

- AICTE should appoint a watchdog committee to oversee the financial allocations and expenditures in libraries and insist for separate budget for e-resources/databases. A consortium could play a vital role in enhancing the resources with the limited budget.

8.2.2.4 Managing Environment

Though there was no attempt to obtain data on physical environment of the library, the customers' suggestions/expectations focus on ambience too. It is noticeable especially when user/staff spends considerable in library. Though it is beyond the scope of this study, it is suggested that:

- Library management should make arrangements to maintain clean toilets, dust free book shelves, brighter stack area and well ventilated reading halls. Many respondents suggested library air-conditioning too.

- The noise by loud talking, dragging furniture, electrical fixtures and during reshelving in the library should be reduced as it disturbs customers.

- Group discussion is an emerging trend among student community. The library management can think of providing a separate place for group discussion.

- Customers suggest keeping library open for 24 hours. Libraries can consider the extension of their library working hours beyond the current timings including Sundays/holidays.

To summarize, the technology particularly information technology is affecting and transforming all key functions of libraries. The tools and techniques of information collection and retrieval are undergoing sea change. The need of hour is to enhance the quality of library services by incorporating IT-based resources and services for customer service. The journey to quality starts with quality product, service oriented personnel, excellent services, and equally interested customers to receive them.

Quality product: The libraries should enrich their print and electronic resources as desired by their users. As recommended in the report, the AICTE and other Government authorities should closely monitor the developments and provide financial support for

enriching the collection. Formation of consortium/technology cell at nodal centre in Karnataka could help the libraries for resource sharing and effective bargaining.

Quality personnel: The library professionals in Karnataka are enthusiastic to implement digital library using open sources such as GSDL and dSpace. A Technology facilitation cell at nodal centre is desirable for providing regular training and to offer advisory services for libraries.

Quality Services: Business outsourcing, library automation and Wi-Fi would definitely help library authorities for proper maintenance of IT equipment, improved efficiency and campus-wide wireless Internet access to user community.

Quality customers/users: Customers attach primary importance to their institute library and their preferences are also moving towards electronic resources. Looking through the customer eyes, the significant gaps exist in the technology supported resources, facilities and services provided in Technical and Management institutes in Karnataka. The concerned authorities need to address these issues (as discussed earlier) and provide remedies for the same.

Finally, technology is only a facilitating tool and it is the people that make or mar the system. The staff needs to be self-motivated, service minded and caring towards users. Their satisfactions, rewards and comforts need to be addressed by the parent organisation. The recommendations proposed in this report are application-oriented and this project will find its success and fruitfulness if the recommendations are considered seriously and put into action by the concerned authorities.

****

REFERENCES

Adeyoyin , Samuel Olu (2005): Strategic Planning of Marketing Library Services. *Library Management*, 26(8/9): 494-507.

Alavi, Maryam and Gallupe, Brent (2003): Using Information Technology in Learning: Case Studies in Business and Management Education Programs *Academy of Management Learning and Education*, 2(2): 139-153.

Altman, Ellen and Peter Hernon (1998): Service Quality and Customer Satisfaction Do Matter. *American Libraries.* 29(4), August : 53-54.

Aman, Mohammed M (2004): recent Developments in IT and Library Systems in the Arab world. Presented at Program on Impact of Technology on Asian, African, and Middle Eastern Libraries organised by ALA-ACRL (Association of College and Research Libraries) on June 24, 2004 at Orland, Florida, 12 pages. Article was sent by the author on request. aman@sois.uwm.edu

American Library Association (2006): Vote in the 2006 ALA election- An interview with presidential candidates. Downloaded from ALA Website: http://www5.OCLC.org/downloads/design/abstracts/04102006/alaelection.htm

Andaleeb, S and Simmonds, P (1998): Explaining User satisfaction with Academic libraries: Strategic Implications. *College and Research Libraries.* 59(2), March: 156-167.

Association of Research Libraries (1997): In Search of new Measures. *ARL Newsletter.* 197, February : 2.

Ball, David (2004): What's the "Big Deal", and why is it a bad deal for Universities? *Intending and Document Supply*. 32(2): 117-125.

Bitner, Mary Jo (1991): The evolution of services marketing Mix and its relationship with service Quality. In Service Quality: Multidisciplinary and multinational perspectives. Edited by Brown et al. New York: Lexington Books: 23-37.

Blixrud, Julia C (1998): Issues in Research Library Measurement. *ARL Newsletter.* No. 197, April: 1-2.

Bolton, Ruth N (1998): A Dynamic model of the Duration of the Customer Relationship with a continuous service provider: The Role of Satisfaction. *Marketing Science.* 17(1), January: 45-65.

Bolton, Ruth N and Drew, James H (1991): A longitudinal Analysis of the impact of Service changes on customer attitudes. *Journal of Marketing.*55(1),January:1-9.

Boulding, William et al (1993): A dynamic Process model of Service Quality: From Expectations to Behavioural intentions. *Journal of Marketing Research* 30(1), February: 7-27.

Breeding, Marshal (2005): Looking towards the Future of Library Technology. *Computers in Libraries: Library Technology Guides*, 25(25), May, p1-5. Download from http://www.librarytechnology.org/ltg-displaytext.pl?RC-11414

Brown, Stephen w and Swartz, Teresa AA (1989): Gap Analysis of Professional Service Quality. *Journal of Marketing.* 53(2), April :.92-98.

Brown, Stephen W et al(Eds) (1991): Service Quality: Multidisciplinary and Multinational Perspectives. New York: Lexington Books: Viii.

Bryant, Carol et al (1998): Increasing Consumer satisfaction. *Marketing Health Services.* 18(4), Winter: 5-14.

Bryson, Jo (1997): Managing Information services. Hampshire: Gower Publishing Ltd.: 410-423.

Cadotte, Ernest R, Woodruff, Robert B and Jenkins, Roger L (1987): Expectations and norms in models of customer satisfaction. *Journal of Marketing Research.* 24(3), August: 305-314.

Cairncross, Frances (1997): The Death of the Distance. Boston: Harvard Business School.

Calvert, P J and Hernon, Peter (1997): Surveying Service Quality within University Libraries in New Zealand. *Journal of Aca. Librarianship.* 23 (5), Sept. 408-15.

Cardiff University Libraries (1996): Report of Service Quality Survey at Cardiff University Libraries. Report downloaded from Internet.

Catterall, Susan (2003): Using Technology to Enhance Library Services. *ALERT*, 32(1), January: 1, 3-7.

Clair, St. Guy (1997): Total Quality Management in Information Services. London: Bowker-Saur Ltd : 49, 127-135

Coleman, Vicki et al (1997): Towards TQM Paradigm: SERVQUAL to Measure Library Service Quality.(Report of library survey carried out at Sterling Evans libraries during 1994). *College and Research Libraries.* 58(3), May : 237-251.

Coleman, Vicki, Cook, Colleen and Heath, Fred panel (1999): SERVQUAL: A Client-Based Approach to Developing performance indicators. In Third Northumbria International Conference in performance Measurement in Libraries held on August 26-31 at Northumbria.

Coogan, Elizabeth et al (1998): Service to Users Task Force Report submitted to Brown University Library in October: 1-30.

Cook, Colleen and Heath, Fred M (2000): User perceptions of Service Quality: A LIBQUAL+ Qualitative study. ARL Measuring Service Quality Symposium held on Oct 20-21 at Washington : 2.

Cook, Colleen and Heath, Fred M (2000a): The ARL "LibQUAL+" Pilot Project: An Update Use of the SERVQUAL Survey Instrument to Evaluate Research Libraries. *ARL*(211), August: 12-14.

Cook, Colleen and Heath, Fred M (2001c): Users' Perceptions of Library Service Quality: A LibQUAL+ Qualitative Study." *Library Trends* 49(4) (Spring 2001): 548-84.

Cook, Colleen and Heath, Fred M et al (2000b): LibQUAL+: One Instrument in the new Measures Toolbox Adaptation of the SERVQUAL Survey Instrument for Research Libraries. *ARL* (212), October: 4-7.

Cook, Colleen and Heath, Fred M et al (2001a): Users' Hierarchical Perspectives on Library Service Quality: A "LibQUAL+" study. *College & Research Libraries*, 62(2), March: 147-53.

Cook, Colleen and Heath, Fred M et al (2001b): LibQUAL+: Service Quality Assessment in Research Libraries. *IFLA Journal*, 27(4): 264-8.

Crawford, John (2003): The use of Electronic Information Services by students at Glasgow Caledonian University: Background to the project and introductory focus groups. *Library and Information Research*, 27 (86) Sum: 30-36.

Davis, Ian and Stephenson, Elizabeth (2006): Ten Trends to Watch in 2006. McKinsey Quarterly. Web exclusive January :1-5. http://www.mckinseyquarterly.com/article

Davis, Ian and Stephenson, Elizabeth (2006): Ten Trends to Watch in 2006. *McKinsey Quarterly*, January, p1-5. Download from http://search.epnet.com (EBSCO database – BSP)

Dawes, Jillian and Rowley, J (1998): Enhancing the customer experience: Contributions from information technology *Management Decision*. 36 (5): 350–357.

Debrowski, D S (1999): Library Technicians and the Management of Technology Innovation. Projection/reflections: our Heritage and our Future 2000 and beyond. Proceedings of 10th ALIA. National Library Technicians Conference, Perth, Australian Library and Information Association (ALIA).

Doucet, Lorna (2004): Service Provider Hostility and Service Quality. *Academy of Management Journal*, 47(5): 761-771

Edwards, Susan and Mairead Browne (1995): Quality in Information Services: Do Users and Librarians Differ in Their Expectations? *Libraries and Information Science Research.* 17(2) : 163-182

Evans, Peter (2000): e-lending: The Next Wave to hit Libraries? *Biblio Tech Review: information Technology for Libraries Review*. January 28, 2 pages. Download from http://www.biblio-tech.com/BTR900/January_2000/e-lending.html .

Franklin, Brinley and Danuta Nitecki (1999): User satisfaction White Paper.*ARL new Measures.* April 6 : 1-7

Frey, Thomas (2005): The Future of Libraries Beginning the Great Transformation. Colorado: The DaVinci Institute, Inc. Download from http://www.davinciinstitute.com/page.php?ID=120

Gard, Gunvor; Lindstrom ,Kari and Margareta Dallner (2002):Effects of Transition to an Integrated IT Technology in surveying work Behavior. *Information Technology*, 21(4): 281-292.

Goodman, P. S. et al (1995): Customer-Firm Relationships, Involvement, and Customer Satisfaction. *Academy of Management Journal.* 38(5) : 1310-1324.

Haksever, Cenziz et al (2000): Service Management and Operations. 2nd ed. New Jersey: Prentice Hall International Inc.

Harkness, Warren L.; Kettinger ,William J and Sengars , Albert S. (1996): Sustaining Process Improvement and Innovation in the Information Services Function: Lessons Learned at the Bose Corporation. *MIS Quarterly*, September: 349-368.

Hebert, Françoise (1993): Quality of Interlibrary Borrowing Services in Large Urban Public Libraries in Canada. Thesis submitted to University of Toronto, Toronto for the award of Doctoral Degree.

Hebert, Françoise (1994): Service Quality: An Unobtrusive Investigation of Interlibrary Loan in Large Public Libraries in Canada. *Library and Information Science Research. 16(1): 3-21.*

Hernon, Peter and Dugan, Robert E (1999): Public Service Guidelines: A Critique. *Journal of Academic Librarianship.* 25(3), May : 229-31

Hernon, Peter and McCLure, Charles R (1990): Evaluation and Library Decision Making. Norwood, New Jersey. Ablex Publishers : XV.

Hernon, Peter et al (1999): Editorial: Evaluation research. *Journal of Academic Librarianship,* 25(6), November : 429-430.

Hernon, Peter; Nitecki, Danuta and Altman, E (1999): Service Quality and Customer Satisfaction: An assessment and Future directions. *Jl of Academic Librarianship.* 25(2), April : 9-17

Herring, Mark Y. (2001): 10 Reasons Why the Internet is No Substitute for a Library. *American Libraries*, April: 76–78.

Hisle, Lee W (2002): Top Issues facing Academic Libraries: A report of the focus on the Future Task Force. *C&RL News*, 63(10), November, p1-3. Download from http://www.ala.org/ala/acrl/acrlpubs/crlnews/backissues2002/novmonth/topissuesfacing.htm

Horowitz, Lisa et al (1998): Performance Measurement Task Force Recommendations: public Service Redefinition 1998. *ARL Final Report*, 11-5-1998 : 1-5

Hyde, J (1997): How soon is now? Current developments and future possibilities for libraries and librarians: a library technician's view. *The Australian Library journal*, 46(May):181-185.

Kettinger, William J and Lee, Choong C (1997): Pragmatic Perspectives on the Measurement of Information Systems Service Quality. *MIS Quarterly.* 21(2), June: 223-240.

Klein,Leo (2005): Leo Klein's Top Technology Trends. June 23, 5 pages. Download from http://litablog.org/2005/06/23/leo-klein-top-technology-trends.

Kotler, Philip (2000): Marketing Management: Ed.10. New Delhi: P.H.I.: 429.

Kyrllidou, Martha (1999): An Overview of Performance Measures in Higher Education and Libraries. ARL Newsletter, No.197, Oct, 1999: 1-7

LIBRES (1996): The Impact of Technology on Library Space Requirements. *Library and Information Science Research, Electronic Journal*, 6, (1/2), June.

Manjunatha K and Shivalingaiah, D (2000): Customer's Research in Libraries: A Study of Methods and Barriers. *Annals of Library Science and Documentation*, 47(3), September : 101-114

Manjunatha, K (2002): Quality of Library and Information Services: A study of Customer Satisfaction in Academic Libraries. Thesis submitted to Mangalore University, Mangalagangotri, Karnataka for the award of Doctoral Degree.

Manjunatha K (2006): Impact of Technology on Libraries Services: A study from customers' perspectives. The paper was presented during VIII MANLIBNET Convention held at Nirma University, Ahmedabad from Sept 18 to 20, 2006.

Marshall, Joanne Gard (2000): Determining our Worth, Communicating our Values. *Library Journal.* 125(19), November 15 : 28-30

McNicol, Annette (1997): Achieving Quality Through The Collection. Paper Presented at ASEAN-COCI seminar on Quality for all for ASEAN Senior Librarians held on November 19-22 at Singapore : 1-10

Mfrisque (2006): Core competencies in Library technology: what IT is and where IT is going. July 13, 4 pages. http://litablog.org/2006/07/13/core-competencies-in-library-technology-what-it-is-and-where-it-is-going

Millson-Martula, Christoper and Menon, Vanaja (1995): Customer Expectations: Concepts and Reality for Academic Library Services. *College & Research Libraries.* 56(1), January : 33-47.

Morgan, Eric (2006): Eric Lease Morgan's Top Tech Trends for ALA 2006: Some Pontifications. June 18. 5pages. Download from http://litablog.org/2006/06/18/eric-lease-morgans-top-tech-trends-for-ala-2006.

Morrison, James and Peters, Tom (2005): The Future of the Digital Library: An Interview with Tom Peters. This article was originally published in *Innovate* (http://www.innovateonline.info/) as: Morrison, J., and T. Peters. 2005. The future

of the digital library: An interview with Tom Peters. ***Innovate*** 1 (3), http://www.innovateonline.info/index.php?

National Assessment and Accreditation Council (2006): Library and Information Services: Case presentations. Best Practices series-2. Bangalore: NAAC, 80 pages

Nitecki, Danuta A (1995): An Assessment of the Applicability of SERVQUAL Dimensions: A Customer based criteria for evaluating quality of services in Academic Libraries. Thesis submitted to Univ. of Maryland for the award of doctoral degree.

Nitecki, Danuta A (1996): Changing Concept and Measure of Service Quality in Academic Libraries. *Journal of Academic Librarianship.* 22(3), May : 181-190

Nitecki, Danuta A (1997): SERVQUAL: Measuring Service Quality in Academic Libraries. *ARL Newsletter*. 191, May : 1-2

Nitecki, Danuta A and Franklin R (1999): New Measures for Research Libraries. *Journal of Academic Librarianship.* 25(6), November : 1

Nitecki, Danuta A and Hernon, Peter (2000): Measuring Service Quality at Yale University's Libraries. *Journal of Academic Librarianship.* 26(4), July : 259-273 Norwood, NJ: Ablex Pub. Corp., 1996.

Olson, Jerry C and Dover, Phlip (1979): Disconfirmation of consumer expectations through product trail. *Journal of Applied Psychology.* 64(2), April : 179-89

Oreinstein, David (2006): Trends in the Library Profession and the Impact of Technology at the Montgomery College Libraries. Download on 24-6-2006 from http://www.mjfredman.org/oreinstein.pdf

Orenstein, David (2006): Trends in the library Profession and the Impact of Technology at the Montgomery College Libraries. Download from http://www.mjfredman.org/orenstein.pdf . Accessed on June 24, 2006.

Parasuraman, A; Zeithaml, VA and Berry, L L (1994): Reassessment of Expectations as a comparison Standard in Measuring Service Quality: Implications for Future research. *Journal of Marketing.* 58(1), January : 111-124.

Parasuraman, A; Zeithaml, VA and Berry, Leonard L (1985): A Conceptual Model of Service Quality and its Implications on Future Research. *Journal of Marketing.* 48(4), Fall : 41-50.

Parasuraman, A; Zeithaml, VA and Berry, Leonard L (1988): SERVQUAL: A Multiple-item scale for measuring consumer perceptions of Service Quality. *Journal of Retailing.* 64(1), Spring : 12-40.

Parasuraman, A; Zeithaml, VA and Berry, Leonard L (1991): Refinement and Reassessment of SRVQUAL Scale. *Journal of Retailing*. 67(4),Winter : 420-450.

Parthasarathy, Madhavan and Bhattacherjee, Anol (1998):Understanding Post-Adoption Behavior in the Context of Online Services. *Information Systems Research*. 9(4), Dec: 362-379.

Pitt, Leyland F; Watson, R T and Kavan C B (1995): Service Quality: A measure of Information Systems Effectiveness. *MIS Quarterly.* 19(2), June : 173-187.

Pitt, Leyland F; Watson, R T and Kavan, C B (1997): Measuring Information Systems Service Quality: Concerns for a Complete Canvas. *MIS Quarterly.* 21(2), June: 209-221

Pritchard, S. M (1996): Determining quality in Academic Libraries. *Library Trends.* 44(3), Winter : 572-594.

Prosser, David C (2004): Scholarly Communication in the 21st century: the Impact of New Technologies and Models. *Serials: the journal for the serials community* 16(2):pp. 163-167. Full html text downloaded from http://eprints.rclis.org/archive/00001180/ Accessed on Dec 19, 2005.

Ranganathan, S R (1988): Five Laws of Library Science. Bangalore: Sarada Endowment Scheme for Library Science : 287.

Riggs, Donald E and Zhang Li, Sha (1999): The Human Implications of Technology's Impact on Content of Library Science Journals. *Library Trends*, 47(4), Spring: 788-795.

Rust, Ronald T and Oliver, Richard L (1994): Service Quality: New Directions in Theory and Practice. Thousand Oaks: Sage Publications : 72- 94.

Saurine, K. (2000): "Head in the Clouds...feet on the ground." *The Australian Library Journal*, 49(1), February: pp65-71.

Schatz, Bruce and Chen, Hsinchun (1999): Digital Libraries: Technological Advances and Social Impacts. *IEEE Computer*, 32(2), February: 45-50.

Shahid, Syde Md. (2005): Use of RFID Technology in Libraries: a New Anew Approach to Circulation, Tracking, Inventoring, and Security of Library Materials. *Library Philosophy and Practice*, 8(1), Fall, (www.libr.unl.edu:2000/LPP/lppv8nl.htm).

St. Clair, Guy (1997): Total Quality Management in Information Services. London: Bowker-Saur.

Starkweather, W M and Wallin ,Camille C(1999): Faculty Response to Library Technology: Insight on Attitudes. *Library Trends*,47(1), spring: 640 – 668.

Sun Microsystems(2003): Information Technology Advances in Libraries. White Paper. Download http://www.sun.com/edu/whitepapers/pdf/digital_library_trends.pdf

Tan, Pey Lin and Foo, Schbert (1999): Service Quality Assessment: A case study of A Singapore Statutory Board Library. *Singapore Jl. of Library and Information Management.* 28 : 1- 23.

Van Dyke, Thomas P; Kappelman, Leon A and Prybutok, Victor R (1997): Measuring Information Systems service quality: concerns on the use of the SERVQUAL Questionnaire. *MIS Quarterly* 21(2), June : 195-240.

Vergueiro, Waldomiro and Telma de Carvalho (2000): Quality in Brazilian Academic Libraries: Proposal of Indicators from the Customers' Point of View. Proceeding of the 28th Annual Conference Canadian Association for Information Science.

Walker W D (2003). "Designing 21st century research libraries: a view from New York" www.ndl.go.jp/en/publication/ndl_newsletter/130/302text.html#7

Walters, Mitchel et al (1999): Designing a Customer Service Survey Instrument for use in Academic medical libraries. Paper Presented at the 19th Annual Meeting of Medical Library Association held on May 14-20 at Chicago.

Watson, Richard T; Pitt, Leyalnd F, and Kavan, C B (1998): Measuring Information Systems Service Quality: Lessons from two longitudinal case studies. *MIS Quarterly.* 22(1), March : 61-79.

Wei Xia (2003): Digital library services: perceptions and expectations of user communities and librarians in a New Zealand academic library. Download from *Australian Academic & Research Libraries*, 34(1), March, http://alia.org.au/publishing/aarl/34.1/full.text/xia.html

White, Marilyn D; Abels, Eileen G and Nitecki, Danuta A (1994): Measuring Customer Satisfaction and Quality of Service in Special Libraries. Report of the research project submitted to University of Maryland.

White, Marilyn D and Abels, Eileen G (1995): Measuring Service Quality in Special Libraries: Lessons from Service Marketing. *Special Libraries,* 86(1),Win.: 36-45.

White, Marilyn Domas (1997): Measuring Service Quality in Libraries. In. Advances in Library Administration and Organization edited by Edward Garten and Dalmus Williams. Greenwich, CN: Jai Press : 1-37

Whitlatch, Jo Bell (2006): The Future of Reference services Papers. Download from http://www.ala.org/ala/rusa/rusaprotools/futureofref/referencefutures.htm Accessed on Jan1, 06.

Zeithaml, Valarie A; Parasuraman, A and Berry, Leonard L (1990): Delivering quality service: Balancing customers' perceptions and expectations. New York: The Free Press.

Zeithaml, Valarie A; Parasuraman, A and Berry, Leonard L (1993): The Nature and Determinants of Customer Expectations of Service. *Journal of Academy of Marketing Science.* 21(1), Winter : 1-12

APPENDIX - 1

T. A. Pai Management Institute

Manipal –576 104, Udupi Dist., Karnataka
Phone: 0820-2571358, 2573551, http://www.tapmi.org
Email: tapmi@mail.tapmi.org; manjunath@mail.tapmi.org

Impact of Technology on Quality of Services in
Management and Technical Libraries in Karnataka

February 10, 2006

Dear Sir/ madam,

Department of Scientific and Industrial Research, Govt. of India, New Delhi has awarded a research project on "Impact of Technology on Quality of Services in Management and Technical Libraries in Karnataka" to TA Pai Management Institute, Manipal. The main aim of the project is to understand the nature and status of technology supported services provided to by Technical/Management libraries to their users and to examine the quality of those services from Customers'/users' perspectives. We would like to seek your views on i) expectations of library services and ii) perceptions/experiences of those features in your library.

Please find enclosed a questionnaire containing a few key features of service quality. Please go through the features and indicate the extent to which you agree or disagree with those statements. The questionnaire is simple and will not take much of your valuable time for completing the same. We shall be grateful, if you could spare some time to complete the questionnaire. Your assessment will help us to recommend realistic measures to the Government Authorities for providing facilities which might benefit Technical and Management Libraries in Karnataka including your institute library.

We assure you that the data is being collected for academic research purpose only and confidentiality will be maintained. The data will be used for understanding the status of technology in our State and plan for future developments. Individual's identity will not be revealed and the collective findings will be reported to the Government for their consideration.

Thanking you for your kind co-operation and valuable inputs.

Yours sincerely,

Dr. Manjunatha K
Principal Investigator
TAPMI, Manipal-576104

Dr. Rekha D Pai
Co-Investigator
Manipal Institute of Technology, Manipal

Impact of Technology on Quality of Library Services in Technical/ Management Libraries

1	Name (Optional)	
2	Name of Institution	
3	Designation (Please tick the appropriate box)	Faculty Member ☐ Research Scholar ☐ PG Student ☐
4	Age	☐ Years
5	Gender	Male ☐ Female ☐
6	Marital Status	Single ☐ Married ☐
7	Do you come from? (Please tick the appropriate box)	Village ☐ Town ☐ City ☐
8	Currently you reside in	☐ Campus/Hostel ☐ Outside
9	How do you **Obtain** the books and other materials for your reading? (Please **rank them** according to your preference 1 - first rank 5- last rank)	From your inst. Library ☐ Through Self purchase ☐ Through Internet ☐ Through friends/colleagues ☐ Visiting other Libraries ☐
10	**How Long** have you been using your Institute Library?	☐ Year/s
11	How **Often do you visit** your library? (Please tick the appropriate box)	Daily ☐ Once in 2-3 days ☐ Once in a week ☐ Once in 15 days ☐ Occasionally ☐
12	Approx. How much **Time you Spend** during a visit to library?(tick one)	Less than 1 hour/ 1 hr/ 2 hrs / 3 hrs/ 4 hrs/ 5+ hrs
13	How do you get the **Information** from the library? (Please tick all that is applicable to you)	Notice Board ☐ Circulars ☐ Emails ☐ Phone ☐ When visiting lib. ☐
14	What **Type of Information** you get from library (Please tick all that is applicable to you)	New Arrivals ☐ Reminders ☐ Current Awareness ☐ New services ☐ New Developments ☐ Conference etc ☐

The following set of statements describing some key elements of quality services. Please show the extent to which the features are important for **a good library in your field**. **Circle '1' if you feel the feature is not at all important. Circle '5' if you feel the feature is absolutely essential/very important for a good library. If your feelings are less strong, circle any of the numbers in the middle. Please note that there is no right or wrong answer.**

1- Not at all Important; 2- Not Important; 3- somewhat Important; 4- Important ; 5- Very Important

Sl No	Feature	Your Expectations [E] 1-not at all Important; 5- Very Imp.				
1	Spacious & **modern looking building** for a good lib.	1	2	3	4	5
2	**Easy physical access** for a good library	1	2	3	4	5
3	Convenient **library working hours**	1	2	3	4	5
4	Comprehensive **Print Resources** like Books, journals	1	2	3	4	5
5	Good Collection of **Electronic Resources** like CDs/VCs/e-books.	1	2	3	4	5
6	Proper **arrangement** of Print Resources in the library	1	2	3	4	5
7	**State-of-Art computers** in the library	1	2	3	4	5
8	**Laser Printers** in the library	1	2	3	4	5
9	**Scanners** in the library	1	2	3	4	5
10	**Electronic security/burglars** in the library	1	2	3	4	5
11	**Well maintained** computer & equipment in the library	1	2	3	4	5
12	**Internet** connectivity	1	2	3	4	5
13	Subscription to **statistical/bibliographical databases** like cmie, compendex etc...	1	2	3	4	5
14	Subscription to **e-journals/full-text databases** like EBSCO, IEEE, acm etc...	1	2	3	4	5
15	**Automated** Library operations and services	1	2	3	4	5
16	Easy-to-use library **on-line catalogue** (OPAC)	1	2	3	4	5
17	**Remote (LAN/campus-wide) Access** to Library Resources	1	2	3	4	5
18	Making library resources available through **Website**	1	2	3	4	5
19	Provision for **on-line reservations/renewals**	1	2	3	4	5
20	**Speed of response** for Queries via LAN/Internet	1	2	3	4	5
21	Library's **networking/collaboration** with other libraries for interlibrary lending	1	2	3	4	5
22	**Error free records** in the library	1	2	3	4	5
23	Library's **ability to promise products/services** to users by a **certain time** (commitment)	1	2	3	4	5
24	Ability to **deliver the promised services on time**	1	2	3	4	5
25	Staff's **sincere interest/willingness** to help users	1	2	3	4	5
26	Provision of **"Right Document the Very First Time"**	1	2	3	4	5
27	Staff who instill **trust/confidence** in users	1	2	3	4	5
28	Staff who **understand the specific needs of users.**	1	2	3	4	5
29	**Knowledge/competence** of staff to answer user's queries	1	2	3	4	5

30 Please mention any other features that you feel are important for a good library:

_____

The following set of statements relates to your **opinion/experience in your library**. Please show the extent to which the features are available in your **library.** Again **Circle '1' for strong disagreement and Circle '5' –strong agreement. If your feelings are less strong, circle any of the numbers in the middle. Circle "N/A" If the feature is not available in your library or you don't know**

1-Strongly Disagree; 2- Disagree; 3- Somewhat Agree; 4- Agree; 5- Strongly Agree

Sl No	Feature	Your Perception/Experience [P] 1-Strong Disagree; 5- Strong Agree, NA- Not Available					
1	Our Library has Spacious and modern looking building	1	2	3	4	5	
2	Physical access to our library is easy	1	2	3	4	5	
3	Our library working hours are convenient to me	1	2	3	4	5	
4	Our library has comprehensive Print Resources like Books, journals etc.	1	2	3	4	5	NA
5	Our library has Good Collection of CDs/VCs/e-books.	1	2	3	4	5	NA
6	The print documents are properly arranged in our library	1	2	3	4	5	NA
7	Our library as State-of-Art computers	1	2	3	4	5	NA
8	Laser Printers are available in our library	1	2	3	4	5	NA
9	Scanners are available in our library	1	2	3	4	5	NA
10	Electronic security/burglars system is installed in our library	1	2	3	4	5	NA
11	Computers & equipment are well maintained in our library	1	2	3	4	5	NA
12	Our library Internet connection	1	2	3	4	5	NA
13	Our library subscribes to many statistical databases	1	2	3	4	5	NA
14	Our library subscribes to many e-journals/full-text databases (ebsco, IEEE, acm etc).	1	2	3	4	5	NA
15	Our library operations and services are automated	1	2	3	4	5	NA
16	Our library on-line catalogue (OPAC) is easy-to-use	1	2	3	4	5	NA
17	Our library provides remote access to its resources	1	2	3	4	5	NA
18	Our library resources are available through Website	1	2	3	4	5	NA
19	Our library allows on-line reservations/renewals	1	2	3	4	5	NA
20	The response for my queries via LAN/Internet is very fast	1	2	3	4	5	NA
21	Our library has good networking with other libraries	1	2	3	4	5	NA
22	The records in our library are Error-free	1	2	3	4	5	
23	Our library has the ability to promise products/services to users by a certain time	1	2	3	4	5	
24	Our library has the ability to deliver promised services on time	1	2	3	4	5	
25	Our library staff show sincere interest/ willingness to help me	1	2	3	4	5	
26	I get "Right Document the Very First Time" in our library	1	2	3	4	5	
27	Our staff instills trust/confidence in me	1	2	3	4	5	
28	Our library staff understands my specific needs	1	2	3	4	5	
29	Our library staff has the knowledge to answer my queries	1	2	3	4	5	

Overall, Based on your experience how do you rate following?
(Circle 1- For least score; circle 5- for maximum score. If your feelings are not so strong, circle middle nos.)

F1	Over all, are you satisfied with your library facilities and services? (1-Highly Dissatisfied; 2- Dissatisfied; 3-Soemwhat Satisfied; 4- Satisfied ; 5- Highly Satisfied)	1	2	3	4	5
F2	Over all, How do you judge the quality of your library services (1- Very Poor; 2- Poor; 3- Somewhat Good; 4- Good; 5- Very Good)	1	2	3	4	5
F3	Over all, your opinion about the adequacy of Print Resources in your library (1- Not at al adequate; 2- Nor Adequate; 3- Somewhat Adequate; 4- Adequate; 5 – Highly Adequate)	1	2	3	4	5
F3	Over all, your opinion about the adequacy of Elec. Resources in your lib. (1- Not at al adequate; 2- Nor Adequate; 3- Somewhat Adequate; 4- Adequate; 5 – Highly Adequate)	1	2	3	4	5
F4	Overall, your opinion on the nature of IT enabled services in your library (1- Very Poor; 2- Poor; 3- Somewhat Good; 4- Good; 5- Very Good)	1	2	3	4	5
F5	With your experience, would you like to spread the good words among your friends/colleagues about your library? (1- Absolutely No; 2- No; 3- Somewhat Yes; 4- Yes; 5 - Definitely Yes)	1	2	3	4	5

F6 Please mention few Areas (resources/services) where you find visible impact of IT in your library

F6 Please offer your Suggestions for improving of library services:

We express our sincere thanks for sparing your time and providing valuable inputs for this study. We value your observations/opinions and we aggregate them in our final report to DSIR, Govt. of India. We are confident that our recommendations would benefit technical and management libraries in our state.

Dr. Manjunatha K & Dr. Rekha D Pai
Investigators.

APPENDIX - 2

AICTE NORMS and Standards for Technical Library

Website: http://www.aicte.ernet.in accessed and downloaded on 26-12-2006.

National Board of Accreditation (NBA) was constituted by the All India Council for Technical Education (AICTE), as an Autonomous Body, under Section 10(u) of the AICTE Act,1987

"To periodically conduct evaluation of technical Institutions or Programmes on the basis of guidelines, Norms and Standards specified by it and to make recommendations to it, AICTE or to the Council, or to the Commission or to the other bodies, regarding recognition or de-recognition of the institution or programme."

STAFF NORMS:

An engineering institute shall have the staff as given below:

i. Principal and teaching faculty
ii. Workshop Staff
iii. Technical Supporting Staff
iv. Library and Computer Centre Staff
v. Administrative Staff
vi. Maintenance staff and other miscellaneous staff

8.11.1 Library Staff

Library should be provided with the necessary staff to enable it to be available to the staff and students for at least 12 hours in a day. It is suggested that the library should consist of one librarian, one assistant librarian and four library assistants

NORMS FOR INFRASTRUCTURE

12.1 General

The norms for space and buildings have been arrived at, based on the functions, a technical institution offering degree or equivalent programmes, has to perform. In all the cases, unit norms have been evolved taking the absolute minimum needs, which are indicated as norms. As such the institutions, while envisaging their space and building requirements, must keep their perspectives for development in mind and formulate their plans accordantly.

12.2 Classification of Building Area

The building area required for an engineering institution can be classified as instructional area, administrative area, amenities area and residential area. Instructional area will include classrooms, tutorial rooms, drawing halls, laboratories, workshops, computer center, library, instructional resource center, seminar hall etc.

Administrative area comprises Principle's room, visitors lounge, staff rooms, college office, departmental offices, stores, conference room, confidential room, etc.

Area for amenities consists of common rooms, recreation center, hobby center, offices for Gymkhana, N.C.C., N.S.S. and Alumni Association, Co-operative Stores, Dispensary, etc.

Residential area includes student and staff hostels, staff quarters and guesthouse.

12.3.9 Central Library

The central library for an admission of 240 students per year will have a carpet area of 400 Sqm.

At the time of establishing a technical institution with three branches, there should be a minimum of 4000 volumes in the Library distributed as below:

i. Each branch will have 250 titles with four multiple copies.
ii. In subjects like Mathematics, Humanities, Physics, Chemistry, etc. there should be total of 1000 volumes.

There should be a minimum of 12 technical journals - 6 Indian and 6 International for each branch of engineering. While this is essential for institutions offering P.G. programme, the number of International Journals may be relaxed, though preferred for those offering only U.G. Programmes.

Accordingly, the norms for the initial stock of books, yearly addition of books and the number of journals to be subscribed are as given below:

SNo	Item	Minimum
1.	Initial Stock of Books for three branches in Institution	4000
2.	a. Each Branch of Engg. (A) b. Mathematics, Applied Physics Applied Chemistry, Humanities, Social Science and Management Science (B)	1000 (in each branch)
3.	Yearly addition of Books (Average) a. For (A) 1 title per student admitted to the branch b. For (B) 0.2 title per student admitted per year	
4.	Number of Tech. Journals a. For (A) 12 (6 National + 6 International) b. For (B) 12 (6 National + 6 International)	

12.7 Furniture

All laboratories, library, workshops, lecture and tutorial rooms offices hostels and Guest house etc. should be adequately furnished. No norms for the furniture are begin laid, however it is expected that the furniture should conform to the requirement of a dignified institution, The Institution may equip the buildings with the furniture as available indigenously.

MULTIUSE OF FACILITIES

To make maximum use of available facilities (resources), sharing of resources among the institutions closely located should be encouraged.

It goes without saying that similar facilities should not be duplicated within one institution by different departments. Facilities existing in one department should be freely available to another within the institution. Central facilities could be established for teaching/research/ consultancy work.

It will be desirable to have a consortium-approach of having centralized laboratories of sophisticated instrumentation by mobilization of funds from the group of departments/institutions and share those facilities. This scheme can be adopted where the institutions can form themselves as a group to achieve both optimization of resources and also overall fiscal economy.

Approval process Handbook 2006-07

13.3.2 Instructional Area Requirements

Table 4: Instructional Area Requirements, Sq. m.

Inst.. Category		Engg. & Tech.	Pharmacy	HMCT	Arch/ Planning	Appl Arts & Crafts	MCA	PGDM/ PGDBM /MBA
Classrooms, No.		3	1	1	1	1	1	1
Tutorial rooms, No		2	1	1	1	1	1	1
Drawing Halls, Area, Sq. m.		175	na	na	200*	200*	na	2** x 75
Computer Centre, area, Sq. m.		150	150	150	125	150	200	150
Library, area, Sq. m.		400	100	100	100	100	100	100
Workshop and Labs	No.	See Table 5	4	2	2	2	1	na
	Area of Each, Sq.m	—-	75	250	66	66	150	na
Area of Each Classroom = 66 Sq. m.; Area of Each Tutorial Room = 36 Sq. m. na-not applicable, * Studio, ** Conference rooms								

13.5 Requirement of Computers/Software

Table 6: Requirement of Computers/Software

SN	Particulars	Requirements	
		All Undergraduate Degree Programmes	MCA/PGDM/PGDBM/MBA
1.	No. of Computer terminals	Terminal-Student Ratio = 1:4	Terminal-Student Ratio=1:2
2.	Hardware specification	P4 or equivalent Processor, or thin clients supported by a powerful server	
4.	Relevant Licensed Software	At least two system software packages and four Application Software Packages	
5.	Peripherals	Printer: Computer Terminal ratio = 1:10	

- Library, Administrative Wings and Faculty members should be provided with exclusive computing facilities along with LAN and Internet over and above the requirement meant for students.
- Utilization of Open Source Software should be encouraged.

13.6 Library/Books and Journals

Table 7: Books and Journals requirement in Library					
SN	**Category of New Institute**	**Books for Technical Subjects**		**Books for Science & Humanities**	**Journals**
		No. of Titles	**No. of Volumes**	**No. of Volumes**	
1.	Engg & Tech	250 per Course	1000 per course	1000	(5 National + 2 International) per course + 4 in Science and Humanities subjects
2.	Pharmacy	150	1500	250	5 National +2 International
3.	HMCT	150	2000	250	5 National +2 International
4.	Architecture	150	500	250	5 National +2 International
5.	Applied Arts & Crafts	150	500	250	5 National +2 International
6.	MCA	150	1000	100 (applications and case studies)	5 National +2 International
7.	MBA	150	1000	100 (Including case studies)	10 National +2 International
Furniture and other facilities must be sufficient for books & seating for 25 per cent of sanctioned intake					

13.7 Funds

Table 8: Funds required				
SN	**Category of New Institute**	**Minimum Funds Requirement, Rs. Lakh**		
		Building	**Equipment/Library**	**RRPGF**
1.	Engineering & technology (Degree)	100	100	35
2.	Pharmacy (Degree)	25	20	15
3.	Hotel Mgt. & Catering Tech. (Degree)	35	40	15
4.	Architecture (Degree)	25	30	15
5.	Applied Arts & Crafts (Degree)	25	20	15
6.	MCA	25	40	15
7.	PGDM/PGDBM/MBA	25	30	15

13.8 Other Essential Requirements

Table 9: Essential Requirements			
SN	**Description**	**Engineering & Technology**	**Pharmacy/HMCT/MBA/MCA/ Applied Arts and Crafts**
1.	Operational funds, Rs Lakhs	35	20
2.	Digital Library	Four Computers with Multimedia facilities, duly networked	Two Computers with Multimedia facilities, duly networked

14.3.1 Details of Instructional Area (Carpet Area)

S. No	Class of Institution	Class rooms		Turorial Room		Drawing Hall		Computer Centre		Library		Labora-tories /Worksho
		No of Rooms	Area of each Room (sqm)	No of Rooms	Area of each Room (sqm)	No of Halls	Area of each Hall (sqm)	No. of Rooms	Area of each Room (sqm)	No. of Rooms	Area (sqm)	Total Area of Labs (Sqm)
1.	Engg & Tech.	(Y)	66	(YY)	36	1	175	1	150	1	400	250 per lab/work shop
2.	Pharmacy	(Y)	66	(YY)	36	-	-	1	75	1	150	1450
3.	HMCT	(Y)	66	(YY)	36	-	-	1	75	1	150	1425
4.	Architecture/Applied Arts & Crafts	(Y)	66	(YY)	36	5 (YYY)	200	1	75	1	100	360
5.	MCA	(Y)	66	(YY)	36			1	150	1	100	150
6.	MBA/PGDM	(Y)	66	(YY)	36	3*	50	1	150	1	100	-

(*) Conference/Seminar Rooms

(Y) No. of Classrooms = (Total Approved Strength of Students in the Institution) x 0.75/(40 or 60)

(YY) No. of Tutorial Rooms = (Total Approved Strength of Students in the Institution) x 0.5/(40 or 60)

40 for Arch and 60 for others

(YYY) Studio and Exhibition cum Conference Room

14.5 LIBRARY: Requirements for the first year of programmes

Sl No.	Class of Institutions	No. of Books for Technical Subjects		No of Books for Sc.& Humanities (Volumes)	No. of Journals	Full -Time Librarian (Number)	Photo copier (Number)
		No of Titles	No of Volumes				
1.	Engg. & Tech.	250 per Course	1000 per Course	1000	12 per course	1	1
2.	Pharmacy	150	1500	-	15	1	1
3.	HMCT	150	2000	-	12	1	1
4.	Architecture/Applied Arts & Crafts	150	500	-	10	1	1
5.	MCA	150	1000	-	12	1	1
6.	PGDM/PGDBM/MBA	150	1000	-	30	1	1

Note: 1. Sufficient Furniture should be available to cater the requirement for minimum of seating capacity for 25% of total Intake

2. 1000 books to be added every year

14.7 DESIRABLE REQUIREMENTS

Sl	Description	Minimum Requirements as per Norms					
		Engg./Tech.	Pharmacy	HMCT	Architecture	Applied Arts & Crafts	MCA or MBA/ PGDM
10.	Digital Library	Two Computers + Library Networking* + Multimedia Facilities	One Computer + Library Networking* + Multimedia Facilities	One Computer + Library Networking* + Multimedia Facilities	One Computer + Library Networking* + Multimedia Facilities	One Computer + Library Networking* + Multimedia Facilities	One Computer + Library Networking* + Multimedia Facilities

* It includes provision of e-journals and subscription to such services with facilities in place

APPENDIX - 3

Descriptive notes on Statistical tools used for Data Analysis

Statistical Package used:	SPSS (statistical package for Social Sciences) v 14.0	
Source:	The description of each tool has been extracted from the original SPSS manual. No attempt has been made to alter or modify the original text as it affects the originality of the manual.	
Tools Used:	Type	Sample tables in the report
	i. Frequency Distribution	Table 6.4,6.6
	ii. Descriptives	Table 6.8
	iii. Cross Tabulation	Table 6.1, 6.3, 6.25,
	iv. Compare means	Table 6.11, 6.12
	v. Correlations	Table 6.5
	vi. Factor Analysis	Table 6.9, 6.10,
	vii. One-way ANOVA, Multinomial Regression	Section 7.2.2, 7.2.3, 7.2.5 (In view of large text, the original text is not provided. Only the relevant results are extracted)

A Descriptive Statistics:

Under this category three tools such as 'Frequency Distribution' Descriptives, and cross tabulation have been used.

i). Frequency Distribution Table: The Frequencies procedure provides statistics and graphical displays that are useful for describing many types of variables. The Frequencies procedure is a good place to start looking at your data. For each value of a variable, a frequency table displays the number of times (count) that value occurs. Frequency tables are useful for summarizing categorical variables.

For a frequency report and bar chart, you can arrange the distinct values in ascending or descending order, or you can order the categories by their frequencies. The frequencies report can be suppressed when a variable has many distinct values. The information in a frequency table can be graphically displayed in a bar chart. You can label charts with frequencies (the default) or percentages.

Statistics and plots. frequency counts, percentages, cumulative percentages, mean, median, mode, sum, standard deviation, variance, range, minimum and maximum values, standard error of the mean, skewness and kurtosis (both with standard errors), quartiles, user-specified percentiles, bar charts, pie charts, and histograms. The tool uses numeric codes or short strings to code categorical variables (nominal or ordinal level measurements).

To Obtain Frequency Tables

From the menus choose:
Analyze
Descriptive Statistics
Frequencies...
Select one or more categorical or quantitative variables.
Optionally, you can:

- Click Statistics for descriptive statistics for quantitative variables.
- Click Charts for bar charts, pie charts, and histograms.
- Click Format for the order in which results are displayed.

ii). Descriptives: The Descriptive Statistics table provides summary statistics for continuous, numeric variables. Summary statistics include measures of central tendency such as the mean. The Descriptives procedure displays univariate summary statistics for several variables in a single table and calculates standardized values (z scores). Variables can be ordered by the size of their means (in ascending or descending order), alphabetically, or by the order in which you select the variables (the default). The Descriptives procedure is very efficient for large files (thousands of cases).

Statistics that can be generated using this tool are - Sample size, mean, minimum, maximum, standard deviation, variance, range, sum, standard error of the mean, and kurtosis and skewness with their standard errors. The tool uses Data like numeric variables after you have screened them graphically for recording errors, outliers, and distributional anomalies. In general, a skewness value greater than one indicates a distribution that differs significantly from a normal, symmetric distribution.

To Obtain Descriptive Statistics
From the menus choose:
Analyze
Descriptive Statistics
Descriptives...
Select one or more variables.

- Optionally, you can:
- Select Save standardized values as variables to save z scores as new variables.
- Click Options for optional statistics and display order.

iii). Crosstabs: A crosstabulation displays the number of cases in each category defined by two or more grouping variables. It is useful for summarizing categorical variables -- variables with a limited number of distinct categories. The Crosstabs procedure forms two-way and multiway tables and provides a variety of tests and measures of association for two-way tables. The structure of the table and whether categories are ordered determine what test or measure to use.

Crosstabs' statistics and measures of association are computed for two-way tables only. If you specify a row, a column, and a layer factor (control variable), the Crosstabs procedure forms one panel of associated statistics and measures for each value of the layer factor (or a combination of values for two or more control variables). For example, if gender is a layer factor for a table of married (yes, no) against life (is life exciting, routine, or dull), the results for a two-way table for the females are computed separately from those for the males and printed as panels following one another.

Statistics and measures of association- Pearson chi-square, likelihood-ratio chi-square, linear-by-linear association test, Fisher's exact test, Yates' corrected chi-square, Pearson's r, Spearman's rho, contingency coefficient, phi, Cramér's V, symmetric and asymmetric lambdas, Goodman and

Kruskal's tau, uncertainty coefficient, gamma, Somers' d, Kendall's tau-b, Kendall's tau-c, eta coefficient, Cohen's kappa, relative risk estimate, odds ratio, McNemar test, and Cochran's and Mantel-Haenszel statistics.

Data. To define the categories of each table variable, use values of a numeric or short string (eight or fewer characters) variable. For example, for gender, you could code the data as 1 and 2 or as male and female.

To Obtain Crosstabulations

From the menus choose:

Analyze
Descriptive Statistics
Crosstabs...

Select one or more row variables and one or more column variables.
Optionally, you can:

- Select one or more control variables.
- Click Statistics for tests and measures of association for two-way tables or subtables.
- Click Cells for observed and expected values, percentages, and residuals.
- Click Format for controlling the order of categories.

B Compare Means:

The Means procedure calculates subgroup means and related univariate statistics for dependent variables within categories of one or more independent variables. Optionally, you can obtain a one-way analysis of variance, eta, and tests for linearity.

Statistics. The statistics describe the distribution of the dependent variable for each group. Sum, number of cases, mean, median, grouped median, standard error of the mean, minimum, maximum, range, variable value of the first category of the grouping variable, variable value of the last category of the grouping variable, standard deviation, variance, kurtosis, standard error of kurtosis, skewness, standard error of skewness, percentage of total sum, percentage of total N, percentage of sum in, percentage of N in, geometric mean, and harmonic mean. Options include analysis of variance, eta, eta squared, and tests for linearity R and R2.

Data. The dependent variables are quantitative, and the independent variables are categorical. The values of categorical variables can be numeric or short string.

To Obtain Subgroup Means

From the menus choose:

Analyze
Compare Means
Means...

Select one or more dependent variables.

Use one of the following methods to select categorical independent variables:

- Select one or more independent variables. Separate results are displayed for each independent variable.
- Select one or more layers of independent variables. Each layer further subdivides the sample. If you have one independent variable in Layer 1 and one independent variable in

Layer 2, the results are displayed in one crossed table, as opposed to separate tables for each independent variable.

Optionally, click Options for optional statistics, an analysis of variance table, eta, eta squared, R, and R2.

C One-Way ANOVA:

An ANOVA compares the means for the different groups.The One-Way ANOVA procedure produces a one-way analysis of variance for a quantitative dependent variable by a single factor (independent) variable. Analysis of variance is used to test the hypothesis that several means are equal. This technique is an extension of the two-sample t test. The total variation is partitioned into two components. Between Groups represents variation of the group means around the overall mean. Within Groups represents variation of the individual scores around their group means.

In addition to determining that differences exist among the means, you may want to know which means differ. There are two types of tests for comparing means: a priori contrasts and post hoc tests. Contrasts are tests set up before running the experiment, and post hoc tests are run after the experiment has been conducted. You can also test for trends across categories.

Statistics. For each group: number of cases, mean, standard deviation, standard error of the mean, minimum, maximum, and 95%-confidence interval for the mean. Levene's test for homogeneity of variance, analysis-of-variance table and robust tests of the equality of means for each dependent variable, user-specified a priori contrasts, and post hoc range tests and multiple comparisons: Bonferroni, Sidak, Tukey's honestly significant difference, Hochberg's GT2, Gabriel, Dunnett, Ryan-Einot-Gabriel-Welsch F test (R-E-G-W F), Ryan-Einot-Gabriel-Welsch range test (R-E-G-W Q), Tamhane's T2, Dunnett's T3, Games-Howell, Dunnett's C, Duncan's multiple range test, Student-Newman-Keuls (S-N-K), Tukey's b, Waller-Duncan, Scheffé, and least-significant difference. Small significance values (<.05) indicate group differences.

Data. Factor variable values should be integers, and the dependent variable should be quantitative (interval level of measurement).

To Obtain a One-Way Analysis of Variance

From the menus choose:

Analyze

Compare Means

One-Way ANOVA...

Select one or more dependent variables.

Select a single independent factor variable.

D Bivariate Correlations:

The Bivariate Correlations procedure computes Pearson's correlation coefficient, Spearman's rho, and Kendall's tau-b with their significance levels. Correlations measure how variables or rank orders are related. Before calculating a correlation coefficient, screen your data for outliers (which can cause misleading results) and evidence of a linear relationship. Pearson's correlation coefficient is a measure of linear association. Two variables can be perfectly related, but if the relationship is not linear, Pearson's correlation coefficient is not an appropriate statistic for measuring their association.

Statistics. For each variable: number of cases with nonmissing values, mean, and standard deviation. For each pair of variables: Pearson's correlation coefficient, Spearman's rho, Kendall's tau-b, cross-product of deviations, and covariance.

Data. Use symmetric quantitative variables for Pearson's correlation coefficient and quantitative variables or variables with ordered categories for Spearman's rho and Kendall's tau-b.

To Obtain Bivariate Correlations

From the menus choose:
Analyze
Correlate
Bivariate...
Select two or more numeric variables.
The following options are also available:

- Correlation Coefficients. For quantitative, normally distributed variables, choose the Pearson correlation coefficient. If your data are not normally distributed or have ordered categories, choose Kendall's tau-b or Spearman, which measure the association between rank orders. Correlation coefficients range in value from –1 (a perfect negative relationship) and +1 (a perfect positive relationship). A value of 0 indicates no linear relationship. When interpreting your results, be careful not to draw any cause-and-effect conclusions due to a significant correlation.
- Test of Significance. You can select two-tailed or one-tailed probabilities. If the direction of association is known in advance, select One-tailed. Otherwise, select Two-tailed.
- Flag significant correlations. Correlation coefficients significant at the 0.05 level are identified with a single asterisk, and those significant at the 0.01 level are identified with two asterisks.

E Factor Analysis

Factor analysis attempts to identify underlying variables, or factors, that explain the pattern of correlations within a set of observed variables. Factor analysis is often used in data reduction to identify a small number of factors that explain most of the variance that is observed in a much larger number of manifest variables. Factor analysis can also be used to generate hypotheses regarding causal mechanisms or to screen variables for subsequent analysis (for example, to identify collinearity prior to performing a linear regression analysis).

The factor analysis procedure offers a high degree of flexibility:

- Seven methods of factor extraction are available.
- Five methods of rotation are available, including direct oblimin and promax for nonorthogonal rotations.
- Three methods of computing factor scores are available, and scores can be saved as variables for further analysis.

Statistics. For each variable: number of valid cases, mean, and standard deviation. For each factor analysis: correlation matrix of variables, including significance levels, determinant, and inverse; reproduced correlation matrix, including anti-image; initial solution (communalities, eigenvalues, and percentage of variance explained); Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity; unrotated solution, including factor loadings, communalities, and eigenvalues; rotated solution, including rotated pattern matrix and transformation matrix. For oblique rotations: rotated pattern and structure matrices; factor score coefficient matrix and factor covariance matrix. Plots: scree plot of eigenvalues and loading plot of first two or three factors.

Data. The variables should be quantitative at the interval or ratio level. Categorical data (such as religion or country of origin) are not suitable for factor analysis. Data for which Pearson correlation coefficients can sensibly be calculated should be suitable for factor analysis.

Factor Analysis Descriptives: Statistics.Univariate descriptives includes the mean, standard deviation, and number of valid cases for each variable. Initial solution displays initial communalities, eigenvalues, and the percentage of variance explained.

Correlation Matrix. The available options are coefficients, significance levels, determinant, KMO and Bartlett's test of sphericity, inverse, reproduced, and anti-image.

Method. Allows you to specify the method of factor extraction. Available methods are principal components, unweighted least squares, generalized least squares, maximum likelihood, principal axis factoring, alpha factoring, and image factoring.

Analyze. Allows you to specify either a correlation matrix or a covariance matrix.

Extract. You can either retain all factors whose eigenvalues exceed a specified value, or you can retain a specific number of factors.

Display. Allows you to request the unrotated factor solution and a scree plot of the eigenvalues.

Maximum Iterations for Convergence. Allows you to specify the maximum number of steps that the algorithm can take to estimate the solution.

Factor Analysis Rotation: Method. Allows you to select the method of factor rotation. Available methods are varimax, direct oblimin, quartimax, equamax, or promax.

Display. Allows you to include output on the rotated solution, as well as loading plots for the first two or three factors.

Maximum Iterations for Convergence. Allows you to specify the maximum number of steps that the algorithm can take to perform the rotation.

Factor Analysis Scores: Save as variables. Creates one new variable for each factor in the final solution. Select one of the following alternative methods for calculating the factor scores: regression, Bartlett, or Anderson-Rubin.

Display factor score coefficient matrix. Shows the coefficients by which variables are multiplied to obtain factor scores. Also shows the correlations between factor scores.

Factor Analysis Options: Missing Values. Allows you to specify how missing values are handled. The available choices are to exclude cases listwise, exclude cases pairwise, or replace with mean.

Coefficient Display Format. Allows you to control aspects of the output matrices. You sort coefficients by size and suppress coefficients with absolute values that are less than the specified value.

F Multinomial Logistic Regression

Multinomial Logistic Regression is useful for situations in which you want to be able to classify subjects based on values of a set of predictor variables. This type of regression is similar to logistic regression, but it is more general because the dependent variable is not restricted to two categories.

Example. In order to market films more effectively, movie studios want to predict what type of film a moviegoer is likely to see. By performing a Multinomial Logistic Regression, the studio can determine the strength of influence a person's age, gender, and dating status has upon the type of film they prefer. The studio can then slant the advertising campaign of a particular movie toward a group of people likely to go see it.

Statistics. Iteration history, parameter coefficients, asymptotic covariance and correlation matrices, likelihood-ratio tests for model and partial effects, –2 log-likelihood. Pearson and deviance chi-square goodness of fit. Cox and Snell, Nagelkerke, and McFadden R2. Classification: observed versus predicted frequencies by response category. Crosstabulation: observed and predicted frequencies (with residuals) and proportions by covariate pattern and response category.

Methods. A multinomial logit model is fit for the full factorial model or a user-specified model. Parameter estimation is performed through an iterative maximum-likelihood algorithm.
Data. The dependent variable should be categorical. Independent variables can be factors or covariates. In general, factors should be categorical variables and covariates should be continuous variables.

Obtaining a Multinomial Logistic Regression

From the menus choose:
Analyze
Regression
Multinomial Logistic...
Select one dependent variable.
Factors are optional and can be either numeric or categorical.
Covariates are optional but must be numeric if specified.

APPENDIX -4

List of Technical and Management Libraries in Karnataka Who have responded to this study.

Mr. Deepak Kumar M. R.
Librarian
Acharya Institute of Technology
Soldevanahalli, Chikkabanawara Post
Hesaragatta Road
Bangalore - 560090
Phone: Phone : (080)-8398711, 8398699
Email: director@acharyainstitutions.org

Ms. Ushalatha D.K.
Librarian
Acharya Patasala Rural College of Engineering
Somanahalli, BangaloreSouth
Bangalore - 560062
Phone: 8432234
Email: usha_dk3@yahoo.co.in

Mr. T.V. Panduranga
Librarian
Adichunchanagiri Institute of Technology
Audichunchanagi Extn., Jyothinagara
Chickmagalore - 577102
Phone: 0826 220063
Email: ait@sanchar.com

Mr. Sham Rao
Librarian
Alpha College of Engineering,
8/1, Hanumantha Sagara, 30/2, Doddagubbi Post,
Bangalore - 562 149
Phone: 080 28465433,28445218.
Email: rao200523@rediff.mail.com

Mr. S.N Srinivasa
Librarian
AMC Engineering College
18 KM Bannerghatta Main Road
Kalkere Villege
Bangalore - 560083
Phone: (080)- 7828655, 56
Email: snsrinivassn@rediffmail.com

Mr. K K Suresh Kumar
Librarian
Amrita School of Engineering
26 & 27 Kasavanahalli, Bellandur Post
Off Sarjapur Road
Bangalore - 560037
Phone: (080)-24841216, 17, 28439565
Email:

MR. N.B. Ranganatha
Librarian
Atria Institute of Technology
ASKB Campus, A G's Colony, 1st Main Road,
Anandnagar, Hebbal Post
Bangalore - 560024
Phone: 080-23631298
Email: info@atria.edu

Shri Suresh A. Patil
Librarian
B.L.D.E.A's V. P. Dr. P. G. Halakatti College of Engineering & Technology
Ashram Road , Bijapur - 586103
Phone: (08352)-261120
Email: s_a_patil54@rediffmail.com

Mr. N. Chowdappa
Librarian
B.M.S College of Engineering
Post Box No. 1908
Bull Temple Road,Basavanagudi
Bangalore - 560019
Phone: (080) - 26615657
Email: nchowdappa@yahoo.co.in

Dr. M.R. Ananda Murthy
Librarian
B.T.L. Institute of Technology
No. 259 B, Bommasandra Industrial Area
Hosur Road, Bangalore - 562158
Phone: 8423055
Email: murthy_ananda@indiatimes.com

Mr. Ramesh A M
Librarian
Bangalore College of Engineering and Technology
Near Heelalige Railway Station, Chandapura,
Anekal Taluk, Bangalore - 562145
Phone: (080) -7834822, (R) 26692138
Email: ramesh_gcc@yahoo.co.in

Mr. H.C. Sreenivasa
Librarian
Bangalore Institute of Technology
V. V. Puram, K. R. Road,
Bangalore - 560004
Phone: (080) - 6613237
Email: sreenivasahclib@yahoo.co.in

Mr. K. V. Manjunatha
Librarian
Bapuji Institute of Engineering & Technology
Post Box No-325, Shamnur Road
Davanagere - 577004
Phone: (08192) - 221461 Ext. 212
Email: kvmdvg@yahoo.co.in

Mr. Bhadresh K S
Librarian
Basava Academy of Engineering
Gangondamamli Main Road
Nagasandra Post, Bangalore - 560073
Phone: 23721546
Email: mn_vanajakshi@indiatimes.com

Mr. Dandage Rajkumar
Librarian
Basavakalyana Engineering College
Near Koudiyal Village,N.H.9
Basavakalyan, Bidar - 585327
Phone: 08486-70218
Email: basava@yahoo.com

Mr.Jaffer Basha
Librarian
Bellary Engineering College
Bellary Hospet Road, Allipur Post
Bellary - 583104
Phone: 08392-242900,244741,42
Email: s_jafferbasha@yahoo.com

Mr.Gopalakrishna
Librarian
B.M.S Institute of Technology & Management
Avalahalli, Yalahanka
Bangalore - 560064
Phone:
Email: gk_bmsitg9@rediffmail.com

Mr. M.K. Mohandas
Librarian
Canara Engineering College
Benjanapadavu, Karnagala Grama
Bantwal Taluk - 574219
Phone: 0824 - 778269
Email: mk_mohandas@yahoo.co.uk

Mr. S.F. Kattimani
Librarian
City Engineering College
Kanakapura Road, Doddakallasandra
Bangalore South - 560062
Phone: 93435 56559
Email: sfkattimani@yahoo.co.in

Mr. M. Anil Kumar
Librarian
CMR Institute of Technology
#132, Kundahalli Village, I.T.Park Road
AECS Layout, Bangalore - 560037
Phone: (080) - 8524477 8524466
Email: ms_s_anil@yahoo.com

Mr. Siddaramu P
Librarian
Coorg Institute of Technology
Kunda, Halligattu , Ponnampet
Kodagu - 571216
Phone: 08274-49771
Email: siddu_pj@rediffmail.com

Mr. J. C. David
Librarian
Dayananda Sagar College of Engineering
Shavige Malleshawara Hills
Kumaraswamy Layout, Bangalore - 560078
Phone: (080)-6660789, 6662226
Email: libdavid@yahoo.co.in

Mr. Venkategowda
Librarian
Don Bosco Institute of Technology
Sy.No.1,4, & 8 Kumbalagodu Village
Kangere Hobli, Bangalore South - 560074
Phone: (080)-28437028, 29,30
Email: tvenkategowda@yahoomail.com

Smt. C. A. Malaghan
Sr. Librarian
Dr. Ambedkar Institute of Technology
Near Jnana Bharathi Campus, Mallathahalli
Bangalore - 560056
Phone: (080) - 23211504 Extn.: 336
Email: camalaghan@yahoo.com

Dr. Vijay Kumar
Chief Librarian
East Point College of Engineering & Technology
Bypanahalli Villege, Bidrehalli Hobli
Bangalore South - 560049
Phone: (080)-8473777
Email: coolvg@gmail.com

Ms. Malathi
Librarian
East West Institute of Technology
Survey No. 63, Bel Layout, Off Magali Road,
Yeshwanthapur Hobli, Bangalore - 560091
Phone: 080-23288899
Email: malathigowda@yahoo.co.in

Mr. Siddangowda Patil
Librarian
G.M. Institute of Technology
Karur Village, Kasaba Hobli
Davanagere Taluk - 577006
Phone: 08192-233377
Email: patilplr@hotmail.com

Mr. B Krishna
Librarian
G.S.S.S. Institute of Engineering & Technology
Metagalli Industrial Area
K.R.S.Road
Mysore - 570016
Phone: 0821-2581305
Email:

Mr. DV Patwardhan
Librarian
Global Academy of Technology
Halagevoddarahalli Near Ideal Homes Township,
Rajarajeshwari Nagar, Bangalore - 560 098
Phone:
Email: patwardhandv@yahoo.com

Mr. R. M. Puttaswamy
Librarian
Golden Valley Institute of Technolgy
Oorgaum Post, Kolar Gold Fields
Kolar - 563120
Phone: (08153)-361219
Email: swamyrmp@yahoo.co.in

Ms. Rani B
Librarian
Government SKSJT Institute
K. R. Circle
Bangalore - 560001
Phone: (080) -22260126 (Office)
Email:

Mr.Badresh K.S.
Librarian
GSS Institute of Technology
37/2,new Byrohalli Road
Near Kengeri, Satellite Town Club
Bangalore - 560060
Phone:
Email:

Mr. Venkat Rao Potdar
Librarian
Guru Nanak Dev Engineering College
Bidar Mailur Road
Bidar - 585403
Phone: (08482)-26949,26635
Email:pvrao1@rediffmail.com;pvrao1@yahoo.com

Mr. Mulla K. R.
Librarian
H.K.B.K. College of Engineering
S.No.22/1, Nagawara, Arabic College Post
Bangalore - 560045
Phone: 5441722-54437443
Email: mulla_kamalasab@yahoo.com

Mr. Rajeev B.A
Librarian
H.M.S. Institute of Technology
Gowdayyana Palya,Kesaramadu
B O Kyathasandra, Tumkur - 572104
Phone: 0816-2243678
Email: rajeev_bidare@yahoo.co.in

Ms. Arati D. Kabburi
Librarian
Hirasugar Institute of Technology
Tal : Hukkeri, Nidasoshi
Belgaum - 591236
Phone: (0833) 278887,
Email: arti_hit@rediffmail.com

Mrs. Gulnaz Begum
Librarian
Islamiah Institute of Technology
General Education Complex, National Park Road
Bangalore - 560 076
Phone: 080-6581031
Email: Islamaih@gurushikshak.com

Mr. Sidrama Swamy H S
Librarian
S J M Institute of Technology
P.B.No. 73, Chitradurga
Citradurga - 577 502
Phone:
Email: sijmit@sancharne.com

Mr. D. S. Udaya Kumar
Librarian
Jawaharlal Nehru National College of Engineering
Sawalanga Road, Navile
Shimoga - 577204
Phone: (08182) - 270450-276707to 276709
Email: udayds2001@yahoo.com

Mr. Ajit A Mahuli
Librarian
Gogte Institute of Technology
Udayambag
Belgaum - 590008
Phone: (0831)-482243
Email: Aamahuli@yahoo.com

Sri N. L. Patel
Librarian
K. L. E. Society's College of Engg. & Technology
Udyambag
Belgaum - 590008
Phone: (0831)-2440322
Email:

Ms. Bharathi
Librarian
K.S. Institute of Technology
No. 14, Raghuvananhalli, Kanakapura Main Road,
Bangalore - 560062
Phone: 8435723
Email: bharathivr10@yahoo.com

Sri. Sathyanarayana S. N.
Librarian
K.V.G. College of Engineering
Kurunji, Bhag, Sullia - D.K.Dist.
Sullia - 574327
Phone: (08257) - 20241
Email: sathya367_sn@yahoo.com

Dr. M Mallikarjuna Bachalapur
Librarian
Kalpataru Institute of Technology
B.H.Road
Tiptur - 572202
Phone: (08134)-254283, 251938, 251203
Email: bachalapur@yahoo.com

Mr. Sunil T Yaragatti
Librarian
KLS's Vishwanatharao, Deshpande Rural Institute of Technology
Haliyala
Haliyala Taluk, U.K. District
Haliyal - 581329
Phone:

Mr. Shankargowda
Librarian
KCT Engineering College
Gulbarga, KCT Campus, P.B. No. 104,
Qamrul Islam Colony, Roza
Gulbarga - 585104
Phone:
Email:

Mr. Salamantapi, LB
Librarian
M.S. Engineering College
Navarathna,Agrahara
Sadahalli Post, B'lore North
Bangalore - 562110
Phone: (080)-8388843, 3450296
Email: salamantapi2000@yahoo.co.in

Mr. R. H. Anantharamu
Librarian
Malnad College of Engineering
Post Box 21, Salagane Road
Hassan - 573201
Phone: 091-08172-68293 F-091-08172-64683.
Email: mcehas@sancharnet.in

Dr. Rekha D Pai
Sr. Librarian
Manipal Institute of Technology, Manipal
Karnataka
Manipal - 576104
Phone: (0820)-2571201-ex 24451
Email: rekha.pai@manipal.edu

Mr.Navven Kumar
Librarian
Moodalakatte Institute of Technology
Mudalakatte, Kundapura Taluk
Kundapura - 576 217
Phone: 08254-237235,237258,
Email: Naveen_baikal@yahoo.co.in

Mr. Sreeramana
Librarian
MS Ramaiah Institute of Technology
M.S. Ramaiah Nagar, M.S.R.I. Post
Bangalore - 560054
Phone: 91-80-3600822, 3608934, 3606936
Email: library@msrit.edu;rsreeramana@yahoo.co.in

Mr. H. Diwakar Bhat
Librarian
N M A M Institute of Technology
Nitte - 574110
Karkala
Phone: 91-8258-701263/264, 701039
Email: nmamitlibrary@yahoo.co.in

Mr. Dinesh K S
Librarian
Nagarjuna College of Engineering & Technology
Mudugurki, Venkatagiri Kote Post
Devanahally, Bangalore - 562110
Phone: 080-27645990
Email: dineshmail@indiatimes.com

Ms. Anitha S Rai
Librarian
New Horizon College of Engineering
Kadubeesina Halli, Varthur, Hobli
Bangalore - 560087
Phone: 91-80-8440666 / 8440532
Email: anitha_s_rai03@yahoo.com

Mr. Gangadhar K C
Librarian
NITTE Meenakshi Institute of Technology
PBNo. 6429, Govindpura Alias Gollahalli,
Yelahanka, Hobli, Bangalore North - 560064
Phone: 28563616
Email: gangadhar67@yahoo.com

Mr. S. Jagadeesha
Librarian
P. A. College of Engineering
Nadupadav, Kairangala Village
Near Mangalore University, Mangalore - 574153
Phone: (0824)- 2284701-4
Email: pace_library@rediffmail.com

Smt. K. Shivaleela
Librarian
P.D.A. College of Engineering
Gulbarga
Gulbarga - 585102
Phone:
Email: shivaleela_pda@yahoo.co.in

Mrs. P. Gayathir Devi
Asst.Librarian
P.E.S. College of Engineering
Mandya District
Mandya - 571401
Phone: 08232-220043
Email: gayathrip2005@rediff.com

Mrs. Gayathri Sen
Librarian
P.E.S. Institute of Technology
100 Ft.Road, Banashankari III Stage
Bangalore - 560085
Phone: 08472-20172,24360
Email: librarian-pesit@yahoo.co.in

Mr. Gavisiddappa Anandhalli
Librarian
Proudadevaraya Institute of Technology
Sha Bhavarlal Babulal Nahar Campus
T.B.Dam, Bellary Dist, Hospet - 588325
Phone: 08392-39521
Email: Gavi-a@yahoo.com;gavi_a@yahoo.com

Mr. F. S. Rudradevaramath
Librarian
R. V. College of Engineering
R. V. Vidyanikethan (post)
Mysore Road, Bangalore - 560059
Phone: 080 - 860 0184, 860 1700 / 01
Email: rvlibn@rediffmail.com

Mr. Shankara Reddy
Librarian
R.L. Jalappa Institute of Technology
Kodigehalli, Doddaballapura
Bangalore Rural - 561203
Phone: 9886751441/7626800
Email: srcddyan@yahoo.co.in

Mr. M.S.G.Naik
Librarian
Rajiv Gandhi Institute of Technology
Cholanagar, , Hebbal
Bangalore - 560032
Phone: 080-23339377
Email: masagi2004@yahoo.co.in

Ms. Saraswathi S
Librarian
Reva Inst. of Engineering & Technology Studies
222,226,227,Kattigenahalli, Jala Hobli, Yelahanka
Bangalore - 560064
Phone: 57687563/64
Email: saraswathim2000@yahoo.co.in

Ms. Shobha H.A. Prasad
Librarian
R.N.S. Institute of Technology
Channasandra, Subramanya Pura P.O.
Uttarahalli, Kengeri Road
Bangalore - 560061
Phone: 080-8603881
Email: shobhahprasad@yahoo.co.in

Mr. Rajendra R Patil
Librarian
Rural College of Engineering & Technology
Hulkoti, Gadag Taluk
Dharwad - 582205
Phone: 08484-262288,262128
Email: rrpatil_raju@rediffmail.com

Umesh B Masimade
Librarian
Rural Engineering College
Bhalki, Bidar Dist.
Bidar - 585328
Phone: 08372-89097;59589
Email: rec_bhalki@hotmail.com

Dr. Vinayak Bankapur
Librarian
S.D.M. College of Engineering & Technology
Dhavalagiri
Dharwad - 580002
Phone: 0836-447465,448327
Email: sdmcet@yahoo.com

Mr. S.G.Savadatti
Librarian
S.T.J. Institute of Technology
Ranibennur, Savadati, Dharwad Dist.
Haveri - 581115
Phone: 08373-266343, 262075
Email: shivappadn@hotmail.com;stjit@vsnl.com

Mr. Maruthy H.S.
Librarian
Sambharam Institute of Technology
Amba Bhavani Temple Road,
Near M.S. Palya Vidyaranyapura Post
Bangalore - 560097
Phone: 23643618
Email: maruthyhs@yahoo.com

Ms. Mamatha
Librarian
Saptahgiri College of Engineering
No. 14/5, Chikkasandra, Hesaraghatta Main Road
Bangalore - 560057
Phone:
Email: mamthu_nj@yahoo.co.in

Smt. Rathna B Goudar
Librarian
Shri B.V.V.Sangha's Basaveshwar Engg. College
Nijalingappa Road
Bagalkot - 587102
Phone:
Email: ratna_bg@yahoo.com

Mr.Kuragund Ningappa C
Librarian
Shridevi Instittute of Engineering & Technology
Maralenahally, Sira Road
Tumkur - 572106
Phone: 0816-2212629
Email: ningappain@indiatimes.com

Mr. K.M. Rudresh
Librarian
Siddaganga Institute of Technology
S.I.T. Campus, B H Road
Tumkur - 572103
Phone: 0816-282990,02,03
Email: km_rudresh@yahoo.com

Mr. Nanjundaiah
Librarian
Sir MV Institute of Technology
Hunasamaranahalli, Yelhanka
Bangalore - 562157
Phone: 8467248
Email: Nanjunda_mdy@yahoo.com

Mr. Vinay C
Librarian
SJB Institute of Technology
67Uttarahalli Road,kengeri
Bangalore South, Bangalore - 560060
Phone: 56901710/11
Email: vinayc1975@hotmail.com

Mr. Bore Gowda
Librarian
SJC Institute of Technology
Post Box No. 20, B.B. Road, Chickbalapur
Kolar - 562101
Phone: 08156-663181,82
Email: manjegowdamv@yahoo.com

Krishna S Maraddi
Librarian
Smt.Kamala & Sri Venkappa M Agadi College of Eng. & Tech.
Gulaganji, KoppaLakshmeshwara-Savanoor Rd.
Lakshmeshwara, Gadag - 582116
Phone: 08333-78887
Email: krishnamaraddi@yahoo.com

Mrs. G. Savitri
Librarian
Sri Jayachamarajendea College of Engineering
Mysore University Campus
Manasagangotri, Mysore - 570006
Phone: 0821-511385,512568
Email: savitri_g3@yahoo.com

Mr. Kumar G.T.
Librarian
Sri Krishna Institute of Technology
29, Chikkabaswarara Village,
Hesarshatta Road, Bangalore - 560090
Phone:
Email: kumara_gt@rediffmail.com

Mr.Santhosh
Librarian
Sri Revana Siddeshwara Institute of Technology
Chokkanahalli Jala Hobli
Devanahally Taluk District
Bangalore - 560024
Phone: 3533780
Email:

Ms. Malliaka M. H.
Librarian
Sri Siddartha Institute of Technology
Maralur, Kunigal Road
Tumkur - 572105
Phone: 0816-230314
Email:
mallikamh@yahoo.com;mallikamh@rediffmail.co

Dr. S.B.Kittor
Librarian
Sri Venkateshwara College of Engineering
Sy. No. 76/5, Vidyonagar Cross,
Chikkajala Village
Bangalore North - 562157
Phone:
Email:

Ms.Felcy D'souza
Librarian
St. Joseph Engineering College
Dharmagiri, Vamanjoor
Mangalore - 575028
Phone: 2263753-57
Email: sjeclib@yahoo.com

Mr. Shiva Shankar N P
Librarian
National Institute of Engineering
Manandavadi Road
Mysore - 570008
Phone: 0821-2480475
Email: shivageetha11@yahoo.com

Mr. Baskar.B
Librarian
The Oxford College of Engineering
Bommanahalli, Hosur Road
Bangalore - 560068
Phone:
Email: bas_sasi@yahoo.co.in

Mr. Kumaraswamy T
Librarian
Tontadarya College of Engineering
Mundargi, J.T.Math Campus
Gadag - 582101
Phone: 08372-36933,32445
Email: man_ han10@yahoo.com

Mr. S.Shyamasundar
Librarian
U. B. D. T. College of Engineering
P. B. No. 304
Davanagere - 577004
Phone: (08192)-250716, 233412
Email: bdtppl@yahoo.com

Smt. Uma Rajan
Librarian
University Visveswaraya College of Engineering
K. R. Circle
Bangalore - 560001
Phone: (080) 2245566 Extn.: 408
Email: principal@uvce.org

Mr. Ashok S R
Librarian
Vemana Institute of Technology
No.1, 100 Feet Road, 3rd Block, Koramangala
Bangalore - 560034
Phone: 25529874
Email: ashoksip@yahoo.co.in

Ms Nayana H
Librarian
Vidhya Vardhaka College of Engineering
Gokulam III Stage
Mysore - 570002
Phone: 0821-517122,410757
Email: harish_vvce@yahoo.com

Ms. Smitha S J
Librarian
Vidya Vikas Institute of Engineering & Technology
No. 127, Alanahally Lalitadripura Post
Mysore-Bannur Road, Mysore - 570010
Phone: 0821-2471635
Email: smith_smile@indiatimes.com

Mr. A. Guru Raja
Librarian
Vijaynagar Engineering College
Cantonment
Bellary - 583104
Phone: 08392-244809
Email: vce@blr.vsnl.net.in;kumargh@nsa.net

Mr. Vasanth Nitilapura
Librarian
Vivekananda College of Engineering & Technology
Nehru Nagar, Puttur Taluk,
Puttur – 574203, Dakshina Kannada Dist.
Phone:
Email: vasanthsanjeev@yahoo.com

Mr. Vijay Kumar Gowda
Librarian
Vivekananda Institute of Technology
Gudimavu Village Kengeri (Hobli)
Near Kumbalagodu, Bangalore - 560074
Phone: 8437036, 8437696
Email: gowdavijay2005@yahoo.com

Mr.Manjunath K
Librarian
Yellama Dassappa Institute of Technology
Raghuvanahalli 14th Km, Kanakpura Road,
Bangalore - 560062
Phone: 22717988
Email: manju_bps@yahoo.com

Mr.P G Mummigatti
Librarian
B.V.Bhoomareddi College of Engg & Technology
Vidyanagar
Hubli - 580031
Phone: 0836 2378123
Email: librarian@bvb.edu;horakeri@bvb.edu

Ms. Meena S Pavankumar
Librarian
Bahubali College of Engineering
Gommatanagar, Hassan Dist
Shravanabelagola - 573135
Phone: (0817)- 657276
Email: pavanmeena@rediffmail.com

Ms. K.V. Jayamma
Librarian
Acharya Institute of Management Sciences
I Stage, Ist Cross, Peenya
Bangalore - 560058
Phone: 080 28378268, 28390434
Email: Jaya_kgowda@yahoo.co.in

Ms. Vijayalakshmi J S
Librarian
Administrative Management College
AMC Building, 6th Main
30th cross, IV Block, Jayanagar
Bangalore - 560 011
Phone: 080-26638991 / 92
Email: amcbulibrary@yahoo.co.in

Ms. Kala D
Librarian
Al-Ameen Institute of Management Studies
Opp. Lalbagh Main Gate, Hosur Road
Bangalore - 560027
Phone: 080 22109558
Email: kala.6868@yahoo.co.in

Mr. Ravindra B
Librarian
B.V.V.S'S Institute of Management Studies
Basaveshwara Engineering College Campus
Bagalkote - 587102
Phone:
Email: ravindra_bims@yahoo.co.in

Ms. Adilakshmi
Librarian
Canara Bank School of Management Studies
Bangalore University, City Campus
Bangalore - 560 001
Phone: 080 22961975
Email: adilakshmi_cbsms@rediffmail.com

Mr. Thomas Joseph
Librarian
Christ College Institute of Management
Hosur Road
Bangalore - 560029
Phone: 080-25526166
Email: director_ccim@christcollege.edu

Mr. M Krishnappa
Librarian
CMR Institute of Management Studies
2079,II Main, III Block,
Hennur Banaswadi Layout
Bangalore - 560084
Phone: 080 254466340, 25425522
Email: krishnappa@rediffmail.com

Mr. H L Shivakumar
Librarian
East West College of Business Management
1948/49, 8th Main E Block
II Stage Rajajinagar, Bangalore - 560010
Phone: 080 23322909, 23321933
Email: eastwestcollege@vsnl.com

Ms. Kallur G I
Librarian
KLE'S Institute of Management Studies
JGCC Campus
Vidyanagar
Hubli - 580031
Phone:
Email: ganga_kal@yahoo.co.in

Mrs. P N Desai
Librarian
KLS Inst. of Management Education & Research
P.B.No. 504, 'Safalya' , Plot No.427
Bhagyanagar 2nd Cross, Tilakawadi
Belgaum - 590006
Phone: 0831 2405511
Email: Padmajadesai@rediffmail.com

Mr. K Gurumurthy
Librarian
M.P.Birla Institute of Management
Associate Bharatiya Vidya Bhavan
Race Course Road
Bangalore - 560001
Phone: 080 222077421, 22353408
Email: gurumuthy@mpbin.com

Mr. Janardhana Rao A N
Librarian
M.S.Ramaiah Institute of Management
MS Ramaiah Nagar, M S R I T Post
Bangalore - 560054
Phone: 080 23608769, 23606641
Email: anirao@indiatimes.com

Mr. Narasappa K C
Librarian
Sambram Academy of Management Studies
#24/1, Ambabhavani Temple Road
Jyothinagar, Vidyaranyapura P.O.
Bangalore - 560097
Phone: 080 23641018
Email: rksaxena@sambharam.net

Mr.Sunil M V
Librarian
SDM Institute of Management Development
No.1 Chamundi Hill Road
Siddharthnagar P.O.
Mysore - 570 011
Phone: 0821 2429722, 2429161
Email:

Mr. Prabhu S
Librarian
St.Joseph's College of Business Administration
#163 (73)
Brigade Road
Bangalore - 560025
Phone: 080 22127765
Email: sprabhuk@yahoo.com

Ms. Pavitra N N
Librarian
Surana Collge PG Centre
16 Kengeri Satillite Town
Bangalore - 560 060
Phone: 080 25986454
Email: pavi_shilpa@yahoo.com

Dr. Manjunatha K
Librarian
T.A. Pai Management Institute
Behind HPO
Manipal - 576104
Phone: 0820-2573551
Email: manjunath@mail.tapmi.org

Mr. Puttaswamy
Librarian
The Oxford College of Business Management
C.A.Site # 40, I st Phase
J.P.Nagar
Bangalore - 560060
Phone: 080 22455844
Email: poojeshswamy@yahoo.com

Mr. Prabhu F
Librarian
Xavier Institute of Mgt. & Entrepreneurship
Electronic City, Phase II
Hosur Road
Bangalore - 561229
Phone: 080- 28528477, 28528597
Email: ximemelibrary@yahoo.co.in