Chapter I
Introduction
1.1 Introduction
   1.1.1 Changing Role of Academic Libraries
   1.1.2 Information and Communication Technology (ICT)
   1.1.3 Library Collections
   1.1.4 Library Services
   1.1.5 Various Library Services
1.2 Background of the study
   1.2.1 Digital Reference Service (DRS)
   1.2.2 Definition of Library
   1.2.3 College Library
   1.2.4 Engineering College Library
   1.2.5 University of Pune
1.3 Statement of Problem
1.4 Objectives of the study
1.5 Hypotheses
1.6 Significance of the study
1.7 Scope and limitations of the study
1.8 Research Methodology
   1.8.1 Descriptive Research
   1.8.2 Survey Technique (Questionnaire)
   1.8.3 Methods of Data Collection
   1.8.4 Proforma Design
   1.8.5 Sample
   1.8.6 Data Collection Techniques
1.9 Data Analysis and Interpretation
1.10 Conspectus of the study
1.11 Works Cited
1.1 Introduction

The traditional aim of academic libraries is to select, collect and preserve information and to make it available to users. This traditional aim is largely based on printed material including books and journals available in the library. Everyone is aware of technological inventions and changes made accordingly. Library field is not exception to these changes. Academic libraries are changing gradually according to new technologies. Application of information and communication technology (ICT) in libraries changed the way of delivering library services including reference services. Libraries use changing technology to provide varied services to their users. Various literatures on future library services indicate that change is going on. As technology changes, libraries must use changing technology to provide better access and services to users. Electronic information and information sources are challenges for the library professionals. The role of library has been changed from traditional way to electronic to digital library. There are various stages in between this transition. Now a day, it has been shifted to virtual libraries in 21st century.

1.1.1 Changing Role of Academic Libraries

We are aware that transformation of libraries has taken place from clay tablet, leaves, print, electronic and digital library. This process has taken a long period and invention of many things during this long journey is brought about. Most important milestones in this long journey are invention of printing, computer, internet and digital devices. Physical visit to library is significantly decreased with the advent of internet and World Wide Web. Libraries are able to provide variety of services to users who may never visit library physically. Information and Communication Technology (ICT) has improved availability, accessibility and timeliness. In traditional libraries inputs were given first and users access and then use it. But this scenario is changed where input can be added and accessed simultaneously. New models like e-library, digital library, digital reference, wiki, blogs, web2.0, and lib2.0, instant messaging, web opac, links to websites and ask services are popular and familiar.

Changes seen in libraries can be listed as;
1) Form of the library.
2) Ways of collection acquisition, storage, organisation and delivery.
3) Ways of reaching to patrons.
4) Relation between library and other ICT division or the other institutes.
5) Awareness of new technology, resources, tools and its implementation.
6) Use of lib 2.0 tools, internet based tools, 24/7 services, real time services, online services, digital reference services, etc.
7) Use of web based services, repository, etc. (Karisdiddappa, C.R., 2013: p. iii-iv)

1.1.2 Information and Communication Technology (ICT)

Every field, including libraries, is facing challenges by the rapid growing new information and communication technologies (ICT) like computer, internet, telecommunication, multimedia, world wide web, digitization, virtual technologies, etc. The 21st century is marked by the advent of ICT, including internet and multimedia. Communication is basic in education field. Multimedia is one such visual aid which plays important role in teaching and learning. Multimedia means use of computers as communication aid for teaching and learning through interactive mix of graphics, video, text and audio. Internet is a world wide network of computer networks that contains a vast collection of information and resources. It forms greatest source of information accessible anywhere.

1.1.3 Library Collections

A library collection may vary according to type of library. Public library contains general reading material in form of books, journals, periodicals and newspapers on various topics and subjects. Academic library collection relates to parent institution and syllabi taught. Research libraries contain research related collection.

A library is a collection of sources of information and similar resources made accessible to a defined community for reference or borrowing (Wikipedia). Library collection may include books, journals, periodicals, newspapers, manuscripts, films, maps, CDs, DVDs, microform, cassettes, videotapes, audio books, e-books, e-journals and databases. These may be printed or electronic or digitised format or hybrid. Along with these materials, libraries also provide various services. Libraries are changing according to changing environment and they are becoming modern libraries.
1.1.4 Library Services

The objective of academic library is to serve accordingly to parent institution and make available its varied services to users. Academic libraries act as supplement to parent organisation. The services provided are named as library services and these are getting modified with effect of technology. Now a days library services are turned into information services, digital services or web based services, etc.

Library occupies vital place in the framework of academic system. It is not only storehouse of books, but also dynamic part of education system. The main objective of organisation and administration of the academic library is to facilitate the academic community to explore and utilize fully the resources of library for the maximum benefit.

William Dix says that library’s ability to make available the book, a reader needs, is its basic test of quality and further he suggests, “This is the first principle and from it stem nearly all the things we do or ought to do in libraries.” Due to this library should provide planned services to users.
1.1.5 Various Library Services

1) Circulation service

   It is a basic service. All the libraries provide circulation service. It includes issue and return of reading material. It consists of home lending service as well as for reading in library only. Its aim is to facilitate physical access to library resources.

2) Inter-library loan service

   It is the loan service between two or more libraries that have mutual understanding or agreement. In this service reading material which is not available in one library is made available from another linked library. It is helpful for small libraries that have fewer budgets. Some libraries cannot purchase all the material published in the world, this service is helpful in such cases.

3) Reference service

   Aim of this service is to assist the users in finding out the information or the document they need. This is an activity of reference department of the library for the benefit of students, faculty and other readers. In previous days readers must have to visit library for reference service, but now a day this concept has been changed to digital reference service or virtual reference service. Theme behind reference service is to provide a constant, informal and systematic personal service to users for accessing holding of the library for study and research. Recent trend in this service is digital reference service.

4) Readers assistance service

   It includes publication of new arrivals list, abstract of articles and papers, circulation of new and coming periodicals, current awareness service, etc.

5) Supplementary and auxiliary services

   This includes preservation and storage of the library documents, photocopy and reproduction, microfilming, communication facilities, audio-visual services, binding and repairs, extension service includes arranging lectures, exhibition, etc. and service for advanced readers with proper sitting space, equipments, ventilation, light, etc.
6) **Information services**

There has been information explosion in recent years. User needs and demands are growing. Conditions are changing fast, due to which size of library stock is increasing. To cope with user needs academic libraries provide information services.

7) **Internet services**

After globalisation, computer has become essential factor in every sector. Academic libraries are now providing computer with internet facility. Users can use these computers for accessing internet and can search and download information they need. This facility is widely used by the technosavvy generation.

8) **Orientation programme**

Libraries organise orientation programme for new users. By this programme they create awareness among new users regarding library holding and how to use these resources.

9) **OPAC / WEB OPAC service**

Academic libraries are now built with various library management softwares. These softwares have integrated system of OPAC, WEBOPAC for users. Users can browse the library holdings by using OPAC, WEBOPAC facility.

10) **Other services**

It includes current awareness service, selective dissemination of information, new arrivals list, reading hall etc.

11) **Bibliographic Services**

Academic libraries provide this facility for users by informing them about availability of abstracting and indexing journals and reference related documents.

12) **Document delivery services**

Use of information and communication technology (ICT) has made the document delivery services very much simple and reliable. Library networks like
DELNET, INFLIBNET, and MALIBNET etc maintain union catalogues and provide document delivery services.

Thus academic libraries are providing variety of services for their users. Technology has given many options for providing variety of library services. (Sahai, ShriNath, 2009: p. 20)

1.2 Background of the study

Library is the heart of every academic institution. It occupies central and important place in the frame of academic system. It is not only storehouse of books, but also considered as treasury of knowledge and dynamic tool of education. The primary role of library is to fulfil the aim of academic institution as well as to advance its aims and objectives. It is important place for study and research. The total functioning of library has been changed. Many libraries are fully computerised and connected with the world by means of internet. Computer, software and internet have made cataloguing and classification easy.

Main functions of library are:

i) Conservation of knowledge and information.

ii) Expansion of ideas and dissemination of knowledge with the help of interpretation, research and publications.

iii) Dissemination of knowledge through teaching and extension services.

The primary aim of the library in the academic system is to function in such a manner as to fulfil these aims. (Sahai, ShriNath, 2009: p. 31)

1.2.1 Digital Reference Service (DRS)

Many terms are used to describe the study of digital reference such as virtual reference, real time reference, chat reference and live reference. All share a central concept; the use of software and the internet to facilitate human intermediation at a distance (Magamma, M., 2013: p. 2).

Digital reference services began in the mid of 1980s but have developed rapidly in recent years. Digital reference provides more alternatives and flexibility to users, especially those operating within a virtual learning environment (Han, Lifeng and Goulding, Anne, 2003: p. 259).
Also known as virtual reference service, digital reference service (DRS) is “reference service initiated electronically, often in real-time, where patrons employ computers or other internet technology to communicate with reference staff, without being physically present.” (RUSA, 2004) (Ramos, Marian S. and Abrigo, Christine M., 2011: p. 2)

“Digital Reference Services are internet based Services that employ human experts or intermediaries to provide information to users” Whitlatch (2003).

According to James, “Digital Reference Service is provision of direct, professional assistance to people who are seeking information at the time and point of need.”

1.2.2 Definition of Library

In THE LIBRARIAN’S BOOK OF LISTS (Chicago: ALA, 2010), George Eberhart offers this definition:

"A library is a collection of resources in a variety of formats that is (1) organized by information professionals or other experts who (2) provide convenient physical, digital, bibliographic, or intellectual access and (3) offer targeted services and programs (4) with the mission of educating, informing, or entertaining a variety of audiences (5) and the goal of stimulating individual learning and advancing society as a whole." (p.1)

Along with this definition recent libraries are described also as:

i) Hybrid library

This term is utilized to describe library containing a mix of traditional print library resources and growing number of electronic resources.

ii) Automated library

A library where access points and housekeeping operations are computerized is called as automated library.

iii) Digital library

A library in which a significant promotion of the resources is available in machine readable format, accessible by means of computer is called as digital library. The digital content may be locally held or accessed remotely via computer networks.
iv) Virtual library

Access points as well as the graphic records are in electronic / digital form. When these electronic / digital libraries are connected via various networks, particularly the internet, this is called virtual library. (Singh, S.P.)

1.2.3 College Library

The college library functions basically to assist and support the study and teaching in the college. It helps to meet reading needs and requirements of the students as well as the teachers of the college in pursuit of their knowledge. The college library also provides the needed reading materials and documents for research under taken by teachers and students.

D.L. Smith and E.O. Baxten enumerated the functions of college library as:

i. To acquire and provide text and standard reference books to the students, necessary for preparation of their examinations.

ii. To train college students in the use of the library material and to encourage them to enrich their knowledge and outlook in a wider perspective through general and wider readings.

iii. To help and assist the faculty members of the college in preparation of their instructional courses and in keeping them abreast of the current knowledge and concepts in different areas of study.

iv. To assist the teaching staff in the pursuit of higher studies and research and support them with relevant literature and information on the subject. (Sahai, ShriNath, 2009: p. 32)

1.2.4 Engineering College Library

Academic library is a part of academic institution. Thus library which is attached to engineering college is engineering college library. It functions to assist and support the study and teaching in engineering college. It will also support research in that college. As engineering college is related to the technical and technological aspects, this library contains reading and other material related to technical and technological aspects. The documents and reading materials in engineering college libraries vary according to various departments / courses run by engineering college.
1.2.5 University of Pune

Pune is the important educational center of Maharashtra. Various students from every corner of India and the world come to Pune. It is one of the renowned educational centers in India. The climate of Pune is pleasant, green and good for health. The Pune city has many well-known, established institutes and colleges. Savitribai Phule Pune University (formerly University of Pune) is one of the finest and most popular educational centers in the city. It offers excellent programmes in various areas including Science, Commerce, Arts, Languages and Management Studies.

Savitribai Phule Pune University is one of the premier universities in India, is positioned in the North-western part of Pune city. It occupies an area of about 411 acres. It was established on 10th February, 1949 under the Poona University Act. The university houses 46 academic departments. It is popularly known as the 'Oxford of the East'. It has about 307 recognized research institutes and 612 affiliated colleges offering graduate and post-graduate courses.

Initially the University had a jurisdiction extending over 12 districts of Western Maharashtra. However, with the establishment of the Shivaji University, Kolhapur, in 1964, the jurisdiction of the University was restricted to 5 districts, namely Pune, Ahmednagar, Nasik, Dhule and Jalgaon. Out of these, two districts - Dhule and Jalgaon are attached to the North Maharashtra University established in August 1990. Now there are only three districts Pune, Nasik and Ahmednagar.

During the year 1949, there were only 18 colleges affiliated to the University, with an enrollment of over 8000 students. Thereafter, the number of colleges increased, and in 1994-95, the University had 41 post-graduate departments, 209 affiliated colleges and 118 recognized research institutions, with an enrollment of 1,70,000 students for both the under-graduate and post-graduate courses in different faculties.

70 research institutions have been recognized by the University for research. These include institutions of national importance like the National Chemical Laboratory (NCL), MACS, CWPRS, NIV, Gokhale Institute of Politics and Economics, Deccan College among others. (http://www.unipune.ac.in/default.htm)

There are 114 engineering colleges affiliated to university of Pune, providing education in engineering at graduate and post graduate level. It covers three districts namely Pune, Ahmednagar, Nasik. It includes various well known institutes like
1.3 Statement of Problem

Statement of problem is a formal statement explaining the research problem. It is statement about a problem for which the researcher intends to find a solution. In simple words, statement of problem consists of one or more research questions.

Telecommunication, information and communication Technology (ICT) have great impact on every field including libraries. Use of internet is increasing day by day. User demands are also changing and increasing. The number of people visiting library physically is declined significantly and people accessing libraries’ website and internet have grown. People are using online banking, ATMs, electronic billing, e-commerce, etc. Due to these technological changes people expect information from libraries at any point and at any place easily. They expect online data, online catalogue, electronic resources, web based database, etc.

A majority of today’s library clients are millennial, who are characterized as technology savvy, visually oriented, multi-taskers, very demanding and expect nomadic, anytime and anywhere communication (Becker, 2009). In relation to this, there are changes in the help seeking preferences of students. Library clients prefer to access the library via the internet and seek the help of a reference librarian in a digital environment. Thus, they opt to make use of the digital reference service over the traditional reference service being rendered. However, use preference of the library clients may be influenced by their level of awareness of the availability and the knowledge of the features and processes involved in the existing digital reference service (Granfield & Robertson, 2008) (Ramos, Marian S. and Abrigo, Christine M., 2011: p. 2-3)

On the other hand many people are not aware of using online services. They still rely on traditional services. Due to this digital reference services are not fully utilized. There are also lacunias in spite of technological upgradation. It became necessary to study the current status; rating of services, quality of services, measures to improve quality of digital reference services, user feedback and awareness among
the people to increase use of digital reference services. The present study aims at understanding issues related to digital reference services in engineering college libraries affiliated to University of Pune.

1.4 Objectives of the study

Every social research has specific objectives for which the study is conducted. Without definite objectives, research has no meaning. Objectives are list of activities to be performed during the research process for solving the research problem.

The objectives of present study are as follows:

a) To investigate and identify the current level of digital reference services in engineering college libraries affiliated to University of Pune, Pune.

b) To identify strength and weakness of existing digital reference services of libraries under study.

c) To examine use, need, expectations of users of digital reference services in libraries under study.

d) To measure cost and benefits of digital reference services with reference to human resource, budget, technology and user education.

e) To suggest possible solutions for gaps if any in digital reference services and suggest priorities for continuous improvement.

1.5 Hypotheses

According to George Moully (1978) hypothesis is a tentative generalization concerning the relationship between two or more variables. According to Leedy and Ormrod (2001) a hypothesis is a tentative proposition set forth to assist in guiding the investigation of a problem or to provide possible explanations for the observations made. Thus the hypothesis acts as guiding force for the proposed research. With the help of hypothesis a researcher is able to provide more explanations about his initial observations related with the research problem being investigated. Hypothesis should be simple, clear, testable, and based on knowledge and theories. (Kumbhar, Rajendra, 2014: p. 314)
The present study is based on following hypotheses.

i. Library users are satisfied with the digital reference services provided by the college libraries.

ii. Providing digital reference services are expensive in terms of finance.

iii. Digital reference services are not used at high extent by users of engineering college libraries.

1.6 Significance of the study

According to Chowdhury and Chowdhury (2001) most researches have focused on access to and retrieval of digital information rather than digital reference services. There is no doubt digital reference service is a new powerful method for delivering reference service. Robinson (2008) discusses the current generation of students as being digital natives. These natives will benefit from the availability of a variety of digital reference services (Pomerantz, J., 2003: p. 4).

The principal significance of this research is to create new knowledge along with other significances such as to find current status of digital reference service, level of quality, user satisfaction level, feedback and suggestions of users, problems faced library professionals in implementation. In response to the emerging issues and challenges in implementing, managing and evaluating DRS, librarians as well as professional associations, such as the International Federation of Library Associations (IFLA) and the American Library Association’s (ALA’s) Reference and User Services Association (RUSA) compose, modify and publish guidelines for DRS (RUSA, 2004; IFLA, 2005) (Ramos, Marian S. and Abrigo, Christine M., 2011: p. 3). There have been a substantial number of studies on evaluating the DRS in foreign countries but very little research is made locally. There is less research on this subject in India also. It is necessary to study the digital reference services in engineering colleges because these colleges are creating Engineers which build the nation in many ways.

1.7 Scope and limitations of the study

Scope of research problem states the coverage of research and also covers area in which research is to be done. This research study covers engineering college libraries affiliated to university of Pune. As per web site of Directorate of Technical
Education, Maharashtra, there are 114 engineering colleges under University of Pune (www.dtemaharashtra.gov.in). Geographically these are spread over in three districts i.e. Pune, Ahmednagar and Nasik. These college libraries are to be evaluated with reference to digital reference services.

The scope of this study is to evaluate digital reference services with its new features. In the present trends there are various forms like E-mail, ASK a Librarian, web forms, Chatter bots, Simple chat services, extended chat services, web contact service, Instant messaging, VOIP service, Video conferencing, collaborative reference network, web 2.0, electronic document delivery service, link to website, e-resources, online database, subject gateways, etc.

For the purpose of this study, digital reference is defined as any service provided to users that can be accessed remotely (Moran, Carrie., 2010: p. 2). This definition encompasses email, chat reference, library websites, web 2.0 technology, online resources and desktop sharing software. Each of these services can be accessed by users from their home or any other computer with internet. There is significantly less research on digital reference services of engineering college libraries in India due to which this research topic has been selected for study.

**Limitations of the study**

This study has following limitations.

1) The study is to be completed within time period as per Ph.D. rules and guidelines.

2) It does not cover other traditional college libraries like Arts, Commerce, Science and Management, etc.

3) It also does not cover other library services.

4) The study covers only engineering college libraries affiliated to University of Pune.

**1.8 Research Methodology**

Present study is descriptive, basic, evaluative and qualitative research. Research Methodology mainly highlights the method chosen for reading the target on result, conclusion or generalization. It is systematic inquiry, exhaustive investigation or experimentation for its aim, the discovery and their correct interpretation.
Methodology primarily supports continuous research for knowledge and understanding. (Kumbhar, Rajendra, 2014: p.111)

1.8.1 Descriptive Research

Descriptive research is a research that describes accurately and objectively an organisation, its resources, facilities, services, programmes, events, problem, etc. Descriptive researcher’s job is to just describe what has happened or is happening. Purpose of descriptive research is to describe current status, process, procedures and correlations, get answers to questions to present background information about event. Researcher neither has any control over variables nor does he manipulate any variable as is done in experimental research (Kumbhar, Rajendra, 2014: p.116)

1.8.2 Survey Technique (Questionnaire)

Survey is process of knowing characteristics of a particular population. It is process of understanding the population, its current nature and status. Survey is research method which arrives at logical conclusions about a population by studying a sample. Survey generalizes by analyzing sample data.

Being a sample based study, survey enables in delivering accurate conclusions about population. Many times the number of elements in the population of a survey is very large. Considerable time, money and efforts will be required for studying a large population. Survey studies only samples which help to saves time, money and efforts.

Survey is systematic way of collecting data from samples. It collects data from samples at a single point of time. Sample is small group that represents the population. Survey aims to describe the characteristics and experiences of population, thus survey is type of descriptive research.

The survey method consists of various techniques like observation, questionnaire and interview. For data collection of this study questionnaire method is used mainly, hence discussed in detail. While preliminary survey of websites of engineering college libraries under study, observation technique is used for checking availability of digital reference services. Whenever possible, interview technique is also utilized for recording response. A detailed; structured questionnaire for librarians and users is designed and distributed among respondents in engineering college libraries under study. Questionnaire is designed by keeping focus on aims and objectives of this study. Researcher had prepared mixed questionnaire to avail benefits of both the types of questionnaires. Most of the questions are close ended, few are open ended. Mixed questionnaire helps to get qualitative as well as
quantitative data. Before mailing questionnaires to respondents, a pilot survey has been taken. Thus researcher has taken all care to construct appropriate questionnaire, which helps in getting accurate and adequate data for fulfilling aims and objectives of the study.

1.8.3 Methods of Data Collection

While deciding about the method of data collection to be used for the study, the researcher keeps in mind two types of data i.e. primary and secondary. The primary data are those which are collected afresh and for first time and thus its original in character. The secondary data are those which have already been collected by someone else and undergone through the statistical process.

The researcher has used both primary and secondary data for this study. Primary data are collected by using questionnaire technique. While preliminary survey of websites of engineering college libraries under study, observation technique is used for checking availability of digital reference services. Whenever possible, interview technique is also utilized for recording response. While secondary data is collected from published books, journals, library literature, reports, thesis, dissertations; conference/seminar proceedings and database from internet etc.

1.8.4 Proforma Design

Kunz, Rittel&Schwuchow, (1977) given the following factors for consideration while designing the proforma:
1. Should be designed on the basis of the objectives of the study.
2. Maximum information should be obtained through YES/NO answers or through one of the answers provided in the proforma.
3. The contents in the proforma should be familiar to the respondents to draw out objective information.
4. The statements/questions should be both open ended and close ended.
5. The contents in the proforma which are not self-explanatory, for such statement/questions, instruction should be included by the surveyor.

Researcher uses these guidelines for designing proforma of questionnaires.

1.8.5 Sample

Data required for research could be obtained either from all elements in the population or it could be obtained from samples. To complete study in time, to avoid expenses and with practical approach, researcher studies selected elements (samples) from concerned population.
In present study 114 engineering college libraries affiliated to University of Pune is the population. A list of engineering college libraries affiliated to University of Pune with website listed on Directorate of Technical Education, Maharashtra, has been used. Preliminary survey of websites of engineering college libraries affiliated to University of Pune has been conducted for evidence of digital reference services. Out of 114 colleges, 99 colleges are providing digital references services. These 99 college libraries are used as sample. Convenience sampling method is used and 90 engineering college libraries are selected for study of their digital reference services.

1.8.6 Data Collection Techniques

Data is an essential ingredient for any research. Research means to resolve problems. To resolve a problem one must have data related to all aspects of the given problem. For this study both primary and secondary data is used. Primary data is collected by using questionnaire technique. As per convenience sampling method questionnaires are distributed to 90 engineering college libraries under study.

Seven questionnaires for each college including one for librarian and six for users (Faculties, Researchers and Students) are distributed with request to fill up these questionnaires. Thus total 630 questionnaires are mailed, out of which 90 for librarians and 540 for users are mailed. Out of these questionnaires fully filled 392 questionnaires are received back. In these 392 questionnaires 56 librarians and 336 questionnaires are received from users. While out of 336 user questionnaires 12 researchers, 136 faculties and 188 students questionnaires are there. Researcher gets 62.22 % response rate for primary data collection.

Secondary data is collected from published books, journals, library literature and database from internet, reports, thesis, dissertations; conference/seminar proceedings, etc. Researcher searches in market and libraries for books on digital reference service, but books are not available on this topic. Hence maximum internet database is used. Secondary data is used for history, development and applications of digital reference services.

1.9 Data Analysis and Interpretation

Data analysis includes various activities. Data coding and classification are the two primary activities under analysis. Next step is recording of data in table format.
Numbers of statistical processes are carried out on tabulated data. Interpretation is making predictions on the basis of analysed data.

After receiving fully filled questionnaires, researcher performs data coding and classification. Then recording of data is done in form of tables which is called as tabulation. For this purpose researcher uses Microsoft Excel Software. From the tabulated data, charts/ graphs are prepared for easy understanding. Statistical process carried out on the tabulated data is frequency distribution and percentage calculation. 44 tables and 51 charts/ graphs are prepared for interpretation. On the basis of tables, charts and graphs prepared, researcher has carefully made interpretation and conclusions. Based on these conclusions, researcher has made major research findings, recommendations and suggestions. While doing data analysis and interpretation researcher has taken care of fulfilling objectives of the study. With the help of tables created in the data analysis, testing of hypothesis is also done by researcher. For hypothesis testing chi-square test has been used.

1.10 Conspectus of the study
The present study is represented in the following six chapters:

Chapter – I: Introduction
This chapter covers introduction, background of study, statement of the problem, objectives of the study, hypotheses, significance of study, scope and limitations, research method, sampling technique, and data collection technique, etc.

Chapter – II: Digital Reference Services
In this chapter overview concept and origin of DRS, emerging models of DRS such as virtual reference, web based services, web 2.0 services, Instant Messaging Services, VoIP, Institutional Repository, etc., general process models, DRS collaboration, benefits and limitations, personalized services, trends and challenges, technological development, evaluation and guidelines, etc. are covered.

Chapter – III: Literature review
This chapter comprises a literature review of DRS and covers the background and evolution of digital reference services and previous research done on DRS at national and international level.
Chapter – IV: Data analysis and interpretation

This chapter deals with analysis and interpretation of data collected through questionnaires distributed in 90 engineering college libraries affiliated to University of Pune. Out of these 56 college libraries return fully filled questionnaires and data thus collected is tabulated, interpreted for easy understanding. From tables appropriate graphs and diagrams are created for easy understanding. For this purpose Microsoft Excel Software has been used.

Chapter – V: Findings and Recommendations

This chapter covers major findings, recommendations, testing of hypothesis, further area of research and conclusion of the study.

Chapter VI: References

This chapter covers various references used for the study.

Appendices

1. List of Engineering Colleges
2. Questionnaires (Librarians and Users)
3. Research Papers Published.
1.11 Works Cited


http://libguides.ala.org/library-definition.


http://www.unipune.ac.in/default.htm


Chapter II
Digital Reference Services
2.1 Introduction
2.2 Evolution of Digital Libraries
2.3 Overview Concept of Digital Reference Services
2.4 Evolution of Virtual Reference Services
2.5 Definitions of Digital Reference Service
2.6 Elements of Reference Service
2.7 Elements of Digital Reference Service
2.8 Classification of Digital Reference Service
   2.8.1 Asynchronous Transactions
   2.8.2 Synchronous Transactions
   2.8.3 Collaborative Networks
2.9 Objectives of Digital Reference Services
2.10 Facets of Quality for Digital Reference Services
2.11 Implementation and Maintenance of Digital Reference Services
2.12 IFLA Digital Reference Guidelines
   2.12.1 Administration Guidelines
   2.12.2 Practice Guidelines
2.13 Methods of Digital Reference Services
   2.13.1 Online / digital services
   2.13.2 Real Time Reference
   2.13.3 Question Point Reference Service
      2.13.4 Web Form Services
      2.13.5 Web Based Reference Services
      2.13.6 Web 2.0 Services
2.14 Evaluation of Digital Reference Services
   2.14.1 Methods of Evaluation
2.15 Advantages of Digital Reference Services
2.16 Disadvantages of Digital Reference Services
2.17 Trends and Challenges in Digital Reference Services
2.18 Works Cited
2.1 Introduction

Academic libraries have various sections like acquisition, processing, circulation, reference, periodicals / journals, computer and internet, reprography, etc. All these sections are important and out of which reference has been one of the popular and main section and function of library. In past, reference function was largely based on print materials. But as technology and ICT have impacts on every filed, reference function is also changed. Reference section now uses print as well as electronic, digital resources to provide reference service. Major revolutionary change came in libraries especially in reference services are due to impact of computer, ICT and internet. The information can be obtained in any format like print or digital and also text to multimedia.

Information and reference services are continuously developing as is the library itself. The earliest concept of modern reference work is usually traced to Samuel Swett Green’s 1876 paper entitled “personal relation between libraries and readers” in which he advocates the importance of personal service and guidance to the library users (Han, Lifeng and Goulding, Anne, 2003: p. 251). Till now the concepts and practices of reference work have been increased and evolved significantly. Based on Green’s ideas, Bopp and Bunge categorize the practices of reference services into three groups (Han, Lifeng and Goulding, Anne, 2003: p.251)

1) Information services that take the forms of ready reference questions, bibliographic verification, interlibrary loan and document delivery, information and referral services and information brokering.
2) Guidance including readers’ advisory services, bibliotherapy, term-paper counseling, selective dissemination of information.
3) One to one or group instruction.

As the library is changing to modern library, library professionals are adjusting services according to changing environment and user needs. Various services have changed while some new have been added. If we search related literature, we find that a digital reference service has become more important over recent years.
2.2 Evolution of digital libraries

Traditional libraries changed to automation, then electronic resources and then digital resources. But this process does not complete in short time period. It has long time history and slowly changing process. Today also it is not stopped at any point, although it is going on gradually. Thus digital libraries become the term to notify the digital counterpart of the traditional libraries. The evolution of digital libraries is not linear process, but it is contribution of many disciplines. In this era, digital libraries have become complex networked systems, which support communication as well as collaboration among different world wide spread communities containing “digital objects” and digital counterpart of printed documents, images, videos, programs, multimedia objects, etc.

Digital libraries are significantly different from traditional libraries because they permit patrons to get an on-line access to and work with electronic edition of full text documents and related images. These digital libraries have heterogeneous systems which does not follow single path. According to Smith (2001) digital library is an organized and focused collection of digital objects, including text, images, audio, video with the methods of access and retrieval and for the selection, creation, organization, maintenance and sharing of collection.

Digital libraries offer numerous benefits in terms of accessibility and search. In most library applications, digitization normally results in documents that are accessible from the website of a library on the internet. Digital library is later stage of electronic library. In digital library high speed optical fiber are used for LAN and the access is over the WAN and provide wide range of internet based services. Easily available digital information is worship of internet. All this development gives birth to new range of reference services. In this trend digital reference is the latest one. Reference services at digital libraries are most important aspects. They play vital role in fulfilling library’s aims and objectives. They act as key to library’s four primary service roles; to serve as a centre for information, formal education, research and independent learning. (Magamma, M., 2013: p. 2)
Technological Bases of Library Operations and Materials:

<table>
<thead>
<tr>
<th>Type</th>
<th>Technical Operations</th>
<th>Library Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional Library</td>
<td>Paper</td>
<td>Paper</td>
</tr>
<tr>
<td>Automated Library</td>
<td>Computer</td>
<td>Paper</td>
</tr>
<tr>
<td>Electronic Library</td>
<td>Computer</td>
<td>Electronic Media</td>
</tr>
<tr>
<td>Digital Library</td>
<td>Computer</td>
<td>Digitized Material</td>
</tr>
</tbody>
</table>

(Source: based on Pomerantz, J., 2003:p.3, also added new type)

Buckland (1992) makes difference between types of libraries: the paper, the automated and electronic, now we can add digital library in this. The differentiation of these libraries is based on the materials collected by libraries and way by which technical functions are done. The paper library consists of paper collection and technical operation through paper; the automated library contains paper but technical operation electronically; electronic library is related to both collection and technical operation electronic, while digital library contains digitized material and technical operation electronic.

Buckland’s (1992) differentiation between types of libraries is according to the technology utilized and the purpose of it. But Greenstein and Thorin (2002) differentiate types of digital libraries according to the age and sophistication of the digital library project. They further state that digital libraries can be divided as young, mature and adult digital library. The digital library which is just launched is young and it is in planning and experimentation phase which deploy some innovative technology but caters very traditional library services. The mature digital library is that which has acquired core competencies and technical understanding and focuses on integrating digital materials into library’s collections and on developing the policies, technical capabilities and professional skills required to sustain it. Greenstein and Thorin say that all digital libraries now in existence are of one of these two types. They claim that the adult digital library has yet to arrive. But this assumption has been made by Greenstein and Thorin in 2002, now situation has changed. Many libraries are turned to digital library. This is due to advancement in technology, availability of World Wide Web, etc. (Pomerantz, J., 2003: p.3-6)
2.3 Overview Concept of Digital Reference Services

The primary aim of library is to provide various services to users to meet their information needs. Various techniques used in library like classification, cataloguing, open access, OPAC, shelf-list, guides, etc. are indirect form of assistance to users to find required document in library. Every library works according five laws of library science and tries to save time of users by providing specific information as quickly as possible. This gives rise to personal efforts to bring together user and his document. This method of providing personal attention to users refers to ‘Reference Service’.

According to the American Library Association’s Glossary of Literary Terms, ‘Reference Service is that phase of library work which is directly concerned with assistance to readers in securing information and in using resources of the library in study and research.’

Dr. S.R. Ranganathan defines Reference Service as, ‘personal service to each reader in helping him to find the documents answering his interest at the moment pinpointedly, exhaustively and expeditiously.’ According to Dr. S.R. Ranganathan, in the present electronic and communication environment reference service is not only confined to the library service but also to remote users. Sometimes it is termed as e-reference service, digital reference service and virtual reference service.

New information technologies are drastically influencing every field of our life. We are living in technology era. New concepts are introduced and changing according to advanced technology. The library and information science profession is also facing these challenges. New information technologies have an impact on every aspect of library services. Information technology plays important role in every section of library. Now internet has become more popular source among new generation users and libraries. Internet enables them to find, search, receive and download required information from sources scattered all over the world. Easily available digital information has become most important part of user and librarians. It has also become cost effective and cost efficient alternative to traditional methods. Advances in computer technology result in digital revolution with digital information. All these changes give birth to new range of reference services in which digital reference is latest trend.
2.4 Evolution of Virtual Reference Services

The provision of reference services by libraries dates back to the late 19th century. In 1876, a paper by Samuel Swett Green of the Worcester Public Library identifies four components of reference services: 1) Instruct the reader in how to use the library and its resources 2) Answer readers questions 3) Aide the reader in the selection of good works and 4) Promote the library within the community (Luini, Christina, 2012: p.2).

In 2008, the Reference and User Services Association (RUSA), a division of the American Library Association (ALA) defines reference work as, “Reference transactions and other activities that involve the creation, management and assessment of information or research resources, tools and services”.

RUSA also defines reference transactions as, “Information consultation in which library staff recommends, interpret, evaluate and / or use information resources to help others to meet particular information needs.”

If we compare the Green’s 1876 definition with RUSA’s 2008 definition, we can see that reference service has same component of helping users to get needed information. Since a long time ago, the physical reference desk is serving as the central point between reference service and users. Reference librarians meet and conduct reference interview with users, to understand user’s exact information needs and correlate that need with the reference sources available in library.

Fast moving technology has changed the way of thinking of librarians as well as users, regarding reference services. Information explosion and information available on World Wide Web has made information finding easier for users. Many users try to satisfy their information needs through internet. They find it more convenient. Due to this, today’s reference librarians are providing guidance to users in choosing available resources weather digital or print instead of serving as an intermediary between users and information. Accordingly changes are taking place in user needs, behavior, expectations which has a great impact on libraries and librarians. They are also pulling their services toward virtual or digital. Ask-a-services, Web OPAC, Web Forms, E-mail, Social Media, Instant Messaging Services (IM), Twitter, Video Conferencing, Chat reference etc. are becoming very much popular. Traditional reference desk is changing towards virtual one. Reference services are being provided virtually or digitally.
RUSA defines virtual reference as “It is reference service initiated electronically where patrons employ computers or other technology to communicate with public services staff without being physically present. Communication channels used frequently in virtual reference includes chat, video-conferencing, and voice over IP, co-browsing, e-mail, and instant messaging”.

RUSA’s definition of virtual reference is broad and includes both asynchronous and synchronous forms of reference.

2.5 Definitions of Digital Reference Service

The foundations of modern reference work are laid by Samuel Swett Green in 1876. From that, the practices engaged in reference service have been changed, but central aim of reference service is as it is i.e. to answer and provide exact resources to users for their query. The terms “Digital Reference”, “Internet Information Services”, “E-reference”, “Virtual Reference”, “Real Time Reference”, “Live Reference” and “Chat Reference” are used to describe reference services that utilize computer technology in some way. All share the central objective, use of software and internet to facilitate human intermediation at distance.

Many experts have defined digital reference service as follows:

According to James, “Digital reference service is provision of direct, professional assistance to people who are seeking information, at the time and point of need.”

Smith defines, “Emphasis on use of print as well as digital reference services – provided over the internet and can involve the use of both print and digital resources.”

Hirko defines, “A library service that provides answers to computer questions via electronic means such as e-mails, web forms, interactive chat and application sharing” (Digital Reference Services, accessed through Google)

According to Lankes, “Digital Reference Service refers to the position of human intermediated service over digital network.”

Digital Reference Service may be defined as, “The provision of reference services involving collaboration between library user and librarian, in a computer based medium. These services can utilize various media, including e-mail, web forms,
chat, video, web customer call centre software, voice over internet protocol (VoIP), etc.”

Hence we can conclude that digital reference service requires computer communication with digital network, should have connection between user and the librarian. (Chandwani, Anita, 2006: p. 2)

According to Whitlatch (2003) “Digital Reference Services are internet based services that employ human experts or intermediaries to provide information to users”.

Also known as virtual reference service, digital reference service (DRS) is “reference service initiated electronically, often in real-time, where patrons employ computers or other internet technology to communicate with reference staff, without being physically present.” (RUSA, 2004) (Ramos, Marian S., 2011: p. 2)

Linda Berube (2003) defines that digital reference refers to a network of expertise, intermediation and resources placed at the disposal of someone seeking answers in an online environment.

John M. Wasik (2003) defines, “Digital Reference and ask-a-services are internet based question and answer services that connect users with experts in a variety of subject areas. In addition, experts may also provide users with referrals to other online and print source of information”. (Maharana, Bulu and Panda, K.C., p. 2)

2.6 Elements of Reference Service
A reference service incorporates the following three basic elements:

1) Information or Knowledge base.

2) User or client now likely to be a member of the new cyber-community in which the library operates.

3) Information professional or librarians, who play the role of intermediary assisting and advising the user in their information seeking (Sharma, Sumati; Kumar, Ashok and Singh, Mohinder, 2004: p. 11)

First element is information or knowledge base, which is important part of reference service and includes Encyclopedias, Yearbooks, Dictionaries, Directories, Bibliographies, Indexes, Atlas, Almanacs, etc. This was traditional knowledge base which is completely changed with impact of technological advancements.
Second important element of reference service is the user. According to five laws of library science, user and his information needs are prime important in reference services. User is centre point in reference service. With the advanced technology, computer, and internet, etc. user’s information seeking behavior has also changed. User don’t want physical visit to library, instead of that he wants required information right on his screen at his seat with remote location. This results in no face to face reference services.

Third factor is information professional or reference librarian. First two factors have an impact on this third factor. They are also changed according to changing environment. Role of traditional reference librarian and recent reference librarian has not changed. Both are giving same services only the ways have been changed.

Reference services have been continuously changing from traditional to automated to hybrid to digital. Technological invention played important key role in reference services in post half of 20th century. Face to face communication changed to postal and then came telephone communication. Also libraries explored use of microfilm, microfiche, tapes, sound recordings, etc. Then comes full text databases and electronic card catalogues. Gradually the electronic card catalogue shifted to the online public access catalogues (OPAC) which provided local as well as remote access. It was followed by invention of CD-ROM then in late 1990’s libraries moved from CD-ROM to internet databases. Internet database made great revolution in reference services. (Dollah, Wan Ab. Kadir and Singh, Diljit, 2009: p. 413)

According to Kasowitz (2001), many libraries and organizations have responded to increased need for formal methods of remote communication, between users and librarians by providing reference service via internet or digital reference service to users. Lankes (2000) gives five reasons for moving to electronic reference services:

1) Increasing access to resources beyond the library.
2) Lack of geographical constrains for users.
3) The need to differentiate services to different populations of users in the face of shrinking budgets.
4) Increase in complexity of information resources and the need for specialized knowledge.
5) New options for answering reference questions.

Academic libraries were the first to provide digital reference services, in the early 1980s. One of the first services to go online was the Electronic Access to Reference
Services (EARS) launched by the University of Maryland Health Services Library in Baltimore in 1984. (Dollah, Wan Ab. Kadir and Singh, Diljit, 2009: p. 413)

2.7 Elements of Digital Reference Service

The term “Digital Reference”, “Virtual Reference”, “e-reference”, “Internet Information Services”, “Live Reference” and “Real Time Reference” are used interchangeably to describe reference service that utilize computer technology in some way (Kaza, 2005). A digital reference transaction will usually include following elements:

1) The user
2) The interface
3) Electronic resources
4) The information professionals.

If we see traditional elements of reference service, it has only three elements i.e. user, resources and information professional. In digital reference the interface element has been added. In traditional reference service this element was absent because of physical visit of user to reference desk. As in digital reference physical visit is not necessary due to which the interface element gets added.

The most important part of reference service is user. User needs and expectations are of prime importance and always given first priority. Users are the centre point of reference services. As we know due to advanced technology, remote access is increased and physical visit of user to library is decreased. Due to this digital reference is convenient for such technosavy users.

The second element in digital reference service is the interface. It is new element added in digital reference. It includes form of digital reference service e.g. web form, e-mail, Chat, video, etc.

The third element is electronic resources. In traditional reference service it was information or knowledge base. Now it includes electronic or CD-based resources, web resources, local digitized materials, etc. as well as print resources.

The fourth element is the information professional(s). It remained the same in traditional as well as in digital reference service. This is also important element of reference service without which reference service is incomplete. Information professionals are also changing according to changing environment and technology. If
we see present and past of reference service, we found that present work is not different from past; only the way of doing work is changed. Present work in reference service includes technology advancement and method of delivering information has been changed. All the four elements of digital reference service are interlinked. They all are important equally. (Maharana, Bulu and Panda, K.C., p. 2)

2.8 Classification of Digital Reference Service

The digital reference service may be distinguished into three categories:

2.8.1 Asynchronous transaction
2.8.2 Synchronous transaction
2.8.3 Collaborative networks

Following figure gives a clear idea.

![Topology of virtual reference service](Sourced from Maharana and Panda: p. 3)

2.8.1 Asynchronous Transaction

This transaction involves a time gap between the receiving question and providing answers. In other words it refers to the formats of digital reference service that do not occur in real-time. These transaction include e-mail based, web form, ask-a-service, virtual reference desk (VRD) service, question point, online path finder service, etc. E-mail based service uses one or more e-mail addresses to provide the
user a contact for reference help. Web forms are the forms which are placed on the library website that support the users for details about their information needs.

2.8.1.1 **E-mail based reference service**

This is a common, simple, cheaper and cost beneficiary service which involves to and fro exchange of information. User sends the query in form of a message and after time delay receives back an answer. Patrons can ask a query even when the library is closed. Library gives reply by e-mail, fax or phone as per user’s convenience. (Chandwani, Anita, 2006: p. 2-3) (Maharana, Bulu and Panda, K.C.,p. 3) (Bullard, Kristan A., 2003: p. 6)

**Advantages of E-mail based reference**

- Helpful to shy users which have psychological barrier to communicate face to face.
- Very useful to those users who have poor oral communication skills.
- Removes physical boundaries.
- No need of any extra software.
- No need of extra training.
- Useful for reference librarians also because they get time to think, plan out strategy and then search and answer the query.
- No boundaries of time for users.
- Cost-effective also.

**Disadvantages of E-mail based reference**

- Difficult to judge the urgency of needed information.
- May have problem of band-width or technical problem.
- Speed of receiving and answering query may depend on communication link over internet.
- Face to face interaction not possible.
- Reference librarian will not be able to clarify the doubt regarding exact need of user.

2.8.1.2 **Ask-A-Services**

There are some ask-a-services provided to users as follows:


It is charge based reference service and charge per question varies from $5 to $75.
• Askme: available at http://www.askme.com
It is free service where users can mail question and enter e-mail address.

• All Experts: available at http://www.allexperts.com
Free web based reference service where answers are provided by subject experts like doctors, engineers and scientists, etc.

• Question point: available at http://www.questionpoint.org
It’s a co-operative virtual reference service launched by the Library of Congress and OCLC, Dublin. This service combines an infrastructure of software and communication tools with a global network of cooperating libraries worldwide.

• Britannica: available at http://www.britannica.com
It’s free information service on the web which allows user to search and retrieve information from Encyclopedia Britannica and large number of other web resources. Along with this, there are number of services available where users can conduct a search for reference query.

Infoplease (http://www.infoplease.com)
Internet Public Library (http://www.ipl.org)
Reference desk (http://www.referencedesk.org)

2.8.1.3 Reference via Web

E-mail based reference service has merits as well as demerits. To overcome these demerits, web for transactions were developed as Ask-A-Librarian website. This provides structured web form where user must respond queries, along with their questions. Web form can be accessed from library home page or reference web page. Then users have to fill and send back this form to library through e-mail. Answers are provided by e-mail, phone or post. This web form is useful for reference librarian as well as users as it gives detailed, structured format of questions. The form is constructed carefully to avoid confusion, stress and frustration of users. (Chandwani, Anita, 2006: p. 3-4)

2.8.1.4 Virtual Reference Desk (VRD): http://www.vrd.org

Virtual reference desk permits electronic queing of users, co-browsing, web page sending, pre-defined or “canned” text message, screen capturing, slide shows, demonstration, chart transferring or conferencing and complete transcript record of
the full session. The virtual reference desk works to advance “Ask A Services” on the internet and digital reference in general.

2.8.1.5 Online Path Finders

Path finders are guides created to help users for finding information on a specific topic. Due to availability of more information on the internet, online path finders are popular. Some well known path finders are-

a) Library of Congress Website: [www.loc.gov](http://www.loc.gov)
b) Library U: [http://www.libraryu.org](http://www.libraryu.org)
   Its world’s leading provider of e-books. Its vision and aim is to enhance the role of librarians as stewards of knowledge, support their important role in serving millions of people everyday who need information.
d) Internet Public Library path finders: [http://www.ipl.org/div/pt/](http://www.ipl.org/div/pt/)
   This is collection of projects from author biography to western philosophy.
e) Path Findersonline.org: [http://www.pathfindersonline.org](http://www.pathfindersonline.org)
   This is official website for path finders of the North America Division.

Advantage of online Path Finders

- Online pathfinders are available to users whenever and wherever they can access the internet. Online pathfinders don’t have to wait for hours and weeks for librarians reply. This convenient, self help nature of online path finders is important advantage.
- The possibility of including web links to electronic resources along with text, a multimedia, digitized image, sound files is another advantage.
- A third advantage is guided searching. It helps in avoiding irrelevant web sites. Guided search helps in eliminating problems of false start and end.

Limitations of online Path Finders

- Their static nature is one of the weaknesses. Most online pathfinders are static annotated lists of resources or web links and don’t have any interactivity with users.
- Many online pathfinders are more complex in structure than printed ones and it can cause confusion to user.
- Another weakness is lack of individualization. Specific information needs of a particular individual are not part of an online pathfinder (Sharma, Sumati; Kumar, Ashok and Singh, Mohinder, 2004: p. 15-16)

2.8.2 Synchronous transaction

Synchronous digital reference refers to formats of digital reference that occur in real-time. Synchronous transaction takes place in ‘real time’ with an immediate response to query such as in chat based service, video conferencing or web cam services, Digital Reference Robots, Real Time Reference Services (Live Ref, 24/7 Ref), etc. The interaction between the user and reference librarian is live.

2.8.2.1 Chat based reference

It is also referred as instant messaging. It is a real time communication between two or more computer users over the internet. It is very famous way of communication over the internet. It is only text based. Main benefit of chat reference is that it permits the patron to stay online while getting reference assistance. Its disadvantage is that it is suitable only for one – to one communication, not suitable for multitask. This makes chat slower and required additional reference staff at busy hours.

2.8.2.2 Video Conferencing or web cam services

It is introduced as a solution to the communication problem occurring in text based services. This service is in digital form and includes visual part where reference librarian and patron can use text and speech transactions like face to face communication.

2.8.2.3 Digital Reference Robots

When reference librarian is not available, artificial intelligence is used to respond the query, it is known as digital robots. Most popular example of this service is Ask Jeeves. This service involves use of software for searching the database of question and answers.
2.8.2.4 Real Time Reference Service

Also known as real time live web reference and it is the latest trend in digital reference. Some of the well known examples are:

a) 24/7 Reference http://www.247ref.org

Set of software tools that enable librarians to provide real time reference assistance to their users over the internet. It can be used to:
- Communicate with users using real time chat.
- Guide the user’s browser to the best resources on the internet with collaborative browsing.
- Send images, files, power point presentations to user’s computer.
- Use customized, pre-scripted chat messages and web pages to improve efficiency.
- Organize scripts by subject, language category or according to user needs.
- Customize the software to integrate with participant library’s website.

b) Live Reference

It is registry of real time reference services, which is created by Gerry Mckierman. It is categorized listing of libraries that offer real time library reference or information services using chat software, live interactive communications utilities, call centre management software, web contact centre software, bulletin board services, interactive customer assistance system or related internet technologies.

c) Know-it-now services http://www.cpl.org

CLEVNET Library consortium’s know-it-Now service is an association of 31 public libraries in the Los Angeles area. These services are available to users on the web 24/7, except on certain holidays. Basically the service is extension of text based chat reference. However, it has more features and capabilities than pure chat reference. (Sharma, Sumati; Kumar, Ashok and Singh, Mohinder, 2004: p. 16-17)

2.8.3 Collaborative Networks

Increasing user needs and information explosion are the root causes of collaboration. Library and Information science field is also using the collaboration concept from long time. Resource sharing is basic example of collaboration. Collaboration helps each member library for getting desired information. Various
libraries and organizations have understood the advantages of providing digital reference service through collaborative services. The Collaborative Digital Reference Service (CDRS), provided by the Library of Congress, is an international network of libraries. This is free reference service project of Library of Congress and more than 100 partner libraries from various countries. The aim of this collaborative network is to provide professional reference service to the users, researchers at anytime and anywhere through an international digital network of library and information centers. This is world wide network of libraries in which OCLC builds and also maintains a database which include three main elements- member profiles, request manager and knowledge base.

Member profile contains member information regarding strength and features. Request manager contains software for entering, routing and answering reference questions. Knowledge base is a searchable database for questions and answers for future use. (Chandwani, Anita, 2006: p.6)

2.9 Objectives of Digital Reference Services

There are various reasons and benefits of providing digital reference services. These vary from library to library. Some of the objectives are:

- To provide excellent service.
- To assist users in their educational and research related needs.
- To provide individual help.
- To provide and maintain an appropriate collection of reference resources in print as well as electronic format.
- To help users in searching exact information.
- To save the time of users as well as library staff.
- To save space occupied by print resources.
- To make information search interesting and convenient for users.
- To promote remote access.
- To avoid physical visit to library which will help users automatically as they can get required information at their place.
- To educate users regarding resources and research techniques in order to help them in getting required information. (Maharana, Bulu and Panda, K.C; p. 3)
- To extend digital reference service to users who are physically challenged and can’t visit library.
- To allows users to contact library online and in real time 24/7 so that they can get required information at any time and from any place.
- To satisfy user information needs.
- To reach more and more users as per their convenience.

2.10 Facets of Quality for Digital Reference Services

The 1997 Virtual Reference Desk Expert Panel has identified eleven characteristics and features (referred to as facets of quality) for building a digital reference service for the educational community and its fifth version is published in June 2003 (Virtual Reference Desk Expert Panel, 2003). The facets are classified into two main categories: user transaction and service development/management. The user transaction category includes the components that occur during the question-answering process and features visible to the user. The service development / management category includes decisions made during creating and maintaining the service that affect overall quality and user satisfaction.

2.10.1 User Transaction

It includes following components.

Accessible: Digital reference services should be easily accessible and navigable by any internet user, regardless of equipment sophistication, physical disability or language barrier.

Prompt turnaround: Questions should be replied as quickly as possible. Actual turnaround time depends upon question-answer policy and available resources such as staffing, funds, technology, etc.

Clear response policy: Clear communication should be done either before or at the start of every digital reference transaction to reduce any user confusion and inappropriate inquiries.

Interactive: Digital reference services should provide opportunities for an effective and interactive communication between users and experts so that users can communicate necessary information and clarify vague questions.
Instructive: Quality digital reference services should be instructive and should offer more to users than straight, factual answers; they guide users in how to formulate questions, subject knowledge and information literacy.

2.10.2 Service Development and Management

Authoritative: Experts of a digital reference service should have required knowledge and educational background in the services given subject area or skill in order to qualify as an expert. Specific levels of knowledge, skill and experience are determined by each service and its related discipline or field.

Trained Experts: Services should extend effective orientation or training processes to prepare experts to respond to inquiries using simple, clear and effective language and following service response policies and procedures. Training of information specialists is one of the most important criteria of planning and operating a digital reference service.

Private: All communications between users and experts should be held in complete privacy.

Reviewed: Digital reference services should regularly review their processes and services. Ongoing review and assessment helps to ensure quality, efficiency, and reliability of transactions as well as overall user satisfaction.

Provide access to related information: Along with direct response to user questions, digital reference services should also offer access to supporting resources and information. Services can reuse results from question-answer exchanges in resources such as archives and Frequently Asked Questions (FAQs).

Publicize: Services should inform potential users about the value that can be gained from use of the service. A well-defined and structured public relations plan can ensure that services are well-publicized and promoted on a regular basis. Care should be taken that publicity should not create more demand than the service has capacity to handle. (Vijaykumar, Manju and Vijaykumar, J.K., 2005: p.4) (Bullard, Kristan A., 2003: p. 8-9)

2.11 Implementation and Maintenance of Digital Reference Services

While implementing and maintaining the digital reference service following points should be considered:
1) Recruiting new librarians

Care should be taken to appoint staffs who have new technology skills. Now a days library schools are designing curriculum according to changing technology in library field. This helps while appointing new library staff.

2) Staff Training

When new staff appointment is not possible, staff training should be organized for current staff. These training programmes should be frequently organized. It helps current staff to redesign their skills and competencies.

3) Designing Prototype

This includes creating and testing the service. Computers, softwares, trained staff, etc. are the basic and essential requirements in creating the digital reference service. It requires pre-testing before the final implementation.

4) Interface Design

The online reference desk should be designed to permit easy access to resources for large number of users. While planning the site, one must think about hardware and technical limitations of end users. Requirement of hardware for using this service should be clearly stated.

5) Legal Issues

While providing digital reference service, legal issues must be considered and care should be taken accordingly. Some of these are national information policy, copyright, public information legislation, etc.

2.12 IFLA Digital Reference Guidelines

The purpose of these guidelines is to promote digital reference best practices on an international basis. “The terms, “Virtual Reference”, “Digital Reference”, “E-Reference”, “Internet Information Services”, “Live Reference” and “Real Time Reference” are used interchangeably to describe reference services that utilize computer technology in some way…..” (IFLA Digital Reference Guidelines: p.1) IFLA’s discussion group on reference first met in 1998. In 2002 realizing the importance of these issues and growing audience, IFLA created the official standing committee on reference work.
Defining a user base:

Before starting a digital reference service, it is necessary to find who is target clientele. Think how it can enhance and expand an institution’s user base. If institution has online service provision then physical location doesn’t matter. By this service institution’s traditional users as well as new users may get benefited. These guidelines are mainly divided into two broad categories.

1. Administration guidelines.
2. Practice guidelines.

2.1.2.1 Administration Guidelines

Before establishment of new services one must review procedures and policies of an institution. This includes:

A) Reference Policy

- Set goals for new reference service.
- What will be the review period for policy?
- Compliance with copyright and other legal limitations.
- Explain who can use the services in detail.
- Determine policy regarding questions, client misbehavior, etc.

B) Planning

- Create working group and establish service priorities.
- Develop concrete vision and initial action plan.
- Review available software, services and sources of funding.
- See the possibility of co-operative service.
- Secure managerial support.

C) Staffing

- Select staff on the basis of interest, ability, availability, ICT skills, interpersonal and communication skills.
- Explain clear responsibility, job description and assignments, etc.
- Consider how many librarians, technicians, etc. are required.
- Schedule the staffing according to user needs and expectations.
- Determine rescheduling of workload, back-up, technical support, maintaining reference standard, limitation on use, etc.
D) Training

- Determine who will train the staff, time period, orientation, professional development, etc.
- Key skills should include multi tasking, clear communication skills, searching skills, interviewing skills, etc.
- Regular updated training necessary.

E) Interface Design

- Provide appropriate workspace for staff.
- Access should be regardless of language, technical capability and physical impediments.
- Set up virtual workspace properly.
- Should be user friendly interface and easy navigation.
- Clearly state Do’s and Don’ts, minimum hardware requirements.
- Provide means of feedback, etc.

F) Legal Issues

- Librarians should be familiarize with public information legislation, national information policy, copyright, privacy and confidentiality issues, licensing agreements, digital reference and information freedom.

G) Publicity and Promotion

- Identify target audiences.
- Develop project logo/name/identity.
- Create strategic links from library website.
- Contact local media.

H) Evaluation

- Conduct user surveys of both patron and staff.
- Compile and evaluate statistics of service, technical or policy issues.
- Implement changes after statistical analysis.
I) Collaboration

Collaborators must
- Establish a common vision of the services.
- Determine common guidelines for execution.
- Establish accountability.
- Think over future problematic issues like copyright law, licensing agreements, liability, national information policy, etc.

2.12.2 Practice Guidelines

i) General Guidelines

Participants should-
- Be committed to provide effective assistance.
- Show professional courtesy and respect.
- Acknowledge receipt of user question.
- Apply good search strategies, etc.

ii) Content Guidelines

Digital reference services should
- Informative, promote information literary.
- Maintain objectivity; use neutral questioning, interview technique to determine “the real question”.
- Provide with accurate answers, well structured written response.
- Avoid jargon, acronyms, abbreviations, etc.
- Select and site only from authoritative resources.
- The librarian should add value to information and do his/her best to locate and recommend at least one resource for every question.

iii) Chat Guidelines

- Chat should be initiated as soon as possible.
- Queries should be responded to in the order that they are received.
- Take care that other users are waiting.
- Ensure that user is not disconnected at regular intervals.
- Bookmark URLs which are used frequently.
- Use appropriate spelling, grammar and capitalization, etc.
iv) Guidelines for chat sessions

- Allow the user to fully explain his need.
- Use open ended questioning technique.
- Break up long responses into smaller blocks.
- Use complete citations.
- Use client’s name, avoid yes/no responses.
- Clarify confusing terminology.
- Avoid excessive jargon.

2.13 Methods of Digital Reference Services

Digital reference service is an advancement of traditional service that is emerging as natural solution for user’s increasing information needs in changing environment. There are various methods for operating digital reference service. These are discussed below.

2.13.1 Online / Digital Services

Digital service is a network of experts, intermediation and resources placed at the disposal of patron seeking answer online (Magamma, M., 2013: p.7). These includes following services:

i) Web OPAC

OPAC stands for Online Public Access Catalogue. An OPAC displays all the bibliographic information of library. OPAC is modern and flexible form of traditional catalogue card and provides access to any recorded information within a computer. Online Dictionary for Library and Information Science (ODLIS) defines OPAC as, “An Acronym for Online Public Access Catalogue, a database composed of bibliographic records describing the books and other materials owned by a library or library system, accessible via public terminals or workstations usually concentrated near the reference desk to make it easy for users to request the assistance of a trained reference librarian. Most online catalogs are searchable by author, title, subject and
keywords and allow users to print, download or export records to an e-mail account.” (Husain, Rashid and Ansari, MeltabAlam, 2006: p.41)

Web OPAC is a library catalogue on the web or intranet. In other words web OPAC is an OPAC provided on the web and anybody can access it from anywhere with the help of internet. It functions to facilitate the patron’s search for library holdings. It is useful for patrons because they can search library holding by author, title, subject etc. by sitting anywhere in the world. Also users can do reservation of library materials remotely. It is important application of library which requires high speed networks like LAN, WAN, Internet, and Intranet with broadband width.

According to Online Dictionary of Library and Information Science (ODLIS), “An Online Public Access Catalogue (OPAC) that uses a graphical user interface (GUI) accessible via the World Wide Web as opposed to a text based interface accessible via telnet.”

OPAC usage is limited while web OPAC usage is global. Web OPAC is accessible through internet. It has facility of using hypertext links to allow navigation through bibliographic records. It has solved problem of physical space in library. It also saves the time of users as well as staff.

In spite of these advantages, there are also disadvantages of web OPAC. It does not provide sufficient information in the retrieved bibliographic records to enable the user to judge the usefulness of the documents. It does not rank the retrieval sets in decreasing order of probable relevance to the patron’s search criteria. Also does not provide open-ended, explanatory searching through pre-established linkages between records in the data base to retrieve documents related to those already found.

Some existing web OPAC in India are –
-Indian Statistical Institute Library, Delhi
http://www.isid.ac.in/library/new_search_/ib.html
- Tata Institute of Fundamental Research Library, Mumbai
http://158.144.68.87/ISSearch.html.
- Tata Institute of Social Sciences Library, Mumbai
ii) Subject portal / Subject gateways

The term subject gateways or subject based information gateways are emerged during 1990s. It is described as, “A network resource discovery service which provides database of internet resource descriptions with a specific subject focus and created according to specific selection and quality criteria.” (Heron, Susan J. and Hanson, Ardis, 2003: p.3) World Wide Web is rapidly becoming fastest increasing repository of data. People use internet widely. What librarians do for books, the same thing the subject gateways are doing for internet. It is an internet search tool for helping users to find information on the internet. For example electronic journal software datasets, electronic books mailing lists and articles or papers.

Using subject gateways instead of search engine, results in the return of more authentic and related web pages from search. Each gateway has selected and utilized a standard metadata schema for describing the resources incorporated into gateways. The metadata is applied by librarians or educators with experienced knowledge of the disciplines. (Poonkothai, R. and Ganesan, A., 2008: p.102-103)

Subject portals are newest resources. An example of the transition of subject gateways into portals is EEVL (Enhanced and Evaluated Virtual Library) which is award winner free service and provides timely, authentic access to the best engineering, mathematics and computing information available on the internet. Experts select, catalogue, classify and index the subject materials and ensure that only current, high quality, useful resources are included. Effective portals accomplish one of the three goals or all three goals as:

a) Establish procedures for creating web portals that link the expertise of interdisciplinary researchers.

b) Establish a procedure for digital libraries to exchange and share documents, queries and services among digital collections as well as within a single digital collection.

c) Address the different levels of interoperability.

Interoperability includes defining document, query types, managing resources, items described in the portal, establishing intellectual property rights and providing as wider collection related to subject area. (Heron, Susan J. and Hanson, Ardis, 2003: p.3)

Portals should guide the patrons through the use of effective metadata, guided queries and human factor architecture that will provide targeted online content with increasing dependability and convenience to users. It should be done through
standards, dynamic content linking tools, semantic web engines and standardized user interfaces.

iii) **Online database / Web database / Bibliographic database**

As its nomenclature suggest, it is available online or on web. There are large resource collections of machine readable data that are maintained by commercial agencies and can be accessed through communication lines. Most of the libraries subscribe these databases for easy access and use of current information for users. Examples of these are web of science, current contents, SciFinder Scholar, Eicompendex, etc. It also includes some disadvantages. First one is that it only includes bibliographic data and does not include full text data. Second disadvantage is that the information cannot be searched and accessed when the system is down for any reason. On the other hand, it is useful for technosavvy users and remote access (Bhatnagar, Anjana, 2005: p.430-431)

iv) **Institutional Repository**

When we use the term ‘Institutional repository’, we use ‘institution’ to present the educational or research establishment which will be library’s parent body. Institutional repositories emerged from universities, but now spreading into other types of educational institute also. The first and still best known disciplinary repository was arxiv ([www.arxiv.org](http://www.arxiv.org)) which is repository of research papers in particle and high energy physics.

Institutional repositories are digital collections of the output created within a university or research institution. The purpose of repository may different according to type of institution. In most cases they are established to provide open access to the institution’s research output. Repositories are based on internationally agreed set of technical standards i.e. they expose the metadata which includes the bibliographic details such as author names, institution affiliation, date, titles of article, abstract etc. of each item in their collection on the web. There are almost 1300 repositories around the world and growing at an average rate of one per day. The statistics on the numbers and where they can be found in the Registry of Open Access Repositories (ROAR: [http://roar.eprints.org/](http://roar.eprints.org/)) and in the Directory of Open Access Repositories (Open DOAR [http://www.opendoar.org/](http://www.opendoar.org/)). Institutional repositories contain peer-reviewed journal articles and conference proceedings, now research data are increasingly created in digital form.
Datasets may be of many types – spreadsheets, photographs, audio files, video files, diagrams, charts, etc. Some institutional repositories also contain books or book chapters, theses, dissertations and presentations. Anyone with the help of internet can find themselves an article or dataset in an institution’s repository via a web search.
(Enabling open scholarship EOS accessed through www.openscholarship.org)

Advantages of Institutional Repository

- Explores the output of institution to the world.
- Increases the visibility and impact of the output as a result.
- Manages and measures research output and teaching activity.
- Provides work space for work in progress.
- Supports interdisciplinary approaches to research.
- Individual authors also enjoy the same increased visibility for their work and impact.
- Repositories form permanent and important part of scholarly communication process.

v) E-books and e-journals

E-books are invented by Michael Hart, a student at the University of Illinois, in 1971. He founded project Gutenberg, the first and largest collection of e-books available online. The first commercial e-book was launched by Random House in 1981. In mid 1990’s, e-books were started to be as alternative to traditional print documents. Although e-books continue to represent only a smaller part of the total book market and its supply has increased slowly over the past 20 years. (Owen, Victoria and others, 2008: p.3)

Defining e-books depends mostly on the situation in which the term is utilized. Coyle describes an e-book as simply the electronic form of a literary work; Anuradha considers an e-book to consist of both digital content as well as physical devices, such as hand held e-book readers. While for Rao, e-books are comprised of texts published in electronic form as well as physical books converted into digital form, and also books in computer file format, or an electronic file of words and images of monographic character, all of which can be displayed on a desktop, notebook, computer or portable device including dedicated e-book readers. (Owen, Victoria and others, 2008: p.2)

A significant difference between e-books and e-journals is that most e-book distributors protect their e-books with digital rights management. It means user can not copy whole book at a time, only limited pages can be copied depending on policy
of distributor. In print material, copying a reasonable number of pages is allowed. While e-journal aggregators monitor for things like systematic downloads, it is normally quite simple for users to print off or save an entire journal article. Pdf is universally accepted as the standard file format for online journal articles. On the other hand there is no standard format for e-books. There are advantages of e-books and e-journals like remote access, availability, convenience, ease of handling, no requirement of physical space to store, etc. Also there are difficulties like only half of the print books acquired by academic libraries are available as e-books, many e-books are published after three to eighteen months of print-editions, when purchased individually e-books costs more than print edition etc. (Walters, William H., 2013: p.195-203)

vi) Electronic document delivery services

Due to effect of economic and technological factors, libraries are seeking more creative ways to fulfill user needs. No library has the enough resources to purchase all the books published in the world. The price of serials has increased by 138 percent and unit price of monographs by 58 percent. Increased familiarity with the internet and other online research services has opened new doors for users and they expect hard copy of every document which they saw online. In response to these increased demands and expectations, libraries now work together. (Kinslow, Carmela: p.21)

Document delivery services (DDS) provide users copies of documents including articles of scientific journals on demand. These documents are provided by various means like xeroming, mailing etc. Now these are stored electronically and also provided to users through electronic means. Documents are stored and delivered electronically in either image or optical character recognition (OCR) form. Patrons may order documents by electronic mail, fax or in real time from computer terminals. Libraries provide documents by mail, fax, electronic mail or online. Previously document delivery involved hybrid medium.

Advancement in optical storage and data compression has increased electronic storage and retrieval facility. Also increased network capacity, World Wide Web and line fidelity has resulted in higher data transmission speed. Increased digitization, information and communication technology, internet bandwidth has decreased the average time of delivery. It has helped users a lot. (Hugenholtz, P. Bernt, 1993: p.3-5)
vii) Online current awareness services

The international encyclopedia of information and library science (2003) defined a current awareness service as one “Notifying current documents to users of libraries and information services” (Naqvi, Tanveer; p.100)

Sometimes current awareness service is also called as selective dissemination of information. Its origin is traced in 17th century. During 18th century around 1830 abstracting journals are created to notify users’ recent publications and then after a century later, rapid growth of technology such as computer and internet have changed this scenario. Slowly computers have taken over much of these services, but library professionals still have been playing important role of organization and dissemination of information. For some period, private sector was using commercial services. Afterwards some current awareness services are made free and are provided through web. A couple of new services are also introduced; these are news alert services, tables of contents. Table of contents are very popular and easy to set up and cover multiple journals or offer additional functionality. These are quick, easy and almost always free. User can also get topic auto alerts by e-mail from various databases, publishers and also from google and other search engines. But this got the problem of overloading of inbox as all these are sent by e-mail. To get rid of this new concept was introduced called as the feed. Many websites offer alerts when their sites have been updated. Instead of using e-mail, the information is sent to a central place where users go to read all feeds as per their convenience. This has resulted in less e-mail and less time spent on checking individual web sites. RSS (Really Simple Syndication) and Atom are the most common feeds, but there are others also. For using them you need a feed reader or aggregator, a piece of software that collects information from sites that have feeds. You have to add your favorite sites on aggregators, and then aggregators go out regularly to collect the feeds and group them together for you. You have to go to aggregator as per convenience and look at the results. Other approaches include preprints, e-zines, electronic newsletters, blogs and electronic lists, social book marking, etc. (Barr, Dorothy; 2006: p.14-17)

2.13.2 Real Time Reference

It is also known as real time live web reference and also it is latest trend in digital reference. It includes following services.
i) Instant Messaging Service

According to International Engineering consortium, “Instant Messaging (IM) is an internet protocol based application that provides convenient communication between people using a variety of different device types.”

Instant messaging is a type of communication service over the internet which enables individuals to exchange text messages and track availability of a list of users in real time. There are many free public domain instant messaging services. But most popular are AOL Instant Messenger (AIM), ICQ, MSN Messenger and Yahoo! Instant Messenger (YIM) (Mannan, Mohammad and Oorschot, Van P.C.: p.1)

Instant Messaging is also known by chat reference or virtual reference. It has become important point for users to get information and reference help. It is referred as unique method of communication between library staff and users. Instant messaging provides cost beneficial means of communication in real time and also supports effective communication between employees. It provides informal means of communication which helps library staff to create good relationship with users.

ii) Voice over Internet Protocol (VoIP)

Voice over internet protocol is recent way of communication. It is one of the important and advanced technologies in communication world. It is developing telephony solution which allows Voice and data traffic together on the same IP based network. Now a day’s telecommunication networks are getting replaced by data communication network and also voice signals are transferred over data networks by converging them into data packets. In VoIP, calls are transmitted over an IP network instead of using PSTN. VoIP is becoming popular because of wider availability of internet with high bandwidth. (Feroz, S. and Dowland, P.S.: p. 83)

VoIP is simply a way to make phone calls through the internet. VoIP transmits packet through packet switched network in which voice packets may take the most efficient path. While public switched telephone network (PSTN) is a circuit switched network which requires a dedicate line for telecommunication activity. (Kazemitabar, Haniyehand others, 2010: p.352) Key benefits of using VoIP as over WIMAX networks, includes best quality of service, affordable cost and reliability. But there are many threats of using VoIP network over WIMAX network if compared with wire DSL network, such as network capacity, architecture, system design and quality of service.(Jalendry, Sheetal and Verma,Shradha, 2015: p.161).VoIP is a technology which is used to make telephone calls over the internet using broadband connection.
using computer network instead of a regular phone connection. VoIP converts the analog signals from the phone to digital signals so that the signals can travel over the internet. Anyone can make a VoIP call by just picking up the phone and dialing relevant number.

**Advantages of VoIP**
- One can save a lot on his telephone bills because having a broadband internet connection doesn’t need to maintain another line just for phone calls.
- Facility of conferencing allows talking with many people at the same time without paying any extra charges.
- can use in library for interactive communication in reference.

**Disadvantages of VoIP**
- Many of VoIP providers don’t have back up power in case of power outages.
- Most of the time VoIP calls does not connect with emergency numbers.
- VoIP providers don’t have directory assistance.

**Features of VoIP**
- VoIP is cost effective for long distance calls if we compare with charges of the PSTN.
- In case of bandwidth and quality, VoIP is good option than PSTN.
- Hardware and software required for VoIP is computer with full duplex capable sound card, broadband internet connection, dialer software, headset with mike.
- Components included in VoIP are customer premise equipment, call processing and management application, voice handling server. (Feroz, S. and Dowland, P.S., p.83-86) (Singh, Rahul and Chauhan, Ritu, 2014: p.15)

### iii) Chatterbot

Also known as chatbot, conversational agents, artificial conversation entities, chatterbox, talkbot, bot is computer applications that imitate human personality. A chatterbot is interactive, responding in sentences that track the conversation in a way that is meaningful to humans. Library users who want more interactive library experience, like this characteristic of chatterbot. Users feel this something livelier than a search engine. One of the important points of these bots is their ability to handle common directional and predictable questions. Reference librarians can feel free from common questions because bot can execute routine and repetitive tasks. The
chatterbot is programmed with information and pulls together necessary information, reformatting and presenting it in a manner that meets user needs. (Allison, DeeAnn; 2011: p.2-3)

A chatterbot is a computer program which conducts a conversation via auditory or textual methods. These programs are designed to engage in smaller talk with the aim of passing Turing test by fooling the opposite partner into thinking that program is a human. The term “Chatterbot” was originally coined by Michael Mauldin (Creator of First Verbot, Julia) in 1994 to describe these conversational programs. Many chatterbots now include functional features such as games and web searching abilities. A chatterbot may be deployed in a smartphone app also. One popular category of smartphone app that relies on the chatterbot is the “dating sim” or romancebot category. Chatterbots have also been incorporated into devices not meant for computing such as toys. Bots are frequently used to fill chat rooms with spam and advertising or to help in remembering personal information such as bank account number. Common examples are found on Yahoo! Messenger, Windows Live Messenger, AOL Instant Messenger and other instant messaging protocols. (Wikipedia, the free Encyclopedia)

iv) Video Calling / Video Chat / Video Conferencing

Now a day video calling has become popular. It is largely available as camcorders have spread over the online environment; new smart phones built with advanced cameras and as video chat services like skype, google talk and apple ichat have become an important feature of the online and smart phone environment. Also teleconferencing has become more important in the business environment (Rainie, Lee and Zickuhr, Kathryn; 2010: p.3)

Video conferencing technology includes a variety of telecommunication systems that transmit voice, pictures and data over telephone and internet connections. Use and application of video conferencing technology has been increased in various fields like education, library, health care, business and research. This technology provides distance learning, research and reference application. This form of digital reference includes visual element which may be solution for problems in text based services. Librarian and user may be able to use both text and speech for reference transactions. Use of video conferencing technology has been increased in professional and formal education programs. Video conferencing technology for reference purpose
is effective and convenient medium for users. Video conferencing provides a rich medium where multiple nonverbal and verbal cues, use of natural language and immediate feedback is possible. It gives pleasure to librarian and user also that they can feel face to face interaction (Sedgwick, Monique and Spiers, Jude; 2009: p. 1-6)

There are also some disadvantages of video conferencing. It is dependent on specific equipments; high bandwidth of internet, clear network etc. Video conferencing is not useful for shy users. It is technology dependent method. Another disadvantage is that user satisfaction may be influenced by the bandwidth of the internet connection. Also challenges included are staffing, training, time for implementing service, lack of mobility for staff involved with service and cost (Magamma, M; 2013: p. 5)

2.13.3 Question Point Reference Service

Question point is a powerful product of OCLC which allows quality online reference service in a cooperative environment. Availability of 24/7 and shared global expertise are the benefits of question point. The success of question point mostly depends on the regular training as well as effective marketing. Users found it to be useful tool for communication with reference librarian, even though there is low satisfaction rate concerning their experience (Qobose, Edwin and Mologanyi, Baipuso., 2015: p. 9)

2.13.4 Web Form Service

This service includes two types of services. One is web form and another is frequently asked questions (FAQ). The web form has to be accessed from the library homepage or the reference web page. Then the fields in form are to be filled in by the user and the form is finally submitted back to the library. Answers to the query are usually provided by e-mail, phone or post (Magamma, M., 2013: p. 5)

2.13.5 Web based reference services

Because of the development and application of advanced technology, especially computer, internet and web technology, every field including library has changed. The traditional library services have changed greatly in recent years. Another reason behind this is changing user demands and expectations. As a result,
libraries are moving towards various new services in which web based services are recent one. Users can access information according to their convenience, saves time and cost, available 24/7, these are the advantages of web based library services. Web based reference services include following services.

i) Bulletin Boards

Bulletin board systems (BBS) started in the late 70s, as a means of communication for virtual community existing in cyberspace where participants usually under pseudonames may send and receive public and private messages to each other on any topic, transfer software, play online games etc. Ward Christensen and Randy Suess of USA had discussed on 18th January 1978, about designing of the first electronic BBS in the world and implemented the system on 16th February 1978 (Ramaiah, C.K., 1995: p.23)

A bulletin board is an electronic communication platform which contains posted messages and articles related to common topic, subject, theme or area of interest. It allows users to call, leave or retrieve messages. This message may be send to all users of the group or only to selected users. But drawback is that all messages can be read by all users. Many libraries are using bulletin boards for their web based library services. The bulletin board system can be used as an interactive medium of communication to call suggestions on activities and services of library. It can also used as a platform for marketing library services (Bhatnagar, Anjana, 2005: p. 432)

The bulletin board is an online system for a cost effective distribution of information in electronic format. Some bulletin boards are considered more of a talk-net than a platform to exchange research information. Many bulletin board services display discussion topic list with brief details under broad topic heading. Some bulletin boards provide file transfer services. Various bulletin board services are available on national / international networks around the world allowing information exchange via e-mail and computer conferencing to a group of users working in same subject area. Initially bulletin board services were started in universities and research institutions but now private agencies are also operating such services (Ramaiah, C.K., 1995: p. 23-31)

ii) Web Contact Center

Various libraries use web contact center software which has been developed for e-commerce application for digital reference services. Web contact center offer a
variety of features. It allows communication via e-mail, web form and chat and also enable more interactive collaboration through various tools such as page pushing, escorting and co-browsing (Magamma, M., 2013: p. 5)

iii) Search Engine Reference Service

Search engines are huge databases of web page files that have been integrated automatically by machines where as the subject directories are human compiled and maintained. Every page of website is indexed by search engine while subject directories links only homepages. For an information retrieval system, search engine is a popular key. A search engine is computer software which searches electronic material collections to retrieve citations, information or documents that matches user’s query and answers it. The speed of answering user’s query is high. It gives answer within fraction of time, due to which search engine is popular among users. User can get any information or reference very quickly. The materials retrieved by search engines may include text documents, facts extracted from text, images or sounds. While a query is a question created by user and it is phrased so that it can be interpreted properly by search engine. Depending on the type of software, it may be collection of commands, a statement in either full or partial sentences, and one or more keywords or in the case of non text searching, an image or sequence of sounds to be matched. (Bhatnagar, Anjana, 2005: p.431)

Due to technological advancement especially in computer, smart phone, internet and World Wide Web, users can search any required information at anytime from anywhere. For this important requisites are computer or smart phone with internet connection. If any user has these devices then he can search any required information quickly. Top ten most popular search engines in the world today are google, Bing, yahoo, ask.com, AOL.com, Baidu, Wolframalpha, duckduckgo, internet archive and chacha.com (source www.google.com)

iv) Web Based User Education

User education has been defined as “Instruction which equips library users with the skills to enable them to be independent and sophisticated users of libraries and their resources”. (Murugan, Senthur, 2013: p.3)

Enormous growth in publications as well as resulting complex nature of libraries and the literature organization and dissemination methods traces the need for
user education. According to Thomas G. Krik planning of user education programme requires two things namely orientation and bibliographic instruction. Rathore (1992) summarized three levels of user education-

- At the beginning of every academic year for newly admitted students.
- Subject oriented instruction for undergraduates at a stage when they are admitted to special branch or subject.
- Literature search training at the beginning of their research work

(Murugan, Senthur, 2013: p. 3-4)

**Main aims of user education are**-

- To train the users to use the various resources of library effectively.
- To provide the users independent information seeking skills.
- To encourage the users for getting the assistance of library staff.

Information technology has a great impact on user education program. Although there are various traditional methods of user education, information technology in library has changed these methods. Along with lectures, library tour, printed broucher, guides, seminars, orientation, instruction, audio visual method, etc. the new methods are also necessary. These new methods include using internet, browsing, searching, downloading of required information, exploring online database etc. Due to such reasons traditional method of user education is changed to web based user education (Murugan, Senthur, 2013: p. 4-5)

Web based user education is flexible and interactive medium for users. One can see web guides and teaching tools everywhere on the web because they can be easily updated, accessed and printed on demand. The library web site uses web-based user education for inculcating training to patrons in exploring the basic library skills. These skills include glossary of library terms, using OPAC, locating books, magazines, bibliographic data, how to navigate library website, how to select relevant database, guidelines for searching CD ROM, how to locate web based database, other electronic resources, using Boolean operators and searching resources on internet (Murugan, Senthur, 2013: p. 5)

v) **User feedback from service**

Users are always important part for libraries. If we see five laws of library science, users have given most attention. Every library runs on the principles of these five laws. Recently developed digital reference service does not have exception for
these principles. Digital reference services also consider user as important part. Due to which the reference librarians expect feedback from users. User feedback helps in judging the effectiveness of services. A suggestion from user feedback helps to improve service, quality of service, effectiveness of service. Feedback also helps to add new feature or discard old feature of service. Feedback mechanism is medium of interactivity, where reference librarian and users can understand each other’s views. It is helpful to improve service and serve better to patrons. User feedback gives opportunity to remove gap in service if any. It gives pleasure to listen what users expect from library. In feedback form, the libraries provide an online form for asking questions to librarians, libraries, also sending suggestions, views and comment upon the library services which helps in building the services in more effective ways.

2.13.6 Web 2.0 Services

The term web 2.0 is coined by Darcy DiNucci in 1999 and is popularized by Tim O’Reilly at the O’Reilly Media Web 2.0 conference in 2004. The important feature of web 2.0 is that it permits users to interact and collaborate with each other in web space and enables creation of community knowledge (Hazra, Sheuli, 2015: p. 50)

Tim O’Reilly tried to define web 2.0 as, “it is the network as platform, spanning all connected devices; web 2.0 applications are those that make the most of the intrinsic advantages of that platform: delivering software as continually updated service that gets better the more people use it, consuming and remixing data from multiple sources, including individual users, while providing their own data and services in a form that allows remixing by others, creating network effects through an architecture of participation and going beyond the page metaphor of web 1.0 to deliver rich user experiences.” (Sahu, Hemant Kumar; Pathak, Sandip Kumar and Singh, Surya Nath, 2010: p.3) Mukhopadhyay (2008) in his paper categorized web 2.0 services in four major groups:-

a) The read and write component.

b) Social networking component.

c) Collective intelligence support component.

d) Information mash ups component.

Although these groups are not mutually exclusive (Hazra, Sheuli, 2015: p. 51) Web 2.0 Services includes following services:
i) Library blog

Blog is short for web log—an online journal where information including text, audio, video, images is posted on a regular basis and appears in chronological order. It is developing very rapidly. It is quick and popular way to share thoughts with the world. This is one of the tools of web 2.0 services. It falls under read / write web component category (Hazra, Sheuli, 2015: p. 51)

Blog is a powerful two way based tool. A blog is a website on which library patrons can post their views, ideas, thoughts, comments and suggestions. Any matter entered on a blog is known as blog post. These posts are made in journal style and are displayed in chronological order. It allows searching of entries listed in specific categories. It also links to other sites of interest and provides places for comments and monthly archive of pervious entries. Any library patron can publish a blog post easily and cheaply through a web interface and also any user can post a comment on blog post.

Blog in academic library

- It can be used for the collection development because users can request the required resources.
- Library can use blog as a marketing tool for advertising the library and its resources.
- It can be used as platform for discussion.
- It can be used as forum where patrons can post their views, queries, concerns, ideas, comments, suggestions etc.
- It can be used as platform where users can comment on library services and activities. (Sahu, Pathak and Singh, 2010: p. 5)

ii) Twitter

Twitter is a free micro blogging service that allows its users to send and read text based messages of up to 140 characters known as “tweets” via the twitter website, external applications or short message service (SMS). Access to tweets can be restricted or openly available. Library and information professionals know that twitter is fast growing; free messaging service for people and libraries can make good use of it without spending much time or efforts. Twitter has millions of users and it is good place to find and connect people interested in your institution and your areas of expertise. It is designed for exchanging information.
The majority of libraries use twitter for communicating with users. Twitter can be used as public relation mechanism. Many libraries tweet about resources, services, activities, events and community information. Some libraries accept the reference questions via twitter. Libraries can also offer sms or text a librarian services through twitter. Libraries can also use twitter for marketing the library services, resources, etc. (Beaton, Barbara, 2012: p. 6-8)

iii) Library facebook service

Face Book and My Space are two popular social networking sites launched in 2004 and 2003 respectively. My Space provides facility for organizations to generate their own profiles and pages and can be utilized by libraries. Face Book allows individual librarians to create profiles. By using these two services libraries can create a page to reach new users, users can set up interactive and personalized web profiles with personalized information like education, age, areas of interests, hobbies. Patrons can upload photographs, videos, music; create blog, post comments on other patron profile pages and send messages. It allows to share and change resources dynamically in an electronic medium (Hazra, Sheuli, 2015: p. 51) (Sahu, Pathak and Singh, 2010: p. 9)

iv) Social Media

Before a decade social media has been rarely used in profession by librarians. Now the situation has totally changed. As social media has become popular, librarians are also using it in profession. Social media is widely used by library professionals to fulfill various objectives. Popular social media channels used are face book, twitter, blog, flickr, YouTube, research gate, WhatsApp, Skype, etc.

WhatsApp Messenger is a cross platform messaging app which permits users to exchange message without having to pay for SMS. This application is compatible with iPhone, BlackBerry, Android, Nokia and other smart phones. WhatsApp features include one to one chat, group chat, push notifications, sending and receiving audio, video, gif, and pdf files. Now user can make audio and video calls also. (Shambare, Richard, 2014: p. 544)

Skype is created in 2003 and acquired by Microsoft in 2011, is a Voice over Internet Protocol (VoIP) communication tool that can be used to conduct audio or audio/video “telephone” conversations between internet connected computers. It
permits conversations to take place anywhere in the world, and both the service and software are free. In recent years, Skype has added mobile applications for android and ios devices. Basic Skype service is free and includes Skype to Skype calls, one to one video calls, instant messaging and screen sharing. The Ohio University (OU) library was well known as an early adopter of providing Skype based reference service (Beaton, Barbara, 2012: p. 2-3)

**Advantages of using Social Media**

- It is very good collection management tool which offers flexible ways to present resources.
- It helps to market events, services, news and presence.
- Costs of using social media are considered to be low.
- It requires less training.
- It facilitates rapid dissemination of information, news, etc.
- It is interactive medium of communication with users.
- It helps to collect feedback from users which will help to improve existing services.
- It facilitates communication enhancement both within the library and with other departments. (Taylor and Francis, 2014: p. 2-5)

### 2.14 Evaluation of Digital Reference Services

Evaluation is important to get the feedback regarding the service provided by the library. Library is non-profit and service based organization due to which evaluation process is essential. To evaluate means to assess the quality, to judge the standard of the service. Library service should be evaluated to know its significance for users and to measure user satisfaction. Evaluation also gives chance to measure the cost effectiveness as well as staffing and training issues related to any service. It also helps to judge the impact of that service on library. Digital reference services should be evaluated on the basis of their policies, procedures and also on the basis of reliability, quality, efficiency, effectiveness and weakness, etc. While evaluating digital reference service, user satisfaction must be given priority. (Chandwani, Anita, 2006: p. 6) McClure and Lankes (2001) propose four main components of measurement for digital reference services. These are as follows:
1. **Outcome measures** (quality of answers)
   
   Accuracy of responses, appropriateness to user audience, and opportunities for interactivity, instructiveness, and impacts resulting from the digital reference process.

2. **Process measures** (effectiveness and efficiency of process)
   
   Service accessibility, timeliness of response, clarity of service procedures, service extensiveness (percentage of questions answered), staff training and review, service review and evaluation, privacy of user information, user awareness (publicity).

3. **Economic measures** (costing and cost effectiveness of digital reference)
   
   The cost to conduct a digital reference session, infrastructure needed to support quality digital reference services, and impact of these costs on other library expenditures.

4. **User satisfaction** (degree to which users engaged in digital reference services are satisfied with the process and the results)
   
   Satisfaction indicators can include accuracy, timeliness, and behavior of the staff, technical considerations, physical facilities and others. (Gross, Mellisa; McClure, Charles and Lankes, David R., 2001: p. 22)

### 2.14.1 Methods of Evaluation

Before evaluating reference service, it is necessary to think why the service is being evaluated, what is expected by assessment. Then next step is which method should be used for evaluation because there are various methods. These are:

1. **User Feedback**
   
   It includes feedback, suggestions of users. Also includes users reply on service as well as answers they received from library. It is very important because their feedback is helpful for planning and improvement of service.

2. **Rating**
   
   It is another method of evaluation and very common. As we know library provides rating scale like 1-5 for service. Users rank the services from 1 to 5 according to their satisfaction.
3. Survey and Questionnaire

It is most popular form of reference evaluation and also for digital reference services. Questionnaire is used for knowing the feedback of users.

4. Observation

In this method, questions with predetermined answers are sent to users for knowing their response about service.

5. Interview

This includes individual and group interviews. This also helps in getting feedback of users about the service. But it is quite difficult to conduct interview because users may be scattered across the globe.

6. Case Studies

A combination of above mentioned methods is used for examining service for a case study. Case studies are mostly used when researching new service or product. These studies are often presented in academic journals and conferences.

2.15 Advantages of Digital Reference Services

1. Facilitates information search through computer mediated services:
   Majority of scientific, technical and scholarly publications are now available electronically and through web based technology. The digital reference services help common user to locate the required information available electronically.

2. User can get the needed information over the own desktop, without moving physically.

3. It saves the valuable time of users and ultimately digital reference services helps to implement fourth law of library science.

4. Real Time assistance:
   Digital reference service provide online and real-time assistance to patrons to search locally available resources as well as forward the request for locating such resources to other partner libraries and return the appropriate assistance to the concerned patrons.

5. 24/7 online assistance service:
   In traditional reference service there is limitation of time, but digital reference service provides the mechanism for 24/7 online services. Users can send query
at any time of their convenience, if the library is in position to facilitate such service then user can be supported round the clock.

6. If digital reference service consortium is there, it enhances span of service and helps to provide large size of manpower support as well as varied collections.

7. Digital Reference Service can also provide varied platforms for special interest groups to intercommunicate within themselves to exchange available information and ideas. (Guha, Tamal Kumar, 2004: p. 257)

2.16 Disadvantages of Digital Reference Services

1. Face to face interaction with patron is not possible.

2. Library staff may not be able to clarify the doubt regarding exact need of patron.

3. Possibility of technical problems.

4. Dependent on technology.

5. Speed of service depends on the speed of internet and data traffic.

   These are the disadvantages of digital reference services.

2.17 Trends and Challenges in Digital Reference Services

Large numbers of libraries in developed countries are providing digital reference services. Providing reference over internet has been increased. Research by Janes (2000) found that 45% of academic libraries and 12.8% of public libraries offer some type of digital reference. In Indian context, increasing number of consortia in academic domain shows increased importance of digital reference services. (Guha, Tamal Kumar, 2004: p. 258) A large number of reference sources including encyclopedias, thesauri, handbooks, dictionaries, directories, abstracting services like chemical abstract, biological abstract etc. are available on the internet. (Chandwani, Anita, 2006: p. 7)

Challenges in digital reference and the digital library are common to some context. Metadata and standards for interoperability have same approaches like joint services and information re-use. Obviously questions of intellectual property and re-use of digital products are common. Technical problems, institutional repositories, problem of networking, are also common issues. Two issues are specific to digital reference (Lankes, et al.2000), these are
**Scalability** - how digital reference service can grow (scale) to handle a large number of questions given that traditional scaling mechanisms, such as service hours and geographical constraints run counter to user’s expectations on the internet?

**Ambiguity** – how digital reference services can identify a priori the amount of context and human intermediation needed to meet a user’s needs? (Lankes, R. David, 2004: p. 3-4)

Other issues include transition from traditional face to face service to remote access service. Also includes quality aspect, kind of reference interview, real time versus non real time service, media selection in digital reference as well as economics of human intermediation. (Lankes, R. David, 2004: p. 4)

### 2.18 Works Cited


Heron, Susan and Hanson, Ardis. (2003). From Subject Gateways to Portals: The role of metadata in accessing international research. [Available at http://scholarcommons.usf.edu/cgi/viewcontent.cgi?article=1011andcontext=dean_cbcs ] accessed on March 20, 2016.


Chapter III

LITERATURE REVIEW
3.1 Digital Reference Service
3.2 Virtual Reference Service
3.3 Online Reference Service
3.4 Digital Library
3.5 Web Based Library Services
3.6 Subject Gateways and Search Engines
3.7 Institutional Repositories
3.8 Library and Information Services in e-environment
3.9 Electronic Document Delivery
3.10 Question Point
3.11 Chat and Instant Messaging
3.12 Voice over Internet Protocol (VoIP)
3.13 Chat bots
3.14 Video Conferencing
3.15 Bulletin Board
3.16 Customer Contact Centre
3.17 Web 2.0
3.18 Social Media
3.19 Mobile Internet
3.20 Works Cited
According to Busha and Harter the purpose of review of literature or literature search is to attempt to identify, locate and synthesize completed research reports, articles, books and other materials about the specific problems of a research topic. It helps the researchers to know about other research projects in a similar field, to narrow or describe research problem and relate research topic in the context of larger canvas. For the present study, a systematic review of the literature on the digital reference service and related concepts has been conducted. A keyword search under digital reference services has been done in Google, Google scholar search engines and also is searched on shodhganga and shodhgangotri websites for the related topic. For the purpose of literature review following works are studied.

3.1 Digital Reference Service

1) Buckland, Michael K. (2008) presents research article on Reference library services in Digital Environment. This paper draws on work partially supported by the institute of Library and Museum services National Leadership Grant for Libraries. This paper describes Digital Reference Library Service today like 9 to 5 problems, Visit to Virtual Reference Library, also describes semantics of reference service. Researcher concludes the need to develop structures appropriate to digital technology, to the users’ needs, and to the users’ work environment. Evolving technology in the digital environment invites an increased attention on empowering the library users and on optimizing reference library service as a whole.

2) Chandwani, Anita. (2006) presents research article on an overview of Digital Reference Services. This paper highlights how new era of traditional reference services is developing as a natural solution to keep pace with comprehensive technological environment. It discusses about basic concepts, elements of digital reference service and gives in detail modes, the advantages, limitations and describes various digital reference services carried out by several libraries and commercial organizations.

Author concludes with the future of Digital Reference Services. In which she states that future of reference service will be based on digital collections and communication links through web. The reference librarian and reference service in the
future will act as centre of information world, if the library is well equipped with computer, internet and CD-ROM.

3) **Dollah, Wan Ab. Kadir Wan and Singh Diljit. (2009)** present research article on Reference Services in Digital Environment. This paper describes the concept, format and background of digital reference services. It also focuses on issues, trends, and challenges in digital reference, besides discussion on technological developments in digital reference services. The benefits and limitations of DRS are also highlighted.

4) **Guha, Tamal kumar. (2004)** presents research article on the human face in virtual library digital reference service. Article briefs about the activities of the digital reference service, its present scenario. The importance and functionalities of the service are highlighted. It also focuses on DRS overview, advantages, how it works, present status, etc.

   Researcher concludes that digital reference gives the library a set of powerful mechanism to serve the users. With increasingly ever-present internet connectivity, and with-out of box network solutions, simply having a presence online is easy. He doesn’t insist library transformation completely to online entity, but rather to have its online virtual services to meet the high standards of quality which the library is expected to provide all the time of the ages.

5) **IFLA Digital Reference Guidelines** are published with purpose to promote digital reference best practices on an International basis. Libraries in different countries may have different traditions of public service, which both affect their current reference practice and their patrons’ expectations. But it is also important to recognize that new technologies will enable librarians to redefine the scope of their public services. These guidelines attempt to create some common standards from diverse traditions in the hope that this will allow the worldwide community of librarians to freely explore the possibilities.

   Some of the issues raised in these guidelines may warrant additional consideration and expansion issues such as the management of change. These guidelines address the needs of library administrators as well as practicing librarians.
6) **Lankes, R. David.** (2004) commissiones white paper for the international conference and name of paper is the Roles of Digital Reference in a Digital Library Environment. This white paper presents the background of digital reference movement, highlights current work and research in the area and provides some examples of how digital reference can be integrated into digital libraries.


7) **Lankes, R.D. and Shostack, P.** (2002) present research article on the necessity of real time: fact and fiction in digital reference systems. Researchers focus on current discussions and trends in digital reference. They use data from the AskERIC digital reference service to demonstrate that asynchronous services are not only useful and used but may have greater utility than real time systems. They emphasize need of co-existence of real time systems and asynchronous systems in case of digital reference service. It is posited that different questions and different user will require different forms of interactions.

8) **Magamma, M.** (2013) in his study ‘Digital Reference Service in Engineering College Libraries: A case study of Visakhapatnam’ explores websites of all selected engineering college libraries and compares digital reference service provided by these libraries. The study reveals that all the ten selected engineering college libraries are providing online / digital services including library website, web-OPAC, subject portals, web databases, collaboration with national, international network and links to e-resources. In case of digital reference service, the reference desk, e-mail reference service, ask a librarian, question point, online chat, FAQ, web based user education and search engine, bulletin board services are provided by engineering college libraries.

The researcher concludes that the majority of selected engineering college libraries are deeply involved in the organization and management of e-resources to
provide various digital reference sources to their users under intranet as well as internet environment.


10) Monn, Lorri and Joseph W. Janes. (2003) analyze “thank you” Study for user satisfaction with digital reference service. They study Internet Public Library (IPL), a virtual library on the internet which has been in existence since March 1995. They analyze 558 internet public library digital reference transcripts that had received “thank you” from users and 250 transcripts that did not receive “thank you” message for total of 810 digital reference interactions.

They conclude that the thank you study raises intriguing Questions about the results that might be found in extending this analysis to other digital reference services. They found an overall “thank you” rate of 15.9% for questions answered within the Internet public Library in 2002.

11) Moran, Carrie. (2010) presents research article on the utility of Digital Reference Services in Academic Libraries: An Annotated Bibliography. This annotated bibliography focuses on the utility of digital reference services in academic libraries. This paper examines what types of digital reference services are provided in academic libraries and determines how these services are utilized by users. The articles used were from 2003 to 2010. For the purpose of this bibliography, Digital reference service was defined as any service provided to users that can be accessed remotely. In summary of findings researcher mentioned various authors and their research articles on digital reference service, with varied conclusions.


Previously answered question gives rise to annotations as information resources and it gives rise to question – do these annotations become a collection in
their own right? Information resources used virtually to answer these questions are part of collection? While studying second question, he discussed they must be created both responsively and proactively. Both issues must be made on a case-by-case basis, by each digital library and its associated digital reference service.

13) **Sharma, Sumati; Kumar, Ashok and Singh, Mohinder. (2004)** present research article on Digital Reference service. The paper highlights how the new face of service is evolving as a natural solution to keep pace with the multifaceted technological environment. It discusses the basic concepts and essential elements of reference service and gives in detail the advantages, limitations and the technology base about the various established and emerging forms of digital reference. It also focuses on some forms of digital reference services.

14) **Singh, Diljit. (2004)** presents research article on Reference services in the Digital Age. This paper describes some of the emerging digital reference services, including e-mail, web forms, text based chat services, Web-camera based services, ask-a-service, digital robots and collaborative services. Future of digital reference services is also explored. Also describes the emergence, concept and practices of reference service in the digital age with a focus on digital reference services.

This research article explains changing role of librarians, reference services, digital age, and emergence of digital reference. In digital reference he describes asynchronous transactions like e-mail, web form, ask-a-service, etc. synchronous transaction like chat reference, chat reference using web contact software, video conferencing, digital reference robots and collaborative digital reference services.

15) **Smith, Linda C. (2002)** prepares white paper for the Digital Reference Research Symposium. Attention has naturally been focused on the education needed by those individuals who are to provide digital reference services. Little has been written about education and training for digital reference services. Discussed in white paper the roles filled by the human librarian will include-knowledge of wide range of information sources in print and digital form as part of an information landscape. Education for digital reference services must prepare the human librarian to supplement what the user can accomplish.
16) **Vijaykumar, Manju and Vijaykumar, J.K. (2005)** discuss research article on Digital Reference Services: Libraries online 24/7. This paper discusses the methods in online reference service and the role of reference librarian in the digital environment.

Researchers describe library reference service, virtual/digital reference, planning for DRS, delivery of DRS like e-mail, web forms, chat reference, collaborative networks etc; quality facets for DRS. Authors conclude with real time online reference holds enormous potential for revolutionizing the way users find and use reference services. Internet skills are becoming very much important for all the library professionals. In India several libraries have started online reference services using e-mail and ask-a-librarian services but real online reference services should be the focus of us to reach out to the millions of users outside the library walls and serve the community at large.

### 3.2 Virtual Reference Service

1) **Beaton, Barbara. (2012)** discusses research article on new technologies for virtual reference: A Look at Skype and twitter. Paper examines the potential of Skype and twitter, popular social media in many ways for enriching virtual services of Michigan University.

Out of 186 libraries participating in this survey, 88% began to use Skype for reference service within past two years and indicated that this technology is still in the exploration. The vast majority of libraries using twitter continue to use it as a communication and public relations mechanism- twitting about resources, services, events or community information.

2) **Bullard, Kristen A. (2003)** submits paper on Virtual Reference Service Evaluation: An application of unobstructive research methods and the virtual reference desk’s facets of quality for Digital Reference Service. This paper focuses on the quality of virtual reference service in public institution classified by Carnegie classification as Doctoral/Research intensive and extensive universities. Ten Universities’ websites were evaluated for facets of quality such as accessible, publicize, clear response, policy, privacy and access.

The findings in study include the implications for VR standardization utilizing the VR Desk’s facets of quality for digital reference. One area that VR seems to have
achieved some consistency is accessibility as demonstrated through hours of operation. The current version of the VR Desk document, however, does need to be revised to better fit the specialized capabilities and limitation of VR Service. The newness of VR method provides ample opportunities for experimentation.

3) **Gibson, Craig and Mandernach, Meris. (2013)** presents research article on Reference Service at Inflation point: Transformations in Academic Libraries. This research project investigates whether academic libraries are developing new models of research services supporting faculty and students at their institutions, models that transform transaction based reference services.

In result, many libraries mention progress. All of libraries indicate decline in face to face reference services, though some had seen an increase in chat/e-mail questions. Some libraries handle chat /e-mail question on the desk, while others handle it from offices while one library set separate desk.

Researchers conclude that most of the libraries are being asked to demonstrate a return on investment for service as well as determining subject specialist impact within each department.

4) **Luini, Christina. (2012)** presents a study on virtual reference service: A case study of Question Point utilization at the Gallagher law Library. This paper examines the use of OCLC’s Question Point (ASK US) reference service by the Marian Gould Gallagher Law Library. It considered types of patrons who use the service, where they access the service from, and content of their questions.

Analysis shows that only 23% of the inquiries Gallagher receive via its Question point web form come from primary users group. Questions received from secondary user group make up over three fourths (77%) of inquiries received through the Question point. Researcher thinks the reason behind less usage of Question point by primary users as- possible that reference needs are satisfied through traditional live reference service, or may be that students are unaware of it or don’t find it easy to access, or they may prefer other forms of virtual reference like chat etc.

Similarly high usage has several implications. Each reference transaction with secondary user takes valuable time and resources away from its primary patrons. Geographic proximity of user to the library is not most important factor in determining whether user visits the library or relies on the virtual reference service.
5) Maharana, Bulu and Panda, K.C. explores websites of all the IIT’s and IIM’s libraries to identify and assess the present state of virtual reference services provided in the libraries of above premier institutions. In Research article on Virtual Reference Service in Academic Libraries: A Case study of the libraries of IIMs and IITs in India they reveal following major findings
i) Only 2(15.4%) IITs are providing Reference Desk or Help Desk service.
ii) Reference Service through e-mails are being provided by only 7(53.9%) libraries in different form such as TOC Alerts, Ask a Librarian, Question Point, customized news to users, latest library additions etc.
iii) Video conferencing as a real time reference service being facilitate in 6(46.1%) libraries, however only 3(23%) libraries introduced Online Chat facility as a mode of real time reference service. Two libraries also provide Instant Messaging Service.
iv) The study revealed that all the libraries provide links to their collection of e-journals, e-databases and OPAC. However links to e-books provided by 7(53.9%), patents 4(30.76%), e-theses 1(7.7%), standards 6(46.15%), FAQ 11(84.6%), and open access 6(46.15%) libraries.

Researchers conclude that virtual reference service are being developed and implemented at libraries across the country. If virtual reference service is to evolve as bonafide library and information service, librarians need to engage in ongoing assessment and evaluation of those services.

3.3 Online Reference Service

1) Eke, Helen Nneka and Ekwelem, Vincent Onyeaeholam. (2014) examine the availability of online reference services (ORS) in libraries in Nigeria. They conclude that ORS is advertising as being able to reach patrons at any time of the day or night at any location in the world. The investigators concluded that the validity of the results and the strength of the ORS as an instrument of information assessment are enormous, and further discussed the most difficult aspect of the evolving world of electronic technology is the cost. Libraries are really struggling with the overwhelming cost of both technology infrastructure and up gradation of hardware and software.
3.4 Digital Library

1) Chowdhury, Gobinda G. (2002) presents research article on Digital Libraries and Reference services: Present and future. This paper focuses on the current state of research in personalized information services in digital libraries. It analyses some representative definitions or digital libraries in order to establish the need for the personalized services. Then it provides a brief overview of the various online reference and information services currently available on the web. The paper also briefly reviews digital library research that specifically focuses on the personalization of digital libraries and the provision of digital reference and information services. Lastly, the paper states some new areas of the research that may be undertaken to improve the provision of personalized information services in digital Libraries.

2) Han, Lifeng and Goulding, Anne. (2003) presents research article on Information and Reference Services in the Digital Library. This article describes the Paradigm of information and reference services in the digital Library. Authors suggest three leveled system that supports users information needs.

   On the first level, technologies, resources and services are integrated into the digital Library. On the Second level, information professionals provide induction and training courses to educate users to use the digital library. On the third level, reference librarians are waiting for users questions at the reference desk, on the telephone, via email or an interactive system etc.

   This paper also discusses role of the reference librarian at each level. Finally digital reference services, a new means delivering services, is also briefly reviewed. The authors emphasize the need of a systematic process to support user’s information needs in the digital library.

3.5 Web Based Library Services

1) Bhatnagar, Anjana. (2005) studies web-based library services including OPAC, Gateways, Portals, Subject Portals, Electronic Journals, Online databases, search engines, Subject directories, and new web based library services such as virtual library tours, Ask-a-Librarian, Real time services, Bulletin boards, web based user education, web forms.
Indian libraries have realized importance of web based library services and some institutions like CSIR, ISRO, DRDO, DAE, ICAR, SIRNET, NICNET, NISSAT, INFLIBNET, MHRD and IIM libraries are actively working continuously to improve the present situation. Web based library services will become more widespread and sophisticated as the web becomes common place throughout the world especially in e-world. Librarians may play a leadership role in providing better web based library services to their current technosavy users.

2) **Borasky, Danielle. (1999)** examines services offered by libraries via their web sites in “Analysis of web-based Library Services.” Web based library services at fifteen academic libraries in North Carolina were evaluated using combination of content analysis and questionnaires.

The results show that most libraries offer basic text based services as descriptive information about library, some libraries offer web-based access to OPAC, few libraries offer online request forms and bibliographies, while some offer advanced service such as digital collection and cross departmental services. Study also indicates that libraries dedicate staff resources to web services in variety of ways. This study didn’t presented clear relationship between institution resources and the quality or scope of web based service.

3) **Chinta, Nagabhushanam. (2013)** studies web-based OPAC Services in India. Web OPAC is a library catalog on the web or intranet. The major limitation of online catalogues investigated is that most of the libraries not even have library page and lack of federated search facilities. The users generally prefer to go to web search engines rather than to library catalogues. This is the matter of concern for librarians and they must work to bring users back to the library for immediate information needs. The introduction of the library portals with the features of web-based OPAC is the ultimate solution to the problem. Web-based OPAC Service is one of the key roles in e-resource services.

4) **Contreras, Paula; Klimeczyk, Linda and Probst, Laura K. (2004)** presents expansion of web-based library services in large research libraries: A Penn state case study and aim of their study was to meet changing needs and expectations of their
users. The Penn State University Libraria’s building suite of web-based services, including synchronous and asynchronous reference.

They observe that their users submit complaints and questions about network access problems through this service. Library users across the country prefer to be self-sufficient in using library. Findings suggest that the user interfaces on their web pages are not intuitive and that they must improve the usability of their web-based services.

5) Nagarkar, Shubhada. (2011) Studies web based reference services to Bioinformaticians: Challenges for Librarians, and in this she describes how personalized reference services for bioinformaticians are being developed using a portal https://sites.google.com/site/reftobioinfo/.

Researcher finds that scientists are satisfied with the information they get and the time saved, while librarians face a number of challenges when developing this type of personalized services. Librarians have to work closely with the scientists as a team member to understand their information needs as well as conduct information literacy programs for scientists. Librarians’ traditional services can be delivered via web and “ref to bio info” is proof of the same.

6) Madhusudhan, M. and Nagabhushanam, V. (2012) presents research article on use of web-based library service in select University libraries in India: A Study and examine how some of the University libraries provide web access to their collections and user support for that access and the problems faced by users in accessing web-based library services.

Findings show that many of surveyed University libraries are yet to exploit full potential of the web forms and lagging behind in effective use of library website. Few libraries offer innovative web-based library services in different section. The major suggestions were updating the web pages frequently, content based book services, facility to upload content by users, higher bandwidth and wireless connectivity, institutional archives, digital literacy programs and more web-based tutorials for users, etc.


88
Their findings show that more than two third libraries have dedicated or partial website, more than half libraries have direct hyperlink on the university homepage, web OPAC is significant service offered by libraries, 13.15% libraries have e-mail reference, 2.63% has chat reference.

8) Husain, Rashid and Ansari, MehtabAlam. (2006) presents research article on “From Card Catalogue to Web OPAC.” This paper describes what is OPAC, describes about OPACs and Web OPACs technology in libraries and also explains various features, applications and advantages of Web OPACs. Article also focuses on Card catalogue Vs. OPAC, Web OPAC.

Researchers conclude that OPAC is interactive search module of an automated library management system. Thus lot of cataloguing work due to availability of web OPAC is reduced. Web OPAC improve the quality, speed and performance of the services offered by the libraries. Inter library loan becomes easier with the use of e-mail and web. Users can see the collection and issue status of each document of the library.


A Survey carried out, investigated the use of World Wide Web for user education in 68 UK university libraries. Three quarters of the libraries surveyed make use of the web for this purpose. The web is used as a supplement to current existing user education, to enhance independent, student centric learning and reach part-time and distance learners. Only 10% of user education is delivered solely via the web but it will grow in future. One more important finding was that greater use is made of web for information skills training than for library induction. Authors suggest that web based instruction is unlikely to completely replace traditional method but it can be used as supplementary and extended provision.

3.6 Subject Gateways and Search Engines

1) Heron, Susan and Hanson, Ardis. (2003) presents research article on From Subject Gateways to Portals: The Role of Metadata in Accessing International Research.
This paper discusses that use of metadata formatted in uniform way, using thesauri and authority files, aids users in efficient retrieval. Thesaurus of subject terms enhances searching precision, eliminating false leads. There is critical need for new approaches to the problem of information overloads. There is growing demand for searching aids. Author’s names represented in a variety of ways on his/her publications, variant spelling, updated term; evolving geographic entities can lead to missed sites when keyword indexing is only access.

2) **Poonkothai, R. and Ganesan, A. (2008)** has done comparative study between subject gateways and search engines. Subject gateways doing for internet information resource what librarians do for books. Using a Subject gateway instead of a general search engine can result in the return of more genuine and relevant web pages from our search. Subject gateways are undoubtedly very useful internet search tools. While they are more limited in the extent of their coverage than search engines, they are valued by users for the higher quality and relevance of their results.

### 3.7 Institutional Repositories

1) **Enabling Open Scholarship (EOS)** Publishes paper on Open Access Institutional Repositories: A Briefing paper. In this paper they conclude that institutional repositories are digital collections of outputs created within a university or research institution. Purpose of repositories may vary but they adhere to internationally agreed set of technical standard that means they expose the metadata. There are almost 1300 repositories around the world.

    Institutional repositories contain peer reviewed journal articles and conference proceeding, research data, Monographs and books and other content types. Repositories will form a permanent and critically important part of the scholarly communication process. Google and other web search engines index the content of repositories; anyone with internet access can find themselves arriving at an article or dataset in university or research institutions’ repository via a web search. To reduce cost, deposit activity should show a reasonably steady pattern throughout the year.
3.8 Library and Information Services in e- environment

1) **Owen, Victoria and others (2008)** discuss a research article namely E-books in Research Libraries: Issues of Access and Use. The Canadian Association of Research Libraries (CARL) task group on e-books undertook to consider and to make recommendation to the CARL copyright Committee on issues of access and use of e-book in research libraries.

They conclude that there is a danger that research libraries are adding e-books to their collection using agreements that significantly reduce user’s rights. There is some urgency to improve this situation before it becomes a de facto standard. The task group on e-books makes two recommendations to the CARL Copyright Committee: to create or endorse a statement of principles for licensing e-books and to create a model license for Canadian research libraries.

2) **Vatnal, R.M; Prakash, K. and Mathapati, G. C. (2004)** explains research article on developing library and information services for e-learning environment. This paper focuses on the issues of developing e-learning system, its requirement and its implication in e-learning.

The authors describe e-learning term with web based learning; computer based learning and virtual classrooms etc; needs of e-learning, patterns of it, virtual university etc. They also describe various library services in e-learning environment such as access to information resources, consultation services, reference services, inter-library loan and consortia sharing, issue in learning, etc. Authors conclude that in e-learning process the future of libraries will emerge as active bridge between the learners and information, e-learning supported by the advent of digital library will be greatly significant and crucial in higher education and research.

3) **Walters, William H. (2013)** discuss research article on E- books in Academic Libraries: Challenges for Acquisition and Collection Management. This bibliographic essay examines the difficulties associated with the selection, licensing, acquisition and management of e-books in academic libraries. This paper discusses recent research and practice in the United States and the United Kingdom. Although essay emphasizes the challenges associated with e-books.
The Researcher concludes with issues like recent studies have highlighted number of difficulties:

i) Only half of print books acquired by academic libraries are available as e-books.

ii) Many academic e-books are released three to eighteen months after the corresponding print editions.

iii) E-books publishers have taken advantages of the changing digital environment to weaken the legal framework that has traditionally favoured libraries and their patrons.

iv) For scholarly titles, the cost of producing and providing access to e-book is no lower than the cost of producing and distributing a printed volume.

v) Preservation of e-book is also difficult because it requires long-term maintenance of several distinct elements, etc.

### 3.9 Electronic Document Delivery

1) **Kinslow, Carmela** describes research article on Bridging the Gap: Electronic Document Delivery and networked information services. In this paper researcher described how their library changed from traditional services to new electronic age services.

   Researcher presents journey of library from print service, creative ways to meet variety of new research needs. Previously libraries can’t purchase all the resources then come internet, on-line search service like LEXIS, then growth of network resource sharing, and thenKresge law library joined the best known library network OCLC, then implementation of ARIEL, then UMI ARTICLE clearinghouse document delivery system.

### 3.10 Question Point

1) **Qobose, Edwin and Mologanyi, Boipuso (2015)** presenta case study of utilization of Question point at University of Botswana Library, examines the use of “Ask a LIBRARIAN”. They conclude Question point is powerful OCLC product that provides online reference service in a cooperative environment. The usage of Question point at Botswana Library is getting low due to lack of awareness, inadequate training. University of Botswana needs to review Question point in context of web 2.0.
3.11 Chat and Instant Messaging


Researcher says this bibliography is not at all comprehensive. As the title describes, it is really selected set of resources. Researcher attempted to gather resources, primarily articles published from 2000 about chat and IM as vehicles for reference services. Most of key authors conducting research and study in the area of chat and IM are represented in this bibliography. Researcher assumes that this bibliography should serve as starting point who is interested in learning more about this technology for library services. Topics covered are to chat or not to chat, user preferences, what they ask and how we answer, etc.

2) Desai, Christina M. and Graves, Stephanie J. (2006) present research article on Instruction via Instant Messaging Reference: What’s Happening? This case study analyzes one Instant Messaging Reference Service to determine what extent instruction is or can be offered in this medium and whether patrons want or expect it.

Researchers find results that patrons overwhelmingly welcome instruction and that it is provided in a large majority of cases, using variety of the bibliographic instruction techniques. The way the question is framed, however, affects the likelihood of instruction to some extent. And they concluded, this study indicates that librarians should make habit of practicing instruction in IM reference even when patrons don’t appear to be asking for it.

3) Flanagin, Andrew J. (2005) presents research article on IM online: Instant Messaging use among college students. This study examines the most prevalent motivations for using IM within what is currently among the largest demographic groups utilizing this tool, college students.

As a result, four factors were merged like social entertainment, task accomplishment, social attention, and to meet new people. Results also suggest important difference among technologies. Face to face communication was by far the most useful and most versatile channel for need satisfaction. E-mail was rated low on need satisfaction. College age respondents in this study exhibited a high capacity for
multitasking in IM Conversations. Within short lifespan IM has become a central communication tool within this population.

4) **Jennigs III, Raymond B. and Others (2006)** present research article on a study of Internet Instant messaging and Chat Protocols. This article presents an overview of IM protocols as exemplified by three popular systems AOL IM, Yahoo Messenger Microsoft Messenger. They study features and functions, system architecture, session distribution, user authentication, data transfer, etc.

   Result show that most IM systems use client server architecture. AIM used BOS server, MSN use asymmetric architecture, while YMSG uses symmetric architecture. AIM and YMSG uses users name and password for authentication while MSN uses Microsoft passport system. AIM and YMSG both use binary representation for their headers. YMSG has single level structure of fixed length fields.

5) **Ronan, Jana and Turner, Carol. (2002)** compile and publish A SPEC kit at Association of Research Libraries (ARL) on topic Chat Reference. A SPEC Survey on chat reference was distributed to the 124 ARL member libraries in July 2002. Sixty six libraries (53%) responded to survey. Goal of survey was to explore pervasiveness of chat reference in ARL member libraries and to provide overview of technologies being used, usage patterns and practices in areas of personnel, policies and procedures, evaluation and collaboration.

   Researchers find that 54% respondents indicate that chat reference or live online reference is a new dynamic library service. Total of 67 ARL member libraries now offer some type of chat reference service. Most of these services are very new. The number of services almost doubled in less than a year, spreading from 29% to 54%.

6) **Steiner, Sarah and Long, Casey. (2006)** present research article on what are we afraid of? : A survey of librarian’s opinions and misconceptions regarding Instant Messenger. Researchers discuss in general librarians’ opinions of IM are mixed and at times even combative.

   25% of libraries represented in survey offer IM and 28% are planning to offer as a virtual reference option. Based on issues about IM and chat, it is clear that both are still struggling to win full acceptance as virtual reference service. Negative
experiences with commercial chat products, concern about staffing, hours, difficulty of adjusting to the communication style of chat and IM users, all prompt librarians question to the value of services. Study confirms IM is growing in academic libraries in spite of issue around it.

3.12 Voice over Internet Protocol (VoIP)

1) Feroz, S. And Dowland, P.S. addresses a research article on Security and Risk Analysis of VoIP Networks. This paper describes all major issues related to VoIP Security and provides detailed technical information about Voice over Internet Protocol (VoIP). The focus of this paper is to highlight, discuss and introduce security issues relating to VoIP networks, given the expansion in the usage of VoIP within large corporations. This paper also describes current threats and future security measures related VoIP. The researchers concluded that in order to meet user requirements and to satisfy user needs for reliable operations over VoIP, some sorts of guidelines are needed.

2) Jalendry, Sheetal and Verma, Shradha. (2015) present a research article on A Detail Review of Voice over Internet Protocol (VoIP). Voice over Internet Protocol (VoIP) is a new method of communication. This technology allows users to make telephone calls over an IP network. This paper describes Voice over Internet Protocol (VoIP) to a level that allows discussion of security issues and concerns. It is a technology that allows users to make telephone calls over IP network. This paper gives a brief introduction of VoIP technology: the network structure, protocols, echo, delay, Jitter, and packet loss in VoIP network. Finally, researchers concluded with the discussion on the feasibility of providing VoIP over challenging satellite links.

3) Singh, Rahul and Chauvan, Ritu. (2014) present research article on a review paper: Voice over Internet Protocol. This paper describes Voice over Internet Protocol (VoIP) to a level that allows discussion of security issues and concerns. It is a technology that allows users to make telephone calls over IP network.
Researchers conclude that security for VoIP system should begin with solid security on internal network. Conducting risk analysis of each component and process will identify the vulnerabilities and threats. Striking a balance between security and the business needs of the organization is key to the success of the VoIP deployment.

3.13 Chatbots

1) Allison, DeeAnn. (2011) present research article on “Chatbots in the Library: is it time?” This paper is about adapting artificial intelligence technology for reference services. Chatbots (also known as conversational agents, artificial conversation entities or chatterboxes) are computer applications that imitate human personality. A Chatbot is interactive responding in sentences that track the conversation in a way that is meaningful to humans.

Academic libraries in US have been slow to adopt chatbots. The University of Nebraska Lincoln chatbot is the first to go into production. The chatbot, Pixel began development in the fall of 2010. It is impossible to predict what chatters will say to pixel and because they know they are chatting with bot, they will say things they would never say to human.

3.14 Video Conferencing

1) Sedgwick, Monique and Spiers, Jude. (2009) study the use of video conferencing as a medium for the qualitative interview in which they propose to present experience of using videoconferencing technology to collect experimental data from undergraduate nursing students and preceptors in Western and Northern Canada during rural hospital based preceptorship.

The recommendations made in this paper about using videoconferencing as a medium for conducting indepth qualitative interviews include using a high bandwidth connection such as super net or web conferencing and evaluating, whether the type of information being sought is likely to be shared in situations other than in-person face to face conditions. Higher bandwidth connections generally results in greater satisfaction with the videoconferencing experience.

It also presents disadvantages such as highly sensitive information can’t be shared over videoconferencing, interaction might be influenced by bandwidth of connection.
3.15 Bulletin Board
1) Ramaiah, CK (1995) presents the study of bulletin board system for Libraries. This article gives overview about electronic BBS, the infrastructure required to set up BBS and their applications in general.

Researcher suggests BBS should be attractive, user-friendly, advertising, and informative and should provide up to date information. Researcher concludes that numbers of BBS are available on national, international networks throughout the world. BBS software vendors claim that majority of their customers (about 80%) are from business or government and only about 20% are hobby or entertainment users. BBS software packages are available in UNIX, MS-DOS, Shareware, Freeware, etc.

3.16 Customer Contact Centre
1) Murphy, Sarah Anne and Cerqua, Judith. (2012) study and present research article on implementing the customer contact centre: An opportunity to create a valid measurement system for assessing and improving a library’s telephone service. In which they explain that a customer contact centre offers academic libraries the ability to consistently improve their telephone, e-mail and Instant Messaging Services.

They conclude that by consolidating telephone, e-mail and IM service in one location, Ohio State’s Research and Reference Staff gained the opportunity to share best practices across service formats, improved ability to provide consistent service. They also introduced practical methodology for developing a valid measurement system to assess employee’s handling of contact centre’s telephone calls and subsequent training needs.

3.17 Web 2.0
1) Chua, Alton Y.K. and Goh, Dion H. (2010) study web 2.0 applications in library websites. Divided equally between public and academic, 120 Libraries websites from North America, Europe and Asia were sampled and analyzed using three step content analysis methods.

The findings suggest that the order of popularity of web 2.0 applications implemented in libraries is blogs, RSS, instant messaging, social networking services, wikis and social tagging applications. The libraries in North America lead significantly in the adoption of web 2.0 applications compared to their European and
Asian counter part. The presence of web 2.0 applications was found to correlate to the overall quality of library websites.

2) Dora, Malikarjun and Maharana, Bulu. (2008) present research article on A-Lib 2.0: new avatar academic libraries with web2.0 applications. In which they explain how web 2.0 tools could be applied in academic libraries to convert them as A-Lib2.0. They also study various web 2.0 tools such as RSS (Really Simple Syndication) Wikis, blogs, flickr, IM Messenger (chat reference), etc. and its application and cases. Library 2.0 is not to replace traditional philosophy and service whatever library has but it’s about enhancing and extending its services into new areas.

3) Hazra, Sheuli. (2015) explores research article on application of web 2.0 in library services: Are we ready? In which researcher examines the evolution of web from static HTML based entity to AJAX based dynamic and participative web, called 2.0. Researcher also discusses some web 2.0 applications such as blogs, digg, Flickr, Jumpcut, Library Thing, Mashups, MySpace and Face Book, Paperback swap, etc. They also conclude that automated and digital library services are rapidly becoming web 2.0 competent library services. New tools are trying to integrate different information space on the fly in real time and thereby assuring rich experience to users.

4) Ramos, Marian S. and Abrigo, Chritine M. (2011) present paper on Reference 2.0 in action: An Evaluation of the Digital Reference Services in Selected Philippine Academic Libraries. This paper presents the current status of digital reference service among selected academic libraries in the Philippines by figuring out how information service is provided using IM and Social networking sites.

Clearly findings show that full potential of reference service 2.0 has not yet been maximized. When it comes to reference services in academic libraries, students and faculty members have chosen to go online, Ask-a-Librarian, web forms, e-mail and face book. IM and face book were found to be the most useful tools in finding relevant information. The paper further explores the different aspects of IM and face book reference service: statistics, content of the questions and quality of the answers, reference interview and the user’s awareness and preferences.
5) Sheikh, Mohd. Imran (2011) studies impact and application of web 2.0 in libraries: A case study of 12 National libraries of the developed nations. In his study he found that RSS (83.66%) was the most commonly used technology while IM was the least used one with only five libraries (41.66%). More than 65% of libraries (8 out of 12) utilized blogs and half of libraries employed podcasts. The primary purpose of RSS was “new books” (66.66%). More than half of libraries used blogs for “library Services”. The study also reveals that top three purposes of podcasts were advice on library skills, guidance with resources, and library orientation tours. It is clearly stated that Instant messaging (IM) was mostly used as a tool for virtual reference service in terms of chat services. The concept of web 2.0 is still being established.

3.18 Social Media

1) Jadhav, Vilas G. (2014) describes application of social networking services (SNS) for library collaboration: An exploratory study and examined academic librarians perspectives on using social networking services for library collaboration.

   Research Findings show most frequent social networking services on which librarians held an account was facebook, next come Linked IN, MySpace, Library Thing, second life and twitter. Only about half of the librarians under study used SNS on a daily basis. Librarians are very much aware about the use of social networking for library services.

2) Taylor and Francis. (2014) publish white paper on use of social media by the library for current practices and future opportunities. Their research program comprises focus group in the UK, USA and India; ten telephone interviews with thought leaders from library community, a twitter party, online survey (497 respondents) and desk research.

   According to this survey over 70% of libraries are using social media tools, 60% had social media account for three years or longer, 30% of librarians are posting at least daily. Face book and twitter remain most popular channels currently, but range of channels being used is expanding rapidly, such as You Tube, Pinterest, Snapchat.

   Libraries use social media for range of objectives such as promotion, collection management, outreach, etc. But use of social media for enhancing teaching
and learning is currently lower priority, but this will likely became an important activity in the near future. Most librarians feel strongly positive about the potential for social media to help increase engagement between users and library staff and services.

3.19 Mobile Internet

1) Donner, Jonathan and Walton, Marion. (2013) describe research article on “Your phone has internet- why are you at a library pc? Re-imaging public access in the mobile internet era” which focuses on teenage users of public internet access venues (PAVs) in low-income neighborhoods of Cape Town.

In findings they say free use (as in library) supports more resource intensive goals (requiring storage space, time and bandwidth) and stable media production. Paid use (such as a phone) supports time-sensitive goals, interpersonal communication and low bandwidth media use. Librarians and other PAV operators outside of those in for profit cyber cafe may benefit from specific training and encouragement oriented towards the opportunities presented by the mobile internet. With proper skills, PAV staff could help users save time waiting for shared resources and encourage them to get more out of the internet in their pocket.

2) Nazi, Ayoob; Ghasempour, Sakineh and Asgari, Leyla. (2014) discuss research article on “A Feasibility Study of Mobile Services Implementation in National Library and Archives of Iran: User’s trends”. This study seeks to reveal the opinion of the users of national library and archives of the Islamic Republic of Iran (NLAI) about library services based on cell phones, to recommend new services for this library.

Findings of the study show that 68% of respondents supported the use of mobile phone in library and did not recognize it as being a disruptive factor. Among several proposed services, over-due day reminder with 76% was the most favorable service. Providing audio tours of the library with 33% had the lowest interest. Totally, in 79% of proposed services, respondents consent was more than 50%. From the viewpoint of 55% of respondents, mobile based reference services were a suitable and inevitable service. Reference service Via SMS with 55% and through library website with 9% preferred.
3.20 Works Cited


Heron, Susan and Hanson, Ardis. (2003). From Subject Gateways to Portals: The role of metadata in accessing international research. [Available at http://scholarcommons.usf.edu/cgi/viewcontent.cgi?article=1011andcontext=dean_cbc] accessed on March 20, 2016.


105


Murphy, Sarah Anne and Cerqua, Judith. (2012). *Implementing the customer contact centre: An opportunity to create a valid measurement system for assessing and improving a library’s telephone service.* [Available at https://www.press.jhu.edu/journals/portal_libraries_and_the_academy/portal_pre_print/articles/12.3murphy.pdf ] accessed on March 20, 2016.


Chapter IV
Data Analysis and Interpretation
4.1 Introduction

Tables and Charts / Graphs Drawn from Librarian’s Responses

4.2 Online / Digital Services provided
4.3 E – mail Based Services provided
4.4 Question Point Reference Service provided
4.5 Real Time Reference Services provided
4.6 Web Form Services provided
4.7 Web Based Reference Services provided
4.8 Web 2.0 Services provided
4.9 Digital Reference Services Provided through
4.10 Digital Reference Services subscribed
4.11 Criteria for selecting Digital Reference Services
4.12 Selection of Digital Reference Services through
4.13 Evaluation of Digital Reference Services for subscribing
4.14 High extent user of Digital Reference Services
4.15 Digital Reference Services used maximum
4.16 Staff appointed for Digital Reference Services
4.17 Problems faced by librarians while providing Digital Reference Services
4.18 Arrange staff training for providing Digital Reference Services
4.19 Provision of Budget for Digital Reference Services
4.20 Cost benefit of Digital Reference Services
4.21 Provision of user education for Digital Reference Services
Tables and Charts / Graphs Drawn from User’s Responses

4.22 Usage of Online / Digital Services
4.23 Usage of E-mail Based Services
4.24 Usage of Question Point Reference Service
4.25 Usage of Real Time Reference Services
4.26 Usage of Web Form Services
4.27 Usage of Web based Reference Services
4.28 Usage of Web 2.0 Services
4.29 Experience of using Digital Reference Services
4.30 Frequency of using Digital Reference Services
4.31 Time Spent while using Digital Reference Services
4.32 Most frequently used Digital Reference Services
4.33 Place from where Digital Reference Services used by user
4.34 Purpose of using Digital Reference Services
4.35 Problems faced while using Digital Reference Services
4.36 Way to use Digital Reference Services
4.37 Authenticity of Digital Reference Services
4.38 User satisfaction by Digital Reference Services
4.39 Users got needed information through Digital Reference Services
4.40 Support from library staff for using Digital Reference Services.
4.41 As compared to traditional documents Digital Reference Services are
4.42 Users got Information regarding Digital Reference Services from
4.43 Using Digital Reference Services is
4.44 Digital Reference Services in terms of Time
4.45 Digital Reference Services in terms of Cost
4.1 Introduction

This chapter deals with analysis and interpretation of data collected through questionnaires distributed to 90 engineering college libraries affiliated to University of Pune. A detailed; structured, separate questionnaires for librarians and users are designed and distributed among respondents in engineering college libraries under study. Questionnaire is designed by keeping focus on aims and objectives of this study.

Seven questionnaires for each college including one for librarian and six for users (Faculties, Researchers and Students) are distributed with request to get filled up. Thus total 630 questionnaires are mailed, out of which 90 for librarians and 540 for users are mailed. Out of these questionnaires fully filled 392 questionnaires are received back. In these 392 questionnaires, 56 from librarians and 336 from users are received. Out of these 336 questionnaires 12 from researchers, 136 from faculties and 188 from students are there.

Data thus collected is tabulated, interpreted for easy understanding. Suitable tables, appropriate charts and graphs are created for easy understanding. For this purpose Microsoft Excel Software has been used. Statistical process carried out on the tabulated data is frequency distribution and percentage calculation. 44 tables and 51 charts / graphs are prepared for interpretation.
Tables and Charts / Graphs Drawn from Librarian’s Responses

4.2 Online / Digital Services Provided

Digital service is a network of experts, intermediation and resources placed at the disposal of users seeking answer online. This includes various services. In response to the question, the respondents are asked to indicate the online / digital services provided by their libraries. The resultant data has been reflected in table 4.1

<table>
<thead>
<tr>
<th>Online / Digital Services Provided</th>
<th>No. of Libraries (n = 56)</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web-OPAC</td>
<td>47</td>
<td>84</td>
<td>84</td>
</tr>
<tr>
<td>Subject portal / Subject gateways</td>
<td>24</td>
<td>43</td>
<td>127</td>
</tr>
<tr>
<td>Web database / Bibliographic database</td>
<td>38</td>
<td>68</td>
<td>195</td>
</tr>
<tr>
<td>Collaboration with National / International networks</td>
<td>28</td>
<td>50</td>
<td>245</td>
</tr>
<tr>
<td>Institutional repository</td>
<td>14</td>
<td>25</td>
<td>270</td>
</tr>
<tr>
<td>Link to e-resources</td>
<td>52</td>
<td>93</td>
<td>363</td>
</tr>
<tr>
<td>Link to web sites</td>
<td>39</td>
<td>70</td>
<td>432</td>
</tr>
<tr>
<td>Electronic document delivery service</td>
<td>32</td>
<td>57</td>
<td>489</td>
</tr>
<tr>
<td>Online current awareness service</td>
<td>34</td>
<td>61</td>
<td>550</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>308</strong></td>
<td><strong>550</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.1
Online / Digital Services provided

The table 4.1 clearly indicates that out of 56 respondent libraries, web-OPAC service is provided by 47 (84%) libraries. Subject portal / Subject gateways service is provided by 24 (43%) libraries. Web database / Bibliographic database service is
provided by 38 (68%) libraries. Collaboration with national / international network service is provided by 28 (50%) libraries. Institutional repository service is provided by 14 (25%) libraries. Link to e-resources service is provided by 52 (93%) libraries. Link to web-site service is provided by 39 (70%) libraries. Electronic document delivery service is provided by 32 (57%) libraries. Online current awareness service is provided by 34 (61%) libraries.

Investigator finds that link to e-resources (e-books, e-journals) is the highest provided service by the 52 (93%) engineering college libraries under the study as a digital / online service under digital reference service, while institutional repository is lowest provided service by 14 (25%) engineering college libraries as digital / online service. The resultant responses are graphically shown in figure 4.1

![Online / Digital Services Provided](image)

**Figure 4.1**
Online / Digital Services provided

### 4.3 E–mail Based Services provided

This is a common and simple service that involves to and fro exchange of information in which user sends the query in form of a message and after time delay receives back an answer. Library gives reply by e-mail, fax or phone as per user’s convenience. The resultant data has been reflected in table 4.2
<table>
<thead>
<tr>
<th>E-mail based Services provided</th>
<th>No. of Libraries (n = 56)</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>E - mail reference</td>
<td>45</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Ask- A – Librarian</td>
<td>31</td>
<td>55</td>
<td>136</td>
</tr>
<tr>
<td>Total</td>
<td>76</td>
<td>136</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.2
E-mail Based Services Provided

Study reveals that e-mail reference service is provided by maximum 45 (80%) libraries as e-mail based service under digital reference services while ask-a-librarian service is provided by minimum 31 (55%) libraries. The resultant responses are graphically shown in figure 4.2

![E-mail based services provided](image)

Figure 4.2
E-mail Based Services Provided

4.4 Question Point Reference Service provided

Availability of 24/7 and shared global expertise are the benefits of question point. The success of question point mostly depends on the regular training as well as effective marketing. The resultant data has been reflected in table 4.3
<table>
<thead>
<tr>
<th>Question point reference service Provided</th>
<th>No. of libraries</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>32</td>
<td>57</td>
<td>57</td>
</tr>
<tr>
<td>No comments</td>
<td>24</td>
<td>43</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>56</td>
<td>100.00</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.3

Question Point Reference Service Provided

It is found that question point reference service is provided by maximum 32 (57%) engineering college libraries under study, while minimum 24 (43%) college libraries have no comment, which seems that these libraries might be at developmental stage. The resultant responses are graphically shown in figure 4.3

![Figure 4.3 Question Point Reference Service Provided](image)

4.5 Real Time Reference Services provided

It is also known as real time live web reference and also it is latest trend in digital reference. In response to the question, the respondents are asked to indicate the
real time reference services provided by their libraries. The resultant data has been reflected in table 4.4

<table>
<thead>
<tr>
<th>Real Time Reference Services provided</th>
<th>No. of Libraries (n = 56)</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chat reference service</td>
<td>15</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>Instant messaging service</td>
<td>24</td>
<td>43</td>
<td>70</td>
</tr>
<tr>
<td>Voice over Internet Protocol (VoIP)</td>
<td>5</td>
<td>9</td>
<td>79</td>
</tr>
<tr>
<td>Chatter botter</td>
<td>2</td>
<td>4</td>
<td>82</td>
</tr>
<tr>
<td>Video via Reference</td>
<td>11</td>
<td>20</td>
<td>102</td>
</tr>
<tr>
<td>Video conferencing</td>
<td>11</td>
<td>20</td>
<td>121</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>68</strong></td>
<td><strong>121</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.4
Real Time Reference Services provided

Table 4.4 shows that chat reference service is provided by 15 (27%) libraries, instant messaging service is provided by 24 (43%) libraries, VoIP service is provided by 5 (9%) libraries, chatter botter service is provided by 2 (4%) libraries, video via reference service is provided by 11 (20%) libraries and video conferencing service is provided by 11 (20%) libraries.

Investigator finds that under real time reference service, instant messaging service is maximum provided service by 24 (43%) engineering college libraries as digital reference service, while chatter botter is minimum provided service by only 02 (04%) engineering college libraries under study. The resultant responses are graphically shown in figure 4.4
4.6 Web Form Services provided

This service includes two types of services. One is web form and another is frequently asked questions (FAQ). In response to the question, the respondents are asked to indicate the web form services provided by their libraries. The resultant data has been reflected in table 4.5

<table>
<thead>
<tr>
<th>Web Form Services provided</th>
<th>No. of libraries</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Form</td>
<td>11</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Frequently Asked Questions(FAQ )</td>
<td>22</td>
<td>39</td>
<td>59</td>
</tr>
<tr>
<td>No comments</td>
<td>23</td>
<td>41</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>56</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.5

Web Form Services provided

The table 4.5 clearly shows that under web form services; frequently asked question (FAQ) service is provided by maximum 22 (39%) engineering college libraries while web form service is provided by minimum 11 (20%) libraries. Also
there are no comments from 23 (41%) college libraries. Table shows that frequently asked questions (FAQ) service is provided maximum in this category by engineering college libraries under study. The resultant responses are graphically shown in figure 4.5

![Pie chart showing web form services provided]

**Figure 4.5**

Web Form Services provided

### 4.7 Web Based Reference Services provided

It also includes various services. In response to the question, the respondents are asked to indicate the web based reference services provided by their libraries. The resultant data has been reflected in table 4.6

<table>
<thead>
<tr>
<th>Web Based Reference Services provided</th>
<th>No. of Libraries (n = 56)</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulletin boards</td>
<td>16</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>Web contact centre</td>
<td>13</td>
<td>23</td>
<td>52</td>
</tr>
<tr>
<td>Search Engine Reference Service</td>
<td>24</td>
<td>43</td>
<td>95</td>
</tr>
<tr>
<td>Web based user education</td>
<td>24</td>
<td>43</td>
<td>138</td>
</tr>
<tr>
<td>User feedback from service</td>
<td>27</td>
<td>48</td>
<td>186</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>104</strong></td>
<td><strong>186</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Table 4.6**

Web Based Reference Services provided

120
Table 4.6 shows that bulletin boards service is provided by 16 (29%) libraries, web contact centre service is provided by 13 (23%) libraries, search engine reference service is provided by 24 (43%) libraries, web based user education service is provided by 24 (43%) libraries, while user feedback from service is provided by 27 (48%) libraries.

Investigator finds that under web based reference services, user feedback from services is provided by maximum 27 (48%) engineering college libraries, while minimum service provided under this category is web contact centre by 13 (23%) college libraries. The resultant responses are graphically shown in figure 4.6

![Web Based Reference Services Provided](image)

**Figure 4.6**

Web Based Reference Services provided

### 4.8 Web 2.0 Services provided

It includes services like library blog, twitter, library face book service, social media service, etc. In response to the question, the respondents are asked to indicate the web 2.0 services provided by their libraries. The resultant data has been reflected in table 4.7
Table 4.7
Web 2.0 Services provided

<table>
<thead>
<tr>
<th>Web 2.0 Services provided</th>
<th>No. of Libraries</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library Blog</td>
<td>10</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Twitter</td>
<td>5</td>
<td>9</td>
<td>27</td>
</tr>
<tr>
<td>Library FaceBook service</td>
<td>11</td>
<td>20</td>
<td>46</td>
</tr>
<tr>
<td>Social Media(WhatsApp, Skype)</td>
<td>14</td>
<td>25</td>
<td>71</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>16</td>
<td>88</td>
</tr>
<tr>
<td>No comments</td>
<td>7</td>
<td>13</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>56</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.7 clearly shows that under web 2.0 services category of digital reference services, Library Blog service is provided by 10 (18%) libraries, twitter service is provided by 5 (9%) libraries, library FaceBook service is provided by 11 (20%) libraries, social media services including WhatsApp, Skype, etc. is provided by 14 (25%) libraries, other service is provided by 9 (16%) libraries which is not specified by respondents, while there are also no comments from 7 (13%) libraries.

The table 4.7 shows that under web 2.0 services category, social media service (WhatsApp, Skype) is provided by maximum 14 (25%) engineering college libraries, while twitter service is provided by minimum 05 (09%) engineering college libraries as digital reference service. It means social media service is maximum provided web 2.0 service, while twitter service is minimum provided web 2.0 service by engineering college libraries under study. The resultant responses are graphically shown in figure 4.7.
4.9 Digital Reference Services provided through

Respondents are asked how they provide digital reference services. Options included are through internet via website, CD-ROM, online service vendors and others. In response to the question, the respondents are asked to indicate how they provide this service. The resultant data has been reflected in table 4.8

<table>
<thead>
<tr>
<th>DRS provided through</th>
<th>No. of libraries (n = 56)</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet via website</td>
<td>46</td>
<td>82</td>
<td>82</td>
</tr>
<tr>
<td>CD-ROM</td>
<td>39</td>
<td>70</td>
<td>152</td>
</tr>
<tr>
<td>Online service vendors</td>
<td>29</td>
<td>52</td>
<td>204</td>
</tr>
<tr>
<td>Others</td>
<td>3</td>
<td>5</td>
<td>209</td>
</tr>
<tr>
<td>Total</td>
<td>117</td>
<td>209</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.8
Digital Reference Services provided through
Table 4.8 shows that digital reference services are provided through internet via website by 46 (82%) engineering college libraries under study, through CD-ROM by 39 (70%) engineering college libraries, through online service vendors by 29 (52%) engineering college libraries and through others by 03 (05%) engineering college libraries under study.

Table 4.8 shows that internet via website is the medium chosen by maximum 46 (82%) engineering college libraries to provide digital reference services, while only 03 (05%) libraries have used other medium to provide digital reference services and in other category it is not further specified. It means internet via website is maximum utilized medium, while other medium is minimum utilized for providing digital reference services by the engineering college libraries under the study. The resultant responses are graphically shown in figure 4.8

4.10 Digital Reference Services subscribed

In this question, respondents are asked in which format they subscribe the resources for digital reference services. Options included are full text, abstract, bibliographic, numeric, graphic and others. Respondents are asked to indicate their response. The resultant data has been reflected in table 4.9
Table 4.9
Digital Reference Services subscribed

Table 4.9 indicates that resources for digital reference services subscribed in full text format by 48 (86%) engineering college libraries, in abstract format by 33 (59%) libraries, in bibliographic format by 20 (36%) libraries, in numeric format by 13 (23%) libraries, in graphic format by 10 (18%) libraries, and in other format by 1 (2%) engineering college libraries under study and other format is not further specified by respondent library.

The table 4.9 reveals that digital reference service subscribed at highest is full text by 48 (86%) engineering college libraries under the study, while at lowest subscribed service is other by 01 (02%) college libraries. It means subscribing and providing full text digital reference service has been given highest priority and other service is given lowest priority by engineering college libraries under the study. The resultant responses are graphically shown in figure 4.9

<table>
<thead>
<tr>
<th>DRS subscribed</th>
<th>No. of libraries (n = 56)</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Text</td>
<td>48</td>
<td>86</td>
<td>86</td>
</tr>
<tr>
<td>Abstract</td>
<td>33</td>
<td>59</td>
<td>145</td>
</tr>
<tr>
<td>Bibliographic</td>
<td>20</td>
<td>36</td>
<td>180</td>
</tr>
<tr>
<td>Numeric</td>
<td>13</td>
<td>23</td>
<td>204</td>
</tr>
<tr>
<td>Graphic</td>
<td>10</td>
<td>18</td>
<td>221</td>
</tr>
<tr>
<td>Others</td>
<td>1</td>
<td>2</td>
<td>223</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
<td>223</td>
<td></td>
</tr>
</tbody>
</table>
4.11 Criteria for selecting Digital Reference Services

In this question, respondents are asked about the criteria they use for selecting digital reference services. Options included are quantity, user demand, cost effective, authenticity, back volume facility, accessibility and others. Respondents are asked to indicate their criteria for selecting digital reference services. The resultant data has been reflected in table 4.10

<table>
<thead>
<tr>
<th>Criteria for selecting DRS</th>
<th>No. of libraries (n = 56)</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>19</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>User demand</td>
<td>47</td>
<td>84</td>
<td>118</td>
</tr>
<tr>
<td>Cost effective</td>
<td>37</td>
<td>66</td>
<td>184</td>
</tr>
<tr>
<td>Authenticity</td>
<td>41</td>
<td>73</td>
<td>257</td>
</tr>
<tr>
<td>Back Volume facility</td>
<td>36</td>
<td>64</td>
<td>321</td>
</tr>
<tr>
<td>Accessibility</td>
<td>40</td>
<td>71</td>
<td>393</td>
</tr>
<tr>
<td>Others</td>
<td>8</td>
<td>14</td>
<td>407</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>228</strong></td>
<td><strong>407</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.10: Criteria for selecting Digital Reference Services
Table 4.10 indicates that quantity criteria is selected for digital reference services by 19 (34%) engineering college libraries under study, user demand criteria is selected by 47 (84%) libraries, cost effective criteria is selected by 37 (66%) libraries, authenticity criteria is selected by 41 (73%) libraries, back volume facility criteria is selected by 36 (64%) libraries, accessibility criteria is selected by 40 (71%) libraries, while others criteria is selected by 08 (14%) engineering college libraries under study and it is not further specified.

Table 4.10 shows that in criteria for selecting digital reference service, the user demand has been given preference by maximum 47 (84%) engineering college libraries, while others have been given preference by minimum 08 (14%) libraries. It clearly means that engineering college libraries under study give highest priority to user demands while selecting digital reference services and lowest priority given to other criteria for selecting digital reference services. The resultant responses are graphically shown in figure 4.10

![Criteria for selecting DRS](image_url)

**Figure 4.10**
Criteria for selecting Digital Reference Services

127
4.12 Selection of Digital Reference Services through

In this question, respondents are asked about the source through which they do selection of digital reference services. Options included are catalogue, search through internet, recommendations from faculties, researchers and students and free online trial. Respondents are asked to indicate their source through which they select digital reference services. The resultant data has been reflected in table 4.11

<table>
<thead>
<tr>
<th>Selection of DRS Through</th>
<th>No. of libraries (n = 56)</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalogue</td>
<td>22</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td>Search through internet</td>
<td>25</td>
<td>45</td>
<td>84</td>
</tr>
<tr>
<td>Recommendation of faculties, researchers, students</td>
<td>49</td>
<td>88</td>
<td>171</td>
</tr>
<tr>
<td>Free online trial</td>
<td>20</td>
<td>36</td>
<td>207</td>
</tr>
<tr>
<td>Total</td>
<td>116</td>
<td>207</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.11
Selection of Digital Reference Services through

Table 4.11 shows that digital reference services are selected through catalogues by 22 (39%) engineering college libraries under study, search through internet by 25 (45%) libraries, recommendations of faculties, researchers and students by 49 (88%) libraries and free online trial by 20 (36%) libraries.

It clearly shows that selection of digital reference services is maximum through recommendation of faculties, researchers, and students by 49 (88%) college libraries while minimum priority is given to free online trial by 20 (36%) college libraries under study. It again shows that user demands and recommendations are more important. The resultant responses are graphically shown in figure 4.11
4.13 Evaluation of Digital Reference Services for subscribing

In this question, respondents are asked about evaluation of digital reference services for subscribing. Options included are review of expert, trial before use, cost, user needs, and coverage. Respondents are asked to indicate how they evaluate digital reference services for subscribing. The resultant data has been reflected in table 4.12

<table>
<thead>
<tr>
<th>Evaluation of DRS for subscribing</th>
<th>No. of libraries (n = 56)</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review of expert</td>
<td>36</td>
<td>64</td>
<td>64</td>
</tr>
<tr>
<td><strong>Trial before use</strong></td>
<td><strong>31</strong></td>
<td><strong>55</strong></td>
<td><strong>120</strong></td>
</tr>
<tr>
<td>Cost</td>
<td>36</td>
<td>64</td>
<td>184</td>
</tr>
<tr>
<td>User need</td>
<td>46</td>
<td>82</td>
<td>266</td>
</tr>
<tr>
<td>Coverage</td>
<td>35</td>
<td>63</td>
<td>329</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>184</strong></td>
<td><strong>329</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.12
Evaluation of Digital Reference Services for subscribing

129
Table 4.12 clearly shows that evaluation of digital reference services for subscribing is done through review of experts by 36 (64%) engineering college libraries under study, through trial before use by 31 (55%), through cost by 36 (64%), through user need by 46 (82%) and through coverage by 35 (63%) libraries.

The table 4.12 shows while evaluating digital reference service for subscribing, maximum preference is given to user needs by 46 (82%) engineering college libraries and minimum preference is given to trial before use by 31 (55%) college libraries. The resultant responses are graphically shown in figure 4.12.

---

**Figure 4.12**

Evaluation of Digital Reference Services for subscribing

---

### 4.14 High extent user of Digital Reference Services

In this question, respondents are asked about high extent user of digital reference services. Options included are researcher, faculty and student. The resultant data has been reflected in table 4.13.
Table 4.13

High extent user of Digital Reference Services

Table 4.13 shows high extent user of digital reference services, in which researchers are denoted by 12 (21%) engineering college libraries under study, faculties are denoted by 31 (55%) libraries and students are denoted by 24 (43%) libraries.

Table 4.13 clearly points that faculties are the high extent user of digital reference services denoted by 31 (55%) engineering college libraries under study while researchers use minimum digital reference services denoted by 12 (21%) libraries. The resultant responses are graphically shown in figure 4.13

<table>
<thead>
<tr>
<th>High extent user of DRS</th>
<th>No. of libraries (n = 56)</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Researchers</td>
<td>12</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Faculties</td>
<td>31</td>
<td>55</td>
<td>77</td>
</tr>
<tr>
<td>Students</td>
<td>24</td>
<td>43</td>
<td>120</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.13

High extent user of Digital Reference Services
4.15 Digital Reference Services used maximum

In this question, respondents are asked about which digital reference services are used maximum. This question is open ended and respondents are expected to write on their own experience. The resultant data has been reflected in table 4.14

<table>
<thead>
<tr>
<th>DRS Used Maximum</th>
<th>No. of libraries</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEEE</td>
<td>12</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>ASCE</td>
<td>4</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>DELNET</td>
<td>8</td>
<td>14</td>
<td>42</td>
</tr>
<tr>
<td>Internet</td>
<td>11</td>
<td>20</td>
<td>62</td>
</tr>
<tr>
<td>E-resources (e-books, e-journals )</td>
<td>21</td>
<td>38</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>56</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.14
Digital Reference Services used maximum

Table 4.14 shows digital reference services used maximum in which IEEE is denoted by 12 (21%) engineering college libraries under study, ASCE is denoted by 04 (07%) libraries, DELNET is denoted by 08 (14%) libraries, internet is denoted by 11 (20%) libraries and e-resources (e-books, e-journals) is denoted by 21 (38%) libraries under study.

While studying the type of digital reference service used maximum, table 4.14 shows that link to e-resources, including e-books, e-journals, is used at maximum shown by 21 (38%) engineering college libraries while ASCE is used at minimum shown by 04 (07%) college libraries. The resultant responses are graphically shown in figure 4.14
4.16 Staff appointed for Digital Reference Services

In this question, respondents are asked about staff appointed for digital reference services. This question is close ended and respondents are expected to indicate only yes or no. The resultant data has been reflected in table 4.15

<table>
<thead>
<tr>
<th>Staff appointed for DRS</th>
<th>No. of libraries</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>15</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>No</td>
<td>41</td>
<td>73</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>56</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.15

Staff appointed for Digital Reference Services

The table 4.15 show that 41 (73%) engineering college libraries under study does not appoint any staff for providing digital reference services while 15 (27%) libraries have appointed staff for providing digital reference services. It means 73% engineering college libraries are providing digital reference services through regular staff. This is quite disappointing. The resultant responses are graphically shown in figure 4.15
4.17 Problems faced by librarians while providing Digital Reference Services

In this question, respondents are asked about problems faced by them while providing digital reference services. The resultant data has been reflected in table 4.16

<table>
<thead>
<tr>
<th>Problems faced by librarians while providing DRS</th>
<th>No. of libraries</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical</td>
<td>20</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Monetary</td>
<td>36</td>
<td>64</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>56</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.16 Problems faced by librarians while providing DRS

Table 4.16 shows the problems faced by the librarians while providing digital reference services, in which maximum 36 (64%) engineering college libraries have replied the monetary problem and minimum 20 (36%) libraries replied technical problem. The resultant responses are graphically shown in figure 4.16
4.18 Arrange staff training for providing Digital Reference Services

In this question, respondents are asked whether they arrange staff training for providing Digital Reference Services. This question is close ended and respondents are expected to indicate only yes or no. Resultant data has been reflected in table 4.17

<table>
<thead>
<tr>
<th>Arrange staff training for providing DRS</th>
<th>No. of libraries</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>29</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>No</td>
<td>27</td>
<td>48</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>56</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.17

Arrange staff training for providing DRS

Table 4.17 shows that out of 56 engineering college libraries under study, 29 (52%) libraries arrange staff training, while 27 (48%) libraries do not arrange staff training for providing digital reference services. It is quite satisfactory that maximum 29 (52%) engineering college libraries are arranging staff training for providing
digital reference services. The resultant responses are graphically shown in figure 4.17

Arrange Staff Training for Providing DRS

Figure 4.17
Arrange staff training for providing DRS

4.19 Provision of Budget for Digital Reference Services

In this question, respondents are asked about provision of budget for digital reference services. This question is close ended and respondents are expected to indicate only yes or no. The resultant data has been reflected in table 4.18

<table>
<thead>
<tr>
<th>Provision of Budget for DRS</th>
<th>No. of libraries</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>35</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>No</td>
<td>16</td>
<td>29</td>
<td>91</td>
</tr>
<tr>
<td>No response</td>
<td>5</td>
<td>9</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>56</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.18
Provision of Budget for Digital Reference Services
Table 4.18 shows that out of 56 engineering college libraries under study, 35 (62%) college libraries do the provision of budget for digital reference service, while 16 (29%) libraries don’t have provision of budget for digital reference service and 05 (09%) libraries don’t respond. It is quite satisfactory. The resultant responses are graphically shown in figure 4.18

![Provision of Budget for DRS](image)

**Figure 4.18**
Provision of Budget for Digital Reference Services

### 4.20 Cost benefit of Digital Reference Services

In this question, respondents are asked about cost benefit of digital reference services. This question is close ended and respondents are expected to indicate only yes or no. The resultant data has been reflected in table 4.19

<table>
<thead>
<tr>
<th>Cost benefit of DRS</th>
<th>No. of libraries</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>17</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>No</td>
<td>39</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>56</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

**Table 4.19**
Cost benefit of Digital Reference Services

137
Table 4.19 indicates that 39 (70%) engineering college libraries, under study, states that providing digital reference service is not cost beneficiary, while 17 (30%) college libraries states it is cost beneficiary.

It clearly shows that providing digital reference service is cost expensive in terms of finance. The resultant responses are graphically shown in figure 4.19

![Cost Benefit of DRS](image)

**Figure 4.19**
Cost benefit of Digital Reference Services

### 4.21 Provision of user education for Digital Reference Services

In this question, respondents are asked about provision of user education for digital reference services. This question is close ended and respondents are expected to indicate only yes or no. The resultant data has been reflected in table 4.20

<table>
<thead>
<tr>
<th>Provision User Education for DRS</th>
<th>No. of libraries</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>35</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>No</td>
<td>21</td>
<td>38</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>56</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

**Table 4.20**
Provision of user education for Digital Reference Services

138
Table 4.20 shows that 35 (62%) engineering college libraries, under study, have provision of user education for using digital reference services, while 21 (38%) college libraries don’t have provision of user education for using digital reference services. The resultant responses are graphically shown in figure 4.20

![Provision of user education for DRS](image)

**Figure 4.20**
Provision of user education for Digital Reference Services

### Tables and Charts / Graphs Drawn from User’s Responses

#### 4.22 Usage of Online / Digital Services

This includes various services like web opac, subject portal / subject gateways, web database / bibliographic database, collaboration with national / international networks, institutional repository, link to e-resources, link to websites, electronic document delivery and online current awareness service, etc. In response to the question, the respondents are asked to indicate the online / digital services which they know and use, provided by their libraries. The resultant data has been reflected in table 4.21
Table 4.21
Usage of Online / Digital Services

<table>
<thead>
<tr>
<th>Usage of Online / Digital Services</th>
<th>Researchers (n = 12)</th>
<th>Faculties (n = 136)</th>
<th>Students (n = 188)</th>
<th>Average (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kno wn</td>
<td>Use</td>
<td>Use %</td>
<td>Kno wn</td>
</tr>
<tr>
<td>Web-OPAC</td>
<td>11</td>
<td>7</td>
<td>58%</td>
<td>130</td>
</tr>
<tr>
<td>Subject portal / Subject gateways</td>
<td>12</td>
<td>6</td>
<td>50%</td>
<td>101</td>
</tr>
<tr>
<td>Web database / Bibliographic</td>
<td>9</td>
<td>2</td>
<td>17%</td>
<td>63</td>
</tr>
<tr>
<td>database</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Collaboration with National /</strong></td>
<td>9</td>
<td>2</td>
<td>17%</td>
<td>44</td>
</tr>
<tr>
<td><strong>International networks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutional repository</td>
<td>8</td>
<td>5</td>
<td>42%</td>
<td>121</td>
</tr>
<tr>
<td><strong>Link to e-resources</strong></td>
<td>12</td>
<td>11</td>
<td>92%</td>
<td>136</td>
</tr>
<tr>
<td>Link to web sites</td>
<td>12</td>
<td>8</td>
<td>67%</td>
<td>135</td>
</tr>
<tr>
<td>Electronic document delivery</td>
<td>8</td>
<td>5</td>
<td>42%</td>
<td>57</td>
</tr>
<tr>
<td>service</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online current awareness service</td>
<td>8</td>
<td>4</td>
<td>33%</td>
<td>54</td>
</tr>
<tr>
<td><strong>Average (%)</strong></td>
<td>82%</td>
<td>46%</td>
<td>69%</td>
<td>46%</td>
</tr>
</tbody>
</table>

Table 4.21 shows the usage of online / digital services, in which WEB OPAC service is known to 11 researchers and 07 (58%) researchers use it, known to 130 faculties and 112 (82%) use it, known to 178 students and 141 (75%) students use it. Average usage of WEB OPAC service by users is 72%.
Subject portals / subject gateways service is known to 12 researchers and 6 (50%) researchers use it, known to 101 faculties and 27 (20%) faculties use it, known to 101 students and 36 (19%) students use it. Average usage of subject portals / subject gateways service by users is 30 %.

Web database / bibliographic database service is known to 9 researchers and 2 (17%) use it, known to 63 faculties and 15 (11%) use it, known to 93 students and 29 (15%) use it. Average usage of web database / bibliographic database service by users is 14 %.

Collaboration to national / international networks service is known to 9 researchers and 2 (17%) use it, known to 44 faculties and 18 (13%) use it, known to 70 students and 17 (9%) use it. Average usage of collaboration to national / international networks service by users is 13 %.

Institutional repository service is known to 8 researchers and 5 (42%) use it, known to 121 faculties and 99 (73%) use it, known to 160 students and 73 (39%) use it. Average usage of institutional repository service by users is 51 %.

Link to e-resources service is known to 12 researchers and 11 (92%) use it, known to 136 faculties and 131 (96%) use it, known to 178 students and 158 (84%) use it. Average usage of link to e-resources service by users is 91 %.

Link to website service is known to 12 researchers and 8 (67%) use it, known to 135 faculties and 121 (89%) use it, known to 178 students and 161 (86%) use it. Average usage of link to website service by users is 80 %.

Electronic document delivery service is known to 8 researchers and 5 (42%) use it, known to 57 faculties and 9 (7%) use it, known to 84 students and 14 (7%) use it. Average usage of electronic document delivery service by users is 19 %.

Online current awareness service is known to 8 researchers and 4 (33%) use it, known to 54 faculties and 32 (24%) use it, known to 89 students and 25 (13%) use it. Average usage of online current awareness service by users is 23 %.

While studying usage of online / digital services, investigator found that link to e-resources (e-books, e-journals, e-thesis) is maximum average 91% used by users while collaboration with national / international network is minimum average 13 % used service.
The resultant responses are graphically shown in figure 4.21

**Figure 4.21**

**Service Utilization Trend – Online / Digital Services**

Study clearly indicates that average 82% researchers know the online / digital services but only average 46% use the same, while average 69% faculties know these services but only average 46% use it, and average 67% students know these services but only average 39% use these services. The user trend indicates that usage of these online / digital services is less. The resultant responses are graphically shown in figure 4.22
4.23 Usage of E-mail Based Services

This includes two services, i.e. e-mail reference and ask-a-librarian. In response to the question, the respondents are asked to indicate the e-mail based services which they know and use, provided by their libraries. The resultant data has been reflected in table 4.22

<table>
<thead>
<tr>
<th>Usage of E-mail Based Services</th>
<th>Researchers(n=12)</th>
<th>Faculties (n=136)</th>
<th>Students (n=188)</th>
<th>Average (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Known Use (%)</td>
<td>Known Use (%)</td>
<td>Known Use (%)</td>
<td>Known Use (%)</td>
</tr>
<tr>
<td>E-mail reference</td>
<td>11  9 75%</td>
<td>129 107 79%</td>
<td>174 97 52%</td>
<td>68%</td>
</tr>
<tr>
<td>Ask-A-Librarian</td>
<td>11  9 75%</td>
<td>124 100 74%</td>
<td>174 139 74%</td>
<td>74%</td>
</tr>
<tr>
<td>Average %</td>
<td>92% 75%</td>
<td>93% 76%</td>
<td>93% 63%</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.22
Usage of E-mail Based Services
Table 4.22 shows that e-mail reference service is known to 11 researchers and 9 (75%) use it, known to 129 faculties and 107 (79%) use it, known to 174 students and 97 (52%) use it. Average usage of e-mail reference service by users is 68%.

Ask-A-Librarian service is known to 11 researchers and 9 (75%) use it, known to 124 faculties and 100 (74%) use it, known to 174 students and 139 (74%) use it. Average usage of ask-a-librarian service by users is 74%.

Investigator found that under e-mail based digital reference services; ask – a – librarian service is maximum used by average 74% users while e-mail reference service is minimum used by average 68% users. The resultant responses are graphically shown in figure 4.23

![Service Utilization Trend - E-mail Based Services](image)

**Figure 4.23**

Service Utilization Trend: E-mail Based Services

Under e-mail based digital reference services, user trend shows that average 92% researchers know these services but only average 75% use it, while average 93% faculties know these services but average 76% use it and average 93% students know these services but average 63% use these services. The resultant responses are graphically shown in figure 4.24
4.24 Usage of Question Point Reference Service

In response to the question, the respondents are asked to indicate whether they know and use question point reference service provided by their libraries. The resultant data has been reflected in table 4.23

<table>
<thead>
<tr>
<th>Reference Service</th>
<th>Researchers (n=12)</th>
<th>Faculties (n=136)</th>
<th>Students (n=188)</th>
<th>Average (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Known Use</td>
<td>Known Use</td>
<td>Known Use</td>
<td></td>
</tr>
<tr>
<td>Question point reference service</td>
<td>9</td>
<td>2</td>
<td>58</td>
<td>92%</td>
</tr>
<tr>
<td></td>
<td>17%</td>
<td>10</td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>Average %</td>
<td>75%</td>
<td>43%</td>
<td>43%</td>
<td>17%</td>
</tr>
</tbody>
</table>

Table 4.23

Usage of Question Point Reference Service

Table 4.23 shows that question point reference service is known to 9 researchers and 2 (17%) use it, known to 58 faculties and 10 (7%) use it, known to 80 students and 12 (6%) use it. Average usage of question point reference service by users is 10%.
Investigator find that question point reference service is used less at average 10% by users. The resultant responses are graphically shown in figure 4.25.

**Figure 4.25**


User trend shows that question point reference service is known to average 75% researchers but only average 17% use it, while average 43% faculties know this service but only average 7% use it and average 43% students know this service but average 6% uses it. The resultant responses are graphically shown in figure 4.26.

**Figure 4.26**

User Trend: Question Point Reference Service
4.25 Usage of Real Time Reference Services

This includes various services. In response to the question, the respondents are asked to indicate the real time reference services which they know and use, provided by their libraries. The resultant data has been reflected in table 4.24

<table>
<thead>
<tr>
<th>Usage of Real Time Reference Services</th>
<th>Researchers (n= 12)</th>
<th>Faculties (n= 136)</th>
<th>Students (n= 188)</th>
<th>Average (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chat reference service</td>
<td>Kno wn</td>
<td>Use</td>
<td>Use %</td>
<td>Kno wn</td>
</tr>
<tr>
<td>Chat reference service</td>
<td>8</td>
<td>2</td>
<td>17%</td>
<td>38</td>
</tr>
<tr>
<td>Instant messaging service</td>
<td>11</td>
<td>8</td>
<td>67%</td>
<td>122</td>
</tr>
<tr>
<td>VoIP</td>
<td>7</td>
<td>2</td>
<td>17%</td>
<td>68</td>
</tr>
<tr>
<td>Chatter botter</td>
<td>4</td>
<td>0</td>
<td>0%</td>
<td>10</td>
</tr>
<tr>
<td>Video via reference</td>
<td>5</td>
<td>2</td>
<td>17%</td>
<td>10</td>
</tr>
<tr>
<td>Video conference</td>
<td>11</td>
<td>2</td>
<td>17%</td>
<td>116</td>
</tr>
<tr>
<td>Average %</td>
<td>64%</td>
<td>22%</td>
<td>45%</td>
<td>15%</td>
</tr>
</tbody>
</table>

Table 4.24

Usage of Real Time Reference Services

Table 4.24 shows the usage of real time reference services, in which chat reference service is known to 8 researchers and 2 (17%) use it, known to 38 faculties and 4 (3%) use it, known to 59 students and 19 (10%) use it. Average usage of chat reference service by users is 10%.

Instant messaging service is known to 11 researchers and 8 (67%) use it, known to 122 faculties and 104 (76%) use it, known to 169 students and 144 (77%) use it. Average usage of instant messaging service by users is 73%.
VoIP service is known to 7 researchers and 2 (17%) use it, known to 68 faculties and 3 (2%) use it, known to 64 students and 12 (6%) use it. Average usage of VoIP service by users is 8%.

Chatter botter service is known to 4 researchers and no one use it, known to 10 faculties and 1 (1%) use it, known to 38 students and 10 (5%) use it. Average usage of chatter botter service by users is 2%.

Video via reference service is known to 5 researchers and 2 (17%) use it, known to 10 faculties and 3 (2%) use it, known to 47 students and 13 (7%) use it. Average usage of video via reference service by users is 9%.

Video conferencing service is known to 11 researchers and 2 (17%) use it, known to 116 faculties and 11 (8%) use it, known to 131 students and 31 (16%) use it. Average usage of video conferencing service by users is 14%.

Under real time reference services, Instant Messaging service is used at high extent by average 73% users while chatter botter is less used service at average 02% by users of engineering college libraries under study. The resultant responses are graphically shown in figure 4.27

![Service Utilization Trend - Real Time Reference Services](image)

**Figure 4.27**

**Service Utilization Trend: Real Time Reference Services**

User trend of real time reference services shows that average 64% researchers know these services but average 22% use these, while average 45% faculties know these services but average 15% use it and average 45% students know these services
but average 20% use these services. The resultant responses are graphically shown in figure 4.28

![User Trend - Real Time Reference Services](chart.png)

**Figure 4.28**
User Trend: Real Time Reference Services

### 4.26 Usage of Web Form Services

This includes two services. In response to the question, the respondents are asked to indicate the web form services which they know and use, provided by their libraries. The resultant data has been reflected in table 4.25

<table>
<thead>
<tr>
<th>Usage of Web Form services</th>
<th>Researchers (n=12)</th>
<th>Faculties (n=136)</th>
<th>Students (n=188)</th>
<th>Average (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Known Use Use %</td>
<td>Known Use Use %</td>
<td>Known Use Use %</td>
<td>Known Use Use %</td>
</tr>
<tr>
<td>Web Form</td>
<td>6 1 8%</td>
<td>23 11 8%</td>
<td>57 23 12%</td>
<td>10%</td>
</tr>
<tr>
<td>Frequently Asked Questions (FAQ)</td>
<td>12 10 83%</td>
<td>123 93 68%</td>
<td>169 118 63%</td>
<td>71%</td>
</tr>
<tr>
<td>Average %</td>
<td>75% 46%</td>
<td>54% 38%</td>
<td>60% 38%</td>
<td></td>
</tr>
</tbody>
</table>

**Table 4.25**
Usage of Web Form Services
Table 4.25 shows the usage of web form services, in which web form service is known to 6 researchers and 1 (8%) uses it, known to 23 faculties and 11 (8%) use it, known to 57 students and 23 (12%) use it. Average usage of web form service by users is 10%.

Frequently Asked Questions (FAQ) service is known to 12 researchers and 10 (83%) use it, known to 123 faculties and 93 (68%) use it, known to 169 students and 118 (63%) use it. Average usage of this service by users is 71%.

Investigations shows that under web form services, maximum used service is Frequently Asked Questions (FAQ) by average 71% users and web form service is minimum used by average 10% users. The resultant responses are graphically shown in figure 4.29

![Service Utilization Trend- Web Form Services](image)

**Figure 4.29**

Service Utilization Trend: Web Form Services

User trend of web form services indicates that average 75% researchers know these services but only average 46% use these, while average 54% faculties know these services but average 38% use it and average 60% students know these services but average 38% use these services. The resultant responses are graphically shown in figure 4.30
4.27 Usage of Web based Reference Services

Web based reference services includes various services like bulletin boards, web contact centre, search engine reference service, web based user education and user feedback from service, etc. In response to the question, the respondents are asked to indicate the web based reference services which they know and use, provided by their libraries. The resultant data has been reflected in table 4.26
Table 4.26
Usage of Web based Reference Services

Table 4.26 shows the usage of web based reference services, in which bulletin boards service is known to 8 researchers and 1 (8%) use it, known to 57 faculties and 4 (3%) use it, known to 89 students and 17 (9%) use it. Average usage of bulletin boards service by users is 7%.

Web contact centre service is known to 7 researchers and 4 (33%) use it, known to 13 faculties and 4 (3%) use it, known to 41 students and 11 (6%) use it. Average usage of web contact centre service by users is 14%.

Search engine reference service is known to 9 researchers and 5 (42%) use it, known to 93 faculties and 53 (39%) use it, known to 116 students and 60 (32%) use it. Average usage of search engine reference service by users is 38%.

Web based user education service is known to 7 researchers and 1 (8%) use it, known to 25 faculties and 8 (6%) use it, known to 54 students and 22 (12%) use it. Average usage of web based user education service by users is 9%.

<table>
<thead>
<tr>
<th>Usage of Web Based Reference Services</th>
<th>Researchers (n=12)</th>
<th>Faculties (n= 136)</th>
<th>Students (n= 188)</th>
<th>Average (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Known</td>
<td>Use</td>
<td>Use %</td>
<td>Known</td>
</tr>
<tr>
<td>Bulletin boards</td>
<td>8</td>
<td>1</td>
<td>8%</td>
<td>57</td>
</tr>
<tr>
<td>Web contact centre</td>
<td>7</td>
<td>4</td>
<td>33%</td>
<td>13</td>
</tr>
<tr>
<td>Search engine reference service</td>
<td>9</td>
<td>5</td>
<td>42%</td>
<td>93</td>
</tr>
<tr>
<td>Web based user education</td>
<td>7</td>
<td>1</td>
<td>8%</td>
<td>25</td>
</tr>
<tr>
<td>User feedback from service</td>
<td>8</td>
<td>3</td>
<td>25%</td>
<td>19</td>
</tr>
</tbody>
</table>
User feedback from service is known to 8 researchers and 3 (25%) use it, known to 19 faculties and 7 (5%) use it, known to 60 students and 22 (12%) use it. Average usage of user feedback from service by users is 14%.

It clearly shows that out of web based reference services, search engine reference service is used maximum by average 38% users while bulletin boards service is less used by average 7% users. The resultant responses are graphically shown in figure 4.31.

![Service Utilization Trend- Web Based Reference Services](image)

**Figure 4.31**
Service Utilization Trend: Web based Reference Services

User trend of web based reference services indicated that average 65% researchers know these services but only average 23% use these, while average 30% faculties know these services but average 11% use it and average 38% students know these services but average 14% use these services. The resultant responses are graphically shown in figure 4.32.
Web 2.0 services include various services like library blog, twitter service, library facebook service, social media and other services, etc. In response to the question, the respondents are asked to indicate the web 2.0 services which they know and use, provided by their libraries. The resultant data has been reflected in table 4.27.
Table 4.27 shows the usage of web 2.0 services, in which library blog service is known to 6 researchers and 2 (17%) use it, known to 37 faculties and 4 (3%) use it, known to 54 students and 17 (9%) use it. Average usage of library blog service by users is 10%.

Library twitter service is known to 6 researchers and 1 (8%) use it, known to 44 faculties and 23 (17%) use it, known to 80 students and 28 (15%) use it. Average usage of library twitter service by users is 13%.

Library face book service is known to 8 researchers and 4 (33%) use it, known to 11 faculties and 2 (1%) use it, known to 50 students and 24 (13%) use it. Average usage of library face book service by users is 16%.

Library social media service is known to 9 researchers and 6 (50%) use it, known to 111 faculties and 82 (60%) use it, known to 140 students and 102 (54%) use it. Average usage of library social media service by users is 55%.

Other web 2.0 services provided by library is known to 3 researchers and 1 (8%) use it, known to 6 faculties and 2 (1%) use it, known to 33 students and 18 (10%) use it. Average usage of this service by users is 6%.

Investigator finds that under web 2.0 services, social media service is maximum utilized by average 55% users while average 6% other services are used minimum by users. The resultant responses are graphically shown in figure 4.33.

![Service Utilization Trend-Web 2.0 Services](image)

*Figure 4.33: Service Utilization Trend: Web 2.0 Services*
User trend of web 2.0 services indicates that average 53% researchers know these services but only average 23% use it, while average 31% faculties know these services and 17% use it, simultaneously average 38% students know it but use only average 20%. The resultant responses are graphically shown in figure 4.34

![User Trend - Web 2.0 Services](image)

**Figure 4.34**

**User Trend: Web 2.0 Services**

### 4.29 Experience of using Digital Reference Services

In this question, respondents are asked about their experience of using digital reference services. This question is close ended and respondents are expected to indicate their response. The resultant data has been reflected in table 4.28

<table>
<thead>
<tr>
<th>Experience of using DRS</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 6 months</td>
<td>1</td>
<td>9</td>
<td>37</td>
<td>47</td>
<td>14</td>
</tr>
<tr>
<td>6 months-1 year</td>
<td>0</td>
<td>16</td>
<td>26</td>
<td>42</td>
<td>12</td>
</tr>
<tr>
<td>1-2 years</td>
<td>2</td>
<td>40</td>
<td>54</td>
<td>96</td>
<td>29</td>
</tr>
<tr>
<td>2-4 years</td>
<td>6</td>
<td>66</td>
<td>59</td>
<td>131</td>
<td>39</td>
</tr>
<tr>
<td>More than 4 years</td>
<td>3</td>
<td>5</td>
<td>12</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>136</td>
<td>188</td>
<td>336</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table 4.28**

Experience of using Digital Reference Services
Table 4.2 shows how long users are using digital reference services. 01 researcher, 09 faculties, 37 students and total 47 (14%) users have an experience of using digital reference services for less than six months. 16 faculties, 26 students and total 42 (12%) users have an experience of using digital reference services from six months to one year. 02 researchers, 40 faculties, 54 students and total 96 (29%) users have an experience of using digital reference services from one to two years. 06 researchers, 66 faculties, 59 students and total 131 (39%) users have an experience of using digital reference services from two to four years. 03 researchers, 05 faculties, 12 students and total 20 (06%) users have an experience of using digital reference services more than four years.

While studying the experience of using digital reference services, it is found that maximum 06 researchers, 66 faculties, 59 students and total 131 (39%) users are using these services from 2 to 4 years, where as minimum 03 researchers, 05 faculties, 12 students and total 20 (06%) users have an experience of using digital reference services more than four years. The resultant responses are graphically shown in figure 4.35

![Experience of using DRS](image_url)
4.30 Frequency of using Digital Reference Services

In this question, respondents are asked about how frequently they are using digital reference services. This question is close ended and respondents are expected to indicate their response. The resultant data has been reflected in table 4.29

<table>
<thead>
<tr>
<th>Frequency of using DRS</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>12</td>
<td>3.57</td>
</tr>
<tr>
<td>2-3 times in a week</td>
<td>0</td>
<td>6</td>
<td>15</td>
<td>21</td>
<td>6.25</td>
</tr>
<tr>
<td>2-3 times in a month</td>
<td>2</td>
<td>8</td>
<td>13</td>
<td>23</td>
<td>6.85</td>
</tr>
<tr>
<td>once in a month</td>
<td>9</td>
<td>118</td>
<td>142</td>
<td>269</td>
<td>80.06</td>
</tr>
<tr>
<td>None</td>
<td>0</td>
<td>1</td>
<td>10</td>
<td>11</td>
<td>3.27</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td><strong>136</strong></td>
<td><strong>188</strong></td>
<td><strong>336</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table 4.29

Frequency of using Digital Reference Services

Table 4.29 shows how frequently users are using digital reference services. 01 researcher, 03 faculties, 8 students and total 12 (3.57%) users are using digital reference services daily. 06 faculties, 15 students and total 21 (6.25%) users are using digital reference services 2-3 times in a week. 02 researchers, 08 faculties, 13 students and total 23 (6.85%) users are using digital reference services 2-3 times in a month. 09 researchers, 118 faculties, 142 students and total 269 (80.06%) users are using digital reference services once in a month. 01 faculty, 10 students and total 11 (3.27%) users have responded none of the above.

While studying frequency of using digital reference services, it is observed that maximum 09 researchers, 118 faculties, 142 students and total 269 (80.06%) users of engineering college libraries, under study, use these services once in a month, while minimum 01 researcher, 03 faculties, 8 students and total 12 (3.57%) users use these services daily. It shows that digital reference services are not used at high extent by users of engineering college libraries under study. The resultant responses are graphically shown in figure 4.36
4.31 Time Spent while using Digital Reference Services

In this question, respondents are asked about how much time they spend while using digital reference services. This question is close ended and respondents are expected to indicate their response. The resultant data has been reflected in table 4.30

<table>
<thead>
<tr>
<th>Time Spent while using DRS</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 1 hr in a week</td>
<td>9</td>
<td>122</td>
<td>149</td>
<td>280</td>
<td>83.33</td>
</tr>
<tr>
<td>2-3 hrs in a week</td>
<td>3</td>
<td>11</td>
<td>19</td>
<td>33</td>
<td>9.82</td>
</tr>
<tr>
<td>5-6 hrs in a week</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>2.08</td>
</tr>
<tr>
<td>more than 6 hrs in a week</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>1.49</td>
</tr>
<tr>
<td>None</td>
<td>0</td>
<td>1</td>
<td>10</td>
<td>11</td>
<td>3.27</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>136</td>
<td>188</td>
<td>336</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.30
Time Spent while using Digital Reference Services
Table 4.30 shows that 09 researchers, 122 faculties, 149 students and total 280 (83.33%) users spent less than one hour in a week while using digital reference services. 03 researchers, 11 faculties, 19 students and total 33 (9.82%) users spent 2-3 hours in a week. 02 faculties, 05 students and total 07 (2.08%) users spent 5-6 hours in a week. 05 students and total 05 (1.49%) users spent more than 6 hours in a week. 01 faculty, 10 students and total 11 (3.27%) users have responded none of the above.

While studying time spent on using digital reference services, it is observed that maximum 280 (83.33%) users have spent less than one hour in a week, while minimum 05 (1.49%) users have spent more than six hours in a week.

It again shows that digital reference services are not used at high extent by users of engineering college libraries under study. The resultant responses are graphically shown in figure 4.37

![Time Spent while using DRS](image)

**Figure 4.37**

Time Spent while using Digital Reference Services

**4.32 Most frequently used Digital Reference Services**

In this question, respondents are asked which digital reference services are used most frequently by them. This question is open ended and respondents are expected to write their response. The resultant data has been reflected in table 4.31

160
<table>
<thead>
<tr>
<th>Most frequently used DRS</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web OPAC</td>
<td>2</td>
<td>58</td>
<td>58</td>
<td>118</td>
<td>32.69</td>
</tr>
<tr>
<td>E-resources (e-books, e-journals)</td>
<td>3</td>
<td>85</td>
<td>95</td>
<td>183</td>
<td>50.69</td>
</tr>
<tr>
<td>IEEE</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>11</td>
<td>3.05</td>
</tr>
<tr>
<td>ASME</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>10</td>
<td>2.77</td>
</tr>
<tr>
<td>Springer</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>10</td>
<td>2.77</td>
</tr>
<tr>
<td>Science direct</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>10</td>
<td>2.77</td>
</tr>
<tr>
<td>Search engine</td>
<td>2</td>
<td>2</td>
<td>15</td>
<td>19</td>
<td>5.26</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td><strong>159</strong></td>
<td><strong>190</strong></td>
<td><strong>361</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table 4.31

Most frequently used Digital Reference Services

Table 4.31 shows that 02 researchers, 58 faculties, 58 students and total 118 (32.69%) users use WEB OPAC most frequently. 03 researchers, 85 faculties, 95 students and total 183 (50.69%) users use e-resources (e-books, e-journals) most frequently. 01 researcher, 04 faculties, 06 students and total 11 (3.05%) users use IEEE most frequently. 01 researcher, 02 faculties, 07 students and total 10 (2.77%) users use ASME most frequently. 01 researcher, 03 faculties, 06 students and total 10 (2.77%) users use Springer most frequently. 02 researchers, 05 faculties, 03 students and total 10 (2.77%) users use Science Direct most frequently. 02 researchers, 02 faculties, 15 students and total 19 (5.26%) users use search engine most frequently.

Study clearly indicates that most frequently used digital reference service is e-resources (e-books, e-journals), used by maximum 183 (50.69%) users while minimum 10 (2.77%) users use ASME, 10 (2.77%) users use Springer and 10 (2.77%) users use science direct. The resultant responses are graphically shown in figure 4.38.
4.33 Place from where Digital Reference Services used by users

In this question, respondents are asked about the place where they use digital reference services. The resultant data has been reflected in table 4.32.

<table>
<thead>
<tr>
<th>Place used for using DRS</th>
<th>Researcher</th>
<th>Faculty</th>
<th>Student</th>
<th>Total</th>
<th>Percentage</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>In library</td>
<td>9</td>
<td>91</td>
<td>149</td>
<td>249</td>
<td>41.64</td>
<td>41.64</td>
</tr>
<tr>
<td>From home</td>
<td>7</td>
<td>66</td>
<td>37</td>
<td>110</td>
<td>18.39</td>
<td>60.03</td>
</tr>
<tr>
<td>At internet centre</td>
<td>3</td>
<td>91</td>
<td>99</td>
<td>193</td>
<td>32.27</td>
<td>92.31</td>
</tr>
<tr>
<td>Through smartphone</td>
<td>1</td>
<td>13</td>
<td>25</td>
<td>39</td>
<td>6.52</td>
<td>98.83</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>7</td>
<td>1.17</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>263</td>
<td>314</td>
<td>598</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.32
Place from where Digital Reference Services used by user
Table 4.32 shows that 09 researchers, 91 faculties, 149 students and total 249 (41.64%) users use digital reference services in library. 07 researchers, 66 faculties, 37 students and total 110 (18.39%) users use digital reference services from home. 03 researchers, 91 faculties, 99 students and total 193 (32.27%) users use digital reference services from internet centre. 01 researcher, 13 faculties, 25 students and total 39 (6.52%) users use digital reference services through smart phone. 01 researcher, 02 faculties, 04 students and total 07 (1.17%) users use digital reference services from other places but not specified.

While studying place from where digital reference services are used, it is found that maximum 249 (41.64%) users use these services in library, while minimum 07 (1.17%) users use from other place. It is quite amazing that digital reference services are used in library more but on the other hand it shows the traditional mentality of users and necessity of library. The resultant responses are graphically shown in figure 4.39.

<table>
<thead>
<tr>
<th>Place from where DRS used by users</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percent</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Library</td>
<td></td>
<td></td>
<td></td>
<td>149</td>
<td></td>
<td>249 (41.64%)</td>
</tr>
<tr>
<td>From home</td>
<td>07</td>
<td>66</td>
<td>37</td>
<td>110</td>
<td></td>
<td>110 (18.39%)</td>
</tr>
<tr>
<td>At Internet centre</td>
<td>03</td>
<td>91</td>
<td>99</td>
<td>193</td>
<td></td>
<td>193 (32.27%)</td>
</tr>
<tr>
<td>Through Smartphone</td>
<td>01</td>
<td>13</td>
<td>25</td>
<td>39</td>
<td></td>
<td>39 (6.52%)</td>
</tr>
<tr>
<td>Other</td>
<td>01</td>
<td>02</td>
<td>04</td>
<td>07</td>
<td></td>
<td>07 (1.17%)</td>
</tr>
</tbody>
</table>

**Figure 4.39**

Place from where Digital Reference Services used by users

**4.34 Purpose of using Digital Reference Services**

In this question, respondents are asked about purpose of using digital reference services. Respondents are expected to indicate their response. The resultant data has been reflected in table 4.33
Table 4.33

Purpose of using Digital Reference Services

Table 4.33 shows that 08 researchers, 115 faculties, 180 students and total 303 (60.48%) users use digital reference services for educational purpose. 10 researchers, 36 faculties, 28 students and total 74 (14.77%) users use digital reference services for research purpose. 08 researchers, 111 faculties, 03 students and total 122 (24.35%) users use digital reference services for teaching purpose. 02 students and total 02 (0.40%) users use digital reference services for other purpose and further not specified.

Study shows the purpose of using digital reference services is maximum for education by 08 researchers, 115 faculties, 180 students and total 303 (60.48%) users and minimum 02 (0.40%) users use it for other purpose. The resultant responses are graphically shown in figure 4.40

<table>
<thead>
<tr>
<th>Purpose of using DRS</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>8</td>
<td>115</td>
<td>180</td>
<td>303</td>
<td>60.48</td>
</tr>
<tr>
<td>Research</td>
<td>10</td>
<td>36</td>
<td>28</td>
<td>74</td>
<td>14.77</td>
</tr>
<tr>
<td>Teaching</td>
<td>8</td>
<td>111</td>
<td>3</td>
<td>122</td>
<td>24.35</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0.40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>26</strong></td>
<td><strong>262</strong></td>
<td><strong>213</strong></td>
<td><strong>501</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Figure 4.40

Purpose of using Digital Reference Services
4.35 Problems faced while using Digital Reference Services

In this question, respondents are asked about problems faced while using digital reference services. Respondents are expected to indicate their response. The resultant data has been reflected in table 4.34

<table>
<thead>
<tr>
<th>Problems faced while using DRS</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slow access speed</td>
<td>4</td>
<td>82</td>
<td>110</td>
<td>196</td>
<td>39.2</td>
</tr>
<tr>
<td>Difficult to find relevant information</td>
<td>5</td>
<td>22</td>
<td>92</td>
<td>119</td>
<td>23.8</td>
</tr>
<tr>
<td>Downloading speed</td>
<td>3</td>
<td>81</td>
<td>73</td>
<td>157</td>
<td>31.4</td>
</tr>
<tr>
<td>Privacy</td>
<td>3</td>
<td>1</td>
<td>16</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>8</td>
<td>1.6</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>189</td>
<td>296</td>
<td>500</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.34

Problems faced while using Digital Reference Services

Table 4.34 shows the problems faced by users while using digital reference services. 04 researchers, 82 faculties, 110 students and total 196 (39.2%) users face problem of slow access speed. 05 researchers, 22 faculties, 92 students and total 119 (23.8%) users face problem of finding relevant information. 03 researchers, 81 faculties, 73 students and total 157 (31.4%) users face problem of downloading speed. 03 researchers, 01 faculty, 16 students and total 20 (4.0%) users face problem of privacy. 03 faculties, 05 students and total 08 (1.6%) users face other problem and further not specified.

While studying problems faced by users at the time of using digital reference services, it is found that maximum 196 (39.2%) users complain about slow access speed, while minimum 08 (1.6%) users note other problems. The resultant responses are graphically shown in figure 4.41
4.36 Way to use Digital Reference Services

In this question, respondents are asked about how they use digital reference services. Respondents are expected to indicate their response. The resultant data has been reflected in table 4.35

<table>
<thead>
<tr>
<th>Way to use DRS</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>By asking Library staff</td>
<td>4</td>
<td>63</td>
<td>143</td>
<td>210</td>
<td>58.99</td>
</tr>
<tr>
<td>Through college website</td>
<td>9</td>
<td>79</td>
<td>44</td>
<td>132</td>
<td>37.08</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>14</td>
<td>3.93</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>143</td>
<td>199</td>
<td>356</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.35

Way to use Digital Reference Services

Table 4.35 shows that 04 researchers, 63 faculties, 143 students and total 210 (58.99%) users use digital reference service by asking library staff. 09 researchers, 79 faculties, 44 students and total 132 (37.08%) users use digital reference service through college website. 01 researcher, 01 faculty, 12 students and total 14 (3.93%) users use digital reference service by other way.
While studying way to use digital reference services maximum 210 (58.99%) users said that by asking library staff while minimum 14 (3.93%) users use it by other way. The resultant responses are graphically shown in figure 4.42

![Ways to use DRS](image)

**Figure 4.42**

*Way to use Digital Reference Services*

### 4.37 Authenticity of Digital Reference Services

In this question, respondents are asked about authenticity of digital reference services. This question is close ended and respondents are expected to indicate their response. The resultant data has been reflected in table 4.36

<table>
<thead>
<tr>
<th>Authenticity Of DRS</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>9</td>
<td>131</td>
<td>170</td>
<td>310</td>
<td>92.26</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>5</td>
<td>18</td>
<td>26</td>
<td>7.74</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>136</td>
<td>188</td>
<td>336</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table 4.36**

*Authenticity of Digital Reference Services*

Table 4.36 shows that 09 researchers, 131 faculties, 170 students and total 310 (92.26%) users are saying digital reference services are authentic. 03 researchers, 05 faculties, 18 students and total 26 (7.74%) users are saying digital reference services are not authentic.
While studying authenticity of digital reference services, it is noticed that maximum 310 (92.26%) users say YES, it is authentic, while minimum 26 (7.74%) users say NO, it is not authentic service. The resultant responses are graphically shown in figure 4.43

![Authenticity of DRS](image)

**Figure 4.43**

**Authenticity of Digital Reference Services**

### 4.38 User satisfaction by Digital Reference Services

In this question, respondents are asked about satisfaction by digital reference services. Respondents are expected to indicate their response. The resultant data has been reflected in table 4.37

<table>
<thead>
<tr>
<th>User Satisfaction by DRS</th>
<th>Researcher</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full</td>
<td>10</td>
<td>118</td>
<td>139</td>
<td>267</td>
<td>79.46</td>
</tr>
<tr>
<td>Partial</td>
<td>2</td>
<td>17</td>
<td>37</td>
<td>56</td>
<td>16.67</td>
</tr>
<tr>
<td>Less satisfied</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>6</td>
<td>1.79</td>
</tr>
<tr>
<td>No comment</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>7</td>
<td>2.08</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td><strong>136</strong></td>
<td><strong>188</strong></td>
<td><strong>336</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Table 4.37**

**User satisfaction by Digital Reference Services**

168
Table 4.37 shows the user satisfaction by digital reference services. 10 researchers, 118 faculties, 139 students and total 267 (79.46%) users are fully satisfied with digital reference services. 02 researchers, 17 faculties, 37 students and total 56 (16.67%) users are partially satisfied with digital reference services. 01 faculty, 05 students and total 06 (1.79%) users are less satisfied with digital reference services. While 07 (2.08%) students comment nothing about satisfaction with digital reference services.

Survey clearly indicates that maximum 267 (79.46%) users are fully satisfied with digital reference services provided by engineering college libraries under study and minimum 6 (1.79%) users are less satisfied with digital reference service.

It clearly shows that library users are satisfied with digital reference services provided by engineering college libraries under study. The resultant responses are graphically shown in figure 4.44

![User Satisfaction by DRS](image)

**Figure 4.44**

*User satisfaction by Digital Reference Services*

4.39 Users got needed information through DRS

In this question, respondents are asked that do they get needed information through digital reference services. This question is close ended and respondents are expected to indicate their response. The resultant data has been reflected in table 4.38
Table 4.38

<table>
<thead>
<tr>
<th>Users got needed information through DRS</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>9</td>
<td>118</td>
<td>140</td>
<td>267</td>
<td>79.46</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
<td>2</td>
<td>10</td>
<td>12</td>
<td>3.57</td>
</tr>
<tr>
<td>Partial</td>
<td>3</td>
<td>16</td>
<td>38</td>
<td>57</td>
<td>16.96</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>136</td>
<td>188</td>
<td>336</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.38

Users got needed information through DRS

Table 4.38 shows that 09 researchers, 118 faculties, 140 students and total 267 (79.46%) users have replied yes, they get needed information through digital reference services. 02 faculties, 10 students and total 12 (3.57%) users have replied no, they don’t get needed information through digital reference services. 03 researchers, 16 faculties, 38 students and total 57 (16.96%) users have replied that they get partial information through digital reference services.

Investigator finds that maximum 267 (79.46%) users get the needed information through digital reference services, while minimum 12 (3.57%) users don’t get needed information through digital reference services. The resultant responses are graphically shown in figure 4.45

Figure 4.45

Users got needed information through DRS

170
4.40 Support from library staff for using digital reference services.

This question is close ended and respondents are expected to indicate their responses. The resultant data has been reflected in table 4.39

<table>
<thead>
<tr>
<th>Support from library staff for using DRS</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>7</td>
<td>117</td>
<td>151</td>
<td>275</td>
<td>81.85</td>
</tr>
<tr>
<td>Average</td>
<td>3</td>
<td>12</td>
<td>20</td>
<td>35</td>
<td>10.42</td>
</tr>
<tr>
<td>Less</td>
<td>0</td>
<td>3</td>
<td>8</td>
<td>11</td>
<td>3.27</td>
</tr>
<tr>
<td>No comments</td>
<td>2</td>
<td>4</td>
<td>9</td>
<td>15</td>
<td>4.46</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td><strong>136</strong></td>
<td><strong>188</strong></td>
<td><strong>336</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table 4.39
Support from library staff for using digital reference services.

Table 4.39 shows that 07 researchers, 117 faculties, 151 students and total 275 (81.85%) users have responded about high support from library staff for using digital reference services. 03 researchers, 12 faculties, 20 students and total 35 (10.42%) users have responded about average support from library staff for using digital reference services. 03 faculties, 08 students and total 11 (3.27%) users have responded about less support from library staff. 02 researchers, 04 faculties, 09 students and total 15 (4.46%) users have made no comments.

Study clearly indicates that maximum 275 (81.85%) users say that they get high support from library staff for using digital reference services while minimum 11 (3.27%) users say that they get less support from library staff for using digital reference services. The resultant responses are graphically shown in figure 4.46
### Support from library staff for using DRS

![Support from library staff for using DRS](image)

**Figure 4.46**
Support from library staff for using digital reference services

#### 4.41 As compared to traditional documents Digital Reference Services are

This question is also close ended and respondents are expected to indicate their responses. The resultant data has been reflected in table 4.40

<table>
<thead>
<tr>
<th>Compared to traditional documents DRS are</th>
<th>Researcher</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>User friendly</td>
<td>8</td>
<td>31</td>
<td>81</td>
<td>120</td>
<td>20.44</td>
</tr>
<tr>
<td>Time saving</td>
<td>5</td>
<td>27</td>
<td>56</td>
<td>88</td>
<td>14.99</td>
</tr>
<tr>
<td>More expensive</td>
<td>7</td>
<td>104</td>
<td>121</td>
<td>232</td>
<td>39.52</td>
</tr>
<tr>
<td>Easy</td>
<td>4</td>
<td>24</td>
<td>53</td>
<td>81</td>
<td>13.80</td>
</tr>
<tr>
<td>Effective</td>
<td>3</td>
<td>19</td>
<td>44</td>
<td>66</td>
<td>11.24</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
<td>205</td>
<td>355</td>
<td>587</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table 4.40**

Compared to traditional documents DRS are

172
Table 4.40 shows that 08 researchers, 31 faculties, 81 students and total 120 (20.44%) users have responded that the digital reference services are user friendly as compared to traditional documents. 05 researchers, 27 faculties, 56 students and total 88 (14.99%) users have responded that the digital reference services are more time saving as compared to traditional documents. 07 researchers, 104 faculties, 121 students and total 232 (39.52%) users have responded that the digital reference services are more expensive as compared to traditional documents. 04 researchers, 24 faculties, 53 students and total 81 (13.80%) users have responded that the digital reference services are easier than the traditional documents. 03 researchers, 19 faculties, 44 students and total 66 (11.24%) users have responded that the digital reference services are more effective as compared to traditional documents.

Survey shows that maximum 232 (39.52%) users find digital reference services as more expensive as compared to traditional documents while minimum 66 (11.24%) users found it effective as compared to traditional documents. The resultant responses are graphically shown in figure 4.47
4.42 Users got Information regarding Digital Reference Services from

In this question respondents are asked, from where they get information regarding digital reference services. Respondents are expected to indicate their responses. The resultant data has been reflected in table 4.41

<table>
<thead>
<tr>
<th>Users got Information regarding DRS from</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library/college website</td>
<td>8</td>
<td>123</td>
<td>142</td>
<td>273</td>
<td>37.92</td>
</tr>
<tr>
<td>Friends</td>
<td>2</td>
<td>9</td>
<td>46</td>
<td>57</td>
<td>7.92</td>
</tr>
<tr>
<td>Library brochure/ manual</td>
<td>1</td>
<td>25</td>
<td>26</td>
<td>52</td>
<td>7.22</td>
</tr>
<tr>
<td>Library staff</td>
<td>6</td>
<td>113</td>
<td>135</td>
<td>254</td>
<td>35.28</td>
</tr>
<tr>
<td>Teachers</td>
<td>2</td>
<td>8</td>
<td>61</td>
<td>71</td>
<td>9.86</td>
</tr>
<tr>
<td>Library bulletin</td>
<td>2</td>
<td>0</td>
<td>5</td>
<td>7</td>
<td>0.97</td>
</tr>
<tr>
<td>Any other</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>0.83</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>279</td>
<td>419</td>
<td>720</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.41
Users got Information regarding DRS from

Table 4.41 shows that 08 researchers, 123 faculties, 142 students and total 273 (37.92%) users get information regarding digital reference services from library / college website. 02 researchers, 09 faculties, 46 students and total 57 (7.92%) users get information regarding digital reference services from friends. 01 researcher, 25 faculties, 26 students and total 52 (7.22%) users get information regarding digital reference services from library brochure / manual. 06 researchers, 113 faculties, 135 students and total 254 (35.28%) users get information regarding digital reference services from library staff. 02 researchers, 08 faculties, 61 students and total 71 (9.86%) users get information regarding digital reference services from teachers. 02 researchers, 05 students and total 07 (0.97%) users get information regarding digital reference services from library bulletin, while 01 researcher, 01 faculty, 04 students and total 06 (0.83%) users get information regarding digital reference services from other sources.
Investigator finds that maximum 273 (37.92%) users get information regarding digital reference services from library / college website, while minimum 6 (0.83%) users get it from any other source. The resultant responses are graphically shown in figure 4.48

![User got Information regarding DRS from](image)

**Figure 4.48**
Users got Information regarding DRS from

### 4.43 Using Digital Reference Services is

Respondents are asked to indicate their response about using digital reference services. The resultant data has been reflected in table 4.42

<table>
<thead>
<tr>
<th>Using DRS is</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>More interesting</td>
<td>3</td>
<td>43</td>
<td>54</td>
<td>100</td>
<td>24.88</td>
</tr>
<tr>
<td>More challenging</td>
<td>0</td>
<td>6</td>
<td>11</td>
<td>17</td>
<td>4.23</td>
</tr>
<tr>
<td>Easy</td>
<td>1</td>
<td>11</td>
<td>28</td>
<td>40</td>
<td>9.95</td>
</tr>
<tr>
<td>Difficult</td>
<td>9</td>
<td>109</td>
<td>126</td>
<td>244</td>
<td>60.70</td>
</tr>
<tr>
<td>Any other</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0.25</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>169</td>
<td>220</td>
<td>402</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table 4.42**
Using Digital Reference Services is
Table 4.42 shows that 03 researchers, 43 faculties, 54 students and total 100 (24.88%) users have replied that using digital reference services is more interesting. 06 faculties, 11 students and total 17 (4.23%) users have replied that using digital reference services is more challenging. 01 researcher, 11 faculties, 28 students and total 40 (9.95%) users have replied that using digital reference services is easy. 09 researchers, 109 faculties, 126 students and total 244 (60.70%) users have replied that using digital reference services is difficult. 01 student and total 01 (0.25%) user have replied nothing.

Study clearly shows that maximum 244 (60.70%) users find that the use of digital reference service is difficult, while minimum 01 (0.25%) users find any other option while using DRS. The resultant responses are graphically shown in figure 4.49

![Figure 4.49](image)

Using DRS is

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any other</td>
<td>0.25%</td>
</tr>
<tr>
<td>Difficult</td>
<td>60.70%</td>
</tr>
<tr>
<td>Easy</td>
<td>9.95%</td>
</tr>
<tr>
<td>More challenging</td>
<td>4.23%</td>
</tr>
<tr>
<td>More interesting</td>
<td>24.88%</td>
</tr>
</tbody>
</table>

4.44 Digital Reference Services in terms of Time

In this question, respondents are asked about the digital reference services in terms of time. Respondents are expected to indicate their responses. The resultant data has been reflected in table 4.43
Table 4.43

Digital Reference Services in terms of Time

Table 4.43 shows that 03 researchers, 23 faculties, 51 students and total 77 (22.92%) users have replied that using digital reference services is time saving. 09 researchers, 112 faculties, 136 students and total 257 (76.49%) users have replied that using digital reference services is time consuming. 01 faculty, 01 student and total 02 (0.60%) users have replied any other.

Study shows that maximum 09 researchers, 112 faculties, 136 students and total 257 (76.49%) users find digital reference services time consuming, while minimum 01 faculty, 01 student and total 02 (0.60%) users find it any other. The resultant responses are graphically shown in figure 4.50.

<table>
<thead>
<tr>
<th>DRS in terms of time</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time saving</td>
<td>3</td>
<td>23</td>
<td>51</td>
<td>77</td>
<td>22.92</td>
</tr>
<tr>
<td>Time consuming</td>
<td>9</td>
<td>112</td>
<td>136</td>
<td>257</td>
<td>76.49</td>
</tr>
<tr>
<td>Any other</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0.60</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>136</td>
<td>188</td>
<td>336</td>
<td>100</td>
</tr>
</tbody>
</table>
4.45 Digital Reference Services in terms of Cost

In this question, respondents are asked, how they see digital reference services in terms of cost. Respondents are expected to indicate their responses. The resultant data has been reflected in table 4.44

<table>
<thead>
<tr>
<th>DRS in terms of cost</th>
<th>Researchers</th>
<th>Faculties</th>
<th>Students</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costly</td>
<td>6</td>
<td>107</td>
<td>126</td>
<td>239</td>
<td>71.13</td>
</tr>
<tr>
<td>Cheaper</td>
<td>6</td>
<td>28</td>
<td>56</td>
<td>90</td>
<td>26.79</td>
</tr>
<tr>
<td>Any other</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>7</td>
<td>2.08</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>136</td>
<td>188</td>
<td>336</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table 4.44

Digital Reference Services in terms of Cost

Table 4.44 shows that 06 researchers, 107 faculties, 126 students and total 239 (71.13%) users have replied that using digital reference services is costly. 06 researchers, 28 faculties, 56 students and total 90 (26.79%) users have replied that using digital reference services is cheaper. While 01 faculty, 06 students and total 07 (2.08 %) users have replied any other.

Survey indicates that maximum 239 (71.13%) users say that digital reference service is costly while minimum 7 (2.08%) users note any other option. The resultant responses are graphically shown in figure 4.51

![Figure 4.51: Digital Reference Services in terms of Cost](image)
Chapter V

Findings and Recommendations
5.1 Major Research Findings
5.2 Research Recommendations
5.3 Testing of hypothesis
  5.3.1 Null Hypothesis
  5.3.2 Alternative Hypothesis
  5.3.3 Level of significance
  5.3.4 Degree of Freedom
  5.3.5 Chi-square ($\chi^2$) Test
  5.3.6 Testing of Hypothesis - 1
  5.3.7 Testing of Hypothesis - 2
  5.3.8 Testing of Hypothesis - 3
5.4 Further areas of research
5.5 Conclusion of the study
5.1 Major Research Findings

Findings are the inferences based on the data analysis, researcher’s knowledge and critical thinking. Some of the significant findings of the present study are:

1. Investigator finds that link to e-resources (e-books, e-journals) is the highest provided service by the 52 (93%) engineering college libraries under the study as a digital / online service under digital reference service, while institutional repository is lowest provided service by 14 (25%) engineering college libraries as digital / online service.

2. The study reveals that e-mail reference service is provided by maximum 45 (80%) libraries as e-mail based service under digital reference services, while ask-a-librarian service is provided by minimum 31 (55%) libraries.

3. It is found that question point reference service is provided by maximum 32 (57%) engineering college libraries under study, while minimum 24 (43%) college libraries have no comments, which seems that these libraries might be at the developmental stage.

4. Investigator finds that under real time reference service, instant messaging service is maximum provided by 24 (43%) engineering college libraries as digital reference service, while chatter botter is minimum provided service by only 02 (04%) engineering college libraries under study.

5. The study clearly points that under web form services; Frequently Asked Questions (FAQs) service is provided by maximum 22 (39%) engineering college libraries, while web form service is provided by minimum 11 (20%) libraries. Also there are no comments from 23 (41%) college libraries.

6. Investigator finds that under web based reference services, user feedback from services is provided by maximum 27 (48%) engineering college libraries, while minimum provided service under this category is web contact centre by 13 (23%) college libraries.

7. The survey shows that under web 2.0 services category, social media service (WhatsApp, Skype) is provided by maximum 14 (25%) engineering college libraries, while twitter service is provided by minimum 05 (09%) college libraries as digital reference service.
8. Investigator further finds that internet via website is the medium chosen by maximum 46 (82%) engineering college libraries to provide digital reference service, while only 03 (05%) libraries have used other medium to provide digital reference service and in other category it is not further specified.

9. The study reveals that digital reference service subscribed at highest is full text by 48 (86%) engineering college libraries under the study, while at lowest is other by 01 (02%) college libraries.

10. While studying criteria for selecting digital reference service the user demand has been given preference by maximum 47 (84%) engineering college libraries, while others have been given preference by minimum 08 (14%) libraries.

11. Investigator finds that source for selection of digital reference service; maximum priority is given to recommendations of faculties, researchers, and students by 49 (88%) libraries, while minimum priority is given to free online trial by 20 (36%) libraries under study.

12. The survey shows that while evaluating digital reference service for subscription, maximum preference is given to user needs by 46 (82%) engineering college libraries and minimum preference is given to trial before use by 31 (55%) college libraries.

13. Investigation clearly points that faculty is the high extent user of digital reference services denoted by 31 (55%) engineering college libraries under study, while researchers use minimum digital reference service denoted by 12 (21%) libraries.

14. While studying which digital reference service is used maximum, investigator finds that link to e-resources, including e-books, e-journals, is used at maximum shown by 21 (38%) engineering college libraries, while ASCE is used at minimum shown by 04 (07%) college libraries.

15. The study shows that out of 56 engineering college libraries under study, 41 (73%) libraries have not appointed any staff for providing digital reference services, while 15 (27%) libraries have appointed staff for providing digital reference services. This is quite disappointing.

16. Investigator finds that problems faced by the librarians in providing digital reference services, 36 (64%) libraries have replied the monetary problem and 20 (36%) libraries have indicated technical problem.
17. Survey clearly indicates that out of 56 engineering college libraries, 29 (52%) libraries arrange staff training, while 27 (48%) libraries do not arrange staff training for providing digital reference services.

18. Investigator finds that out of 56 engineering college libraries under study, 35 (62%) college libraries have provision of budget for digital reference services, while 16 (29%) libraries do not have provision of budget for digital reference services and 05 (09%) libraries do not have responded.

19. The study indicates that 39 (70%) college libraries under study states that providing digital reference services is not cost beneficiary, while 17 (30%) college libraries state that it is cost beneficiary. It clearly shows that providing digital reference service is cost expensive in terms of finance.

20. Survey shows that 35 (62%) college libraries provide user education for using digital reference service, while 21 (38%) college libraries do not provide user education for using digital reference service.

21. While studying usage of digital reference service under online / digital services category, investigator finds that link to e-resources (e-books, e-journals, and e-thesis) is maximum average 91% used by users, while collaboration with national / international network is minimum average 13 % used service.

22. Study clearly indicates that average 82% researchers know the online / digital service, but only average 46 % use the same. While average 69% faculties know this service, but only average 46% use it and average 67% students know this service, but only average 39% use this service. The usage trend indicates that usage of online / digital services is less.

23. Investigator finds that under e-mail based digital reference service; ask – a – librarian service is maximum used by average 74% users, while e-mail reference is minimum used service by average 68% users.

24. Under e-mail based digital reference service, user trend shows that average 92% researchers know this service, but only average 75% use it, while average 93% faculties know this service, but average 76% use it and average 93% students know this service, but average 63% use this service.

25. Investigator finds that question point reference service is used less at average 10% by users.
26. User trend shows that question point reference service is known to average 75% researchers, but only average 17% use it, while average 43% faculties know this service, but only average 7% use it and average 43% students know this, but average 6% use it.

27. Under real time reference services, Instant Messaging service is used at high extent by average 73% users, while chatter botter is less used service at average 02% by users of engineering college libraries.

28. User trend of real time reference services shows that average 64% researchers know these services, but average 22% use these, while average 45% faculties know these services, but average 15% use them and average 45% students know these services, but average 20% use these services.

29. Investigations show that under web form services, maximum used service is Frequently Asked Questions (FAQs) by average 71% users and web form service is minimum used by average 10% users.

30. Study shows that user trend of web form services indicates that average 75% researchers know these services, but only average 46% use these, while average 54% faculties know these services, but average 38% use these services and average 60% student know these services, but average 38% use these services.

31. Survey clearly shows that out of web based reference services, search engine reference service is used maximum by average 38% users, while bulletin boards is less used service by average 7% users.

32. Survey further shows that user trend of web based reference services indicate that average 65% researchers know these services, but only average 23% use these, while average 30% faculties know these services, but average 11% use it and average 38% students know these services, but average 14% use these services.

33. Investigator finds that under web 2.0 services, social media service is maximum utilized by average 55% users, while other services are used minimum by average 6% users.

34. User trend of web 2.0 services indicates that average 53% researchers know these services, but only average 23% use it, while average 31% faculties know these services and 17% use it, simultaneously average 38% students know these services, but use only 20%.
35. While studying experience of using digital reference services, study shows that maximum 131 (39%) users are using these services from 2 to 4 years, while minimum 20 (06%) users have experience of using digital reference services more than four years.

36. While studying frequency of using digital reference services, it is observed that maximum 269 (80.06%) users of engineering college libraries under study use these services once in a month, while minimum 12 (3.57%) users use these services daily.
   It shows that digital reference services are not used at high extent by users.

37. While studying time spent on using digital reference services, maximum 280 (83.33%) users spent less than one hour a week, while minimum 05 (1.49%) users spent more than six hours per week.
   It again shows that digital reference services are not used at high extent by users of engineering college libraries under study.

38. Study clearly indicates that most frequently used digital reference service is e-resources (e-books, e-journals) used by maximum 183 (50.69%) users, while minimum 10 (2.77%) users use ASME, 10 (2.77%) use Springer and 10 (2.77%) use science direct.

39. While studying place from where digital reference services are used, it indicates that maximum 249 (41.64%) users use these services in library, while minimum 07 (1.17%) users use from other places.
   It is quite amazing that digital reference services are used in library more, but on the other land it proves the traditional mentality of users and necessity of library.

40. Study shows purpose of using digital reference services is maximum for education by 303 (60.48%) users and minimum for other purpose by 02 (0.40%) users.

41. While studying problems faced by users while using digital reference services, it is found that maximum 196 (39.2%) users have noted slow access speed, while minimum 08 (1.6%) users have noted other problems.

42. While studying way to use digital reference services, maximum 210 (58.99%) users have said that by asking library staff, while minimum 14 (3.93%) users use it by other way.
43. While studying authencity of digital reference services, study indicates that maximum 310 (92.26%) users have said YES and it is authentic, while minimum 26 (7.74%) users have said NO, it is not authentic service.

44. Survey clearly indicates that maximum 267 (79.46%) users are fully satisfied with digital reference services provided by engineering college libraries under study and minimum 6 (1.79%) users are less satisfied with digital reference services.

It clearly shows that library users are satisfied with digital reference services provided by engineering college libraries.

45. Investigator finds that maximum 267 (79.46%) users get the needed information from digital reference services, while minimum 12 (3.57%) users don’t get needed information from digital reference services.

46. Study clearly indicates that maximum 275 (81.85%) users have responded that they get high support from library staff for using digital reference services, while minimum 11 (3.27%) users have said that they get less support from library staff.

47. Survey shows that maximum 232 (39.52%) users find digital reference services more expensive as compared to traditional documents, while minimum 66 (11.24%) users find it effective as compared to traditional documents.

48. Investigator finds that maximum 273 (37.92%) users get information regarding digital reference services from library / college website, while minimum 6 (0.83%) users get it from other source.

49. Study clearly shows that maximum 244 (60.70%) users find that using digital reference service is difficult, while minimum 1 (0.25%) user find any other option while using DRS.

50. Study shows that maximum 09 researchers, 112 faculties, 136 students and total 257 (76.49%) users find digital reference service time consuming while minimum 01 faculty, 01 student and total 02 (0.60%) users find it any other.

51. Survey indicates that maximum 239 (71.13%) users say that digital reference service is costly, while minimum 7 (2.08%) users note any other option.
5.2 Research Recommendations

Recommendations are solutions suggested by the researcher, based on the findings, analysis and suggestions made by the respondents.

1. Separate Staff should be appointed in library by the engineering colleges for providing digital reference services.
2. To overcome monetary problem, government or various funding agencies should give subsidy or grant to engineering college libraries for providing digital reference service.
3. To overcome technical problems while providing digital reference services, engineering colleges should appoint technical person.
4. Staff training should be arranged frequently for providing effective digital reference services.
5. Measures should be taken to provide cost beneficiary digital reference services.
6. Engineering college libraries should take steps for marketing of digital reference services to increase its usage.
7. For increasing usage of digital reference services, engineering college libraries should arrange user orientation program frequently.
8. Measures should be taken to increase usage frequency of digital reference services.
9. Review should be taken to know why digital reference services are not used at high extent by users and appropriate remedial measures should be taken.
10. Measures should be taken to upgrade access speed while using digital reference service.
11. Question point reference service is less used; libraries should concentrate on this and should take measure to increase usage.
12. There is need for uniform pattern of providing digital reference services.
13. International agencies like IFLA, ALA, RUSA compose, modify and publish guidelines for digital reference services, but at national level there should be such agencies.
14. Libraries may develop collaborative consortia for providing digital reference services.
15. To overcome financial constraints, libraries should try to generate revenue on their own by commercializing their services.

16. Many libraries don’t have their own websites. They should develop their own website which will help them to provide various digital reference services.

17. If it is not possible to appoint separate technical staff for library, at least training should be provided to library staff at regular intervals to overcome technical problems.

18. User trend of various digital reference services shows that users know the services but usage is less. Measures should be taken by the libraries to increase use of digital reference services.
5.3 Testing of Hypothesis

The Process of verifying the validity or appropriateness of the hypothesis is known as testing of hypothesis. A hypothesis is tested by analyzing the relevant data and applying statistical techniques.

5.3.1 Null Hypothesis

A hypothesis which predicts that there is no correlation between the specific variables is called null hypothesis. Null hypothesis is used for statistical testing of research hypothesis. The null hypothesis is denoted by \( H_0 \).

5.3.2 Alternative Hypothesis

The statement which is true if the null hypothesis is false i.e. a possible or the acceptable alternative to the null hypothesis is known as alternative hypothesis. The alternative hypothesis is denoted by \( H_1 \).

5.3.3 Level of significance

The probability of rejecting \( H_0 \) is the level of significance of the test. In general, 0.05 (on the queries in 5 chances out of 100 which are likely to reject) and 0.01 are the commonly accepted values of the levels of the significance.

5.3.4 Degree of Freedom

The criteria to select the rows in the chi square table are known as degrees of freedom. The columns in chi square table indicate level of significance and rows indicate degree of freedom. The degree of freedom is selected with the help of formula.

5.3.5 Chi- square (\( \chi^2 \)) Test

Chi-square test is one of the simplest and general known tests of hypothesis. The Chi square test consists of two phases. One is calculating chi square values and second is testing the hypothesis. (Kumbhar, Rajendra, 2014: p. 313-323) It is applicable to a very large number as well as small number of problems in general practice under the following headings:

- As test of goodness of fit and independence of attributes.
- As a test of homogeneity of independence estimates of the population variance.
- As a test of hypothetical value of the population variance \( \sigma^2 \).
- To test the homogeneity of independent estimates of the population correlation coefficient.
5.3.6 Testing of Hypothesis - 1 Library users are satisfied with the digital reference services provided by the college libraries.

Testing of Hypothesis-1: (Chi square test of goodness of fit)

Null Hypothesis $H_0$: The satisfaction level of library users with the digital reference services provided by the college libraries is uniform.

Alternative Hypothesis $H_1$: The satisfaction level of library users with the digital reference services provided by the college libraries is not equal i.e. Library users are satisfied with the digital reference services provided by the college libraries.

Under the Null Hypothesis $H_0$:

By the word ‘satisfied’ we consider full satisfaction by the use of digital reference services. Total number of researchers, faculties and students is 336 so the expected frequency is calculated as:

Expected Frequency $E = \Sigma x/x = 336/2 = 168$.

Calculation of Chi-square ($\chi^2$):

<table>
<thead>
<tr>
<th>Satisfied With DRS</th>
<th>Observed Frequency (O)</th>
<th>Expected frequency (E)</th>
<th>(O-E)</th>
<th>$(O-E)^2$</th>
<th>$(O-E)^2 / E$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>267</td>
<td>168</td>
<td>99</td>
<td>9801</td>
<td>58.34</td>
</tr>
<tr>
<td>No</td>
<td>69</td>
<td>168</td>
<td>-99</td>
<td>9801</td>
<td>58.34</td>
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<tr>
<td>Total</td>
<td>336</td>
<td>336</td>
<td></td>
<td></td>
<td>116.6785714</td>
</tr>
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</table>

The calculated value of $\chi^2 = \Sigma[(0 - E)^2 / E] = 116.68$

We have degree of freedom = (n - 1) = 2 - 1 = 1.

Level of significance = 5%.

The tabulated value of $\chi^2$ for 1 degree of freedom at 5 % level of significance is 3.841. Since the calculated value of $\chi^2$ i.e. $\chi^2$ cal = 116.68 is more than the tabulated value of $\chi^2$ Tab = 3.841.

Hence the null hypotheses $H_0$ is rejected at 5% level of significance and degree of freedom 1, and alternative hypothesis $H_1$ is accepted and it is concluded that library users are satisfied with the digital reference services provided by the college libraries.
### 5.3.7 Testing of Hypothesis - 2

Providing digital reference services are expensive in terms of finance.

**Testing of Hypothesis - 2: (Chi square test of goodness of fit)**

**Null Hypothesis \( H_0 \):** The finance for the digital reference services provided by the college libraries is uniform.

**Alternative Hypothesis \( H_1 \):** The finance for the digital reference services provided by the college libraries is not uniform, i.e. providing digital reference services are expensive in terms of finance.

**Under the Null Hypothesis \( H_0 \):**

Expected Frequency \( E = \sum x/x = 56/2 = 28 \).

**Calculation of Chi-square \( \chi^2 \):**

<table>
<thead>
<tr>
<th>DRS is Expensive</th>
<th>Observed Frequency (O)</th>
<th>Expected frequency (E)</th>
<th>(O-E)</th>
<th>(O-E)^2</th>
<th>(O-E)^2 / E</th>
</tr>
</thead>
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<tr>
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<td>39</td>
<td>28</td>
<td>11</td>
<td>121</td>
<td>4.3214</td>
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<tr>
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<td>17</td>
<td>28</td>
<td>-11</td>
<td>121</td>
<td>4.3214</td>
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<td><strong>Total</strong></td>
<td><strong>56</strong></td>
<td><strong>56</strong></td>
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<td></td>
<td><strong>8.6429</strong></td>
</tr>
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</table>

The calculated value of \( \chi^2 = \sum [(0 - E)^2 / E] \approx 8.6429 \)

We have degree of freedom = \( (n - 1) = 2 - 1 = 1 \).

Level of significance = 5%.

The tabulated value of \( \chi^2 \) for 1 degree of freedom at 5% level of significance is 3.841.

Since the calculated value of \( \chi^2 \) i.e. \( \chi^2 \) cal = 8.6429 is more than the tabulated value of \( \chi^2 \) Tab = 3.841.

Hence the null hypotheses \( H_0 \) is rejected at 5% level of significance and degree of freedom 1, and alternative hypothesis \( H_1 \) is accepted and it is concluded that providing digital reference services are expensive in terms of finance.
5.3.8 Testing of Hypothesis - 3

Digital reference services are not used at high extent by users of engineering college libraries.

Testing of Hypothesis-3: (Chi square test of goodness of fit)

Null Hypothesis $H_0$: use of digital reference services by users of engineering college libraries is uniform or equal.

Alternative Hypothesis $H_1$: use of digital reference services by users of engineering college libraries is not uniform, i.e. digital reference services are not used at high extent by users of engineering college libraries.

Under the Null Hypothesis $H_0$:

By the word ‘high extent’ we consider daily use of digital reference services. Total number of researchers, faculties and students is 336, so the expected frequency is calculated as:

Expected Frequency $E = \Sigma x/x = 336/2 = 168$

Calculation of Chi-square ($\chi^2$):

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<th>Use of DRS (Daily)</th>
<th>Observed Frequency (O)</th>
<th>Expected frequency (E)</th>
<th>(O-E)</th>
<th>(O-E)$^2$</th>
<th>(O-E)$^2$/E</th>
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<td>144.86</td>
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<td>156</td>
<td>24336</td>
<td>144.86</td>
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<tr>
<td>Total</td>
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<td>336</td>
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<td>289.71</td>
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</table>

The calculated value of $\chi^2 = \Sigma[(O - E)^2 / E] = 289.71$.

We have degree of freedom = $(n - 1) = 2 - 1 = 1$.

Level of significance = 5%.

The tabulated value of $\chi^2$ for 1 degree of freedom at 5% level of significance is 3.841.

Since the calculated value of $\chi^2$ i.e. $\chi^2$ cal = 289.71 is more than the tabulated value of $\chi^2$ Tab = 3.841.

Hence the null hypotheses $H_0$ is rejected at 5% level of significance and degree of freedom 1, and alternative hypothesis $H_1$ is accepted and it is concluded that digital reference services are not used at high extent by users of engineering college libraries.
5.4 Further areas of research

The present study has been conducted to know the current level of digital reference services in engineering college libraries affiliated to University of Pune. Similar type of studies can also be conducted on the following topics:

- Evaluation of digital reference services in arts, commerce and science college libraries.
- Evaluation of digital reference services in University libraries.
- Evaluation of other services in engineering college libraries.
- User survey of engineering college libraries regarding less usage of digital reference services.
- Use of digital reference services in management studies institutes, medical sciences institutes, etc.

5.5 Conclusion of the study

114 engineering colleges are affiliated to Savitribai Phule Pune University (formerly University of Pune). It is observed that out of 114 engineering college libraries, 99 college libraries are providing some kind of digital reference services. Link to e-resources, e-mail reference service, question point reference service, instant messaging service, Frequently Asked Questions (FAQs) service, user feedback from service, social media service, etc. are the maximum provided services by engineering college libraries. While institutional repository, ask-a-librarian, chatter botter, web form services, web contact center, twitter service, etc. are the minimum provided services by engineering college libraries. While selecting and evaluating digital reference services, highest priority is given to user demands and needs by engineering college libraries.

Link to e-resources, ask-a-librarian, instant messaging service, Frequently Asked Questions (FAQs) service, search engine reference service, social media service, etc. are the maximum used services by users of engineering college libraries. While collaboration with national / international networks, e-mail reference, question point reference service, chatter botter, web form service, bulletin boards, etc. are the minimum used services by users. User trend of various services shows that users know these services but usage by them is less. Efforts should be taken by engineering college libraries to increase the use of digital reference services.
It is surprising that digital reference services are used in library more, but it also insists traditional mentality of users and necessity of library. It is quite disappointing that maximum libraries do not appoint separate staff for providing digital reference services. Many libraries face monetary problem and state that providing digital reference services is expensive in terms of finance. Inspite of all this, users of engineering college libraries are satisfied with digital reference services provided by their libraries.

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Chapter VI
References
Following references are arranged in alphabetical order using APA citation style.


Heron, Susan and Hanson, Ardis. (2003). From Subject Gateways to Portals: The role of metadata in accessing international research. [Available at http://scholarcommons.usf.edu/cgi/viewcontent.cgi?article=1011andcontext=dean_cbcsoaccessed on March 20, 2016.

http://libguides.ala.org/library-definition.


http://www.unipune.ac.in/default.htm


Murphy, Sarah Anne and Cerqua, Judith. (2012). Implementing the customer contact centre: An opportunity to create a valid measurement system for assessing and improving a library’s telephone service. [Available at https://www.press.jhu.edu/journals/portal_libraries_and_the_academy/portal_pre_print/articles/12.3murphy.pdf] accessed on March 20, 2016.


List of Engineering Colleges affiliated to Savitribai Phule Pune University (formerly University of Pune) as on 02/07/2015.

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<tr>
<th>Sr. No.</th>
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<th>Website of Institute</th>
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www.pravaraengg.org.in
www.metbhujbalknowledgecity.ac.in
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www.ghrcemahm.raisoni.net
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<tbody>
<tr>
<td>1</td>
<td>Books</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Journals / Periodicals</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Journals (Bound Volumes )</td>
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</tr>
<tr>
<td>4</td>
<td>Ph.D. Thesis</td>
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</tr>
<tr>
<td>5</td>
<td>Manuscripts</td>
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</tr>
<tr>
<td>6</td>
<td>Rare Books</td>
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</tr>
<tr>
<td>7</td>
<td>Audio Cassettes</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CD – ROMs / Floppies / Database</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Others (Please Specify)</td>
<td></td>
</tr>
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</table>

g) Total Staff :

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Staff</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Librarian</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Reference Librarian</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Assistant Librarian</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Document Officer / Information Officer</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Senior professional assistant</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Library assistant</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>LDC / DEO / Clerk</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Library attendant</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Book lifter</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Peon</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Binder</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Others</td>
<td></td>
</tr>
</tbody>
</table>
h) Total Enrolled Users / Member of Library:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Users</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Faculties</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Research Scholars</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PG Students</td>
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</tr>
<tr>
<td>4</td>
<td>UG Students</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Administration Staff</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Supporting Staff</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Outsiders</td>
<td></td>
</tr>
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</table>

i) Annual Budget Allocated to Library:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Items</th>
<th>Rs. In Lakh</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Books</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Journals</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Non Book Materials</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Others (Please Specify)</td>
<td></td>
</tr>
</tbody>
</table>

j) Is there any provision for separate budget for e-resources: Yes / No

k) Are you using library automation package / software: Yes / No

   If yes please mention Name of the Package / Software: __________________

2. Networking:
   a) Do you have LAN Facilities: Yes / No
   b) Do you have Internet Facilities: Yes / No

3. e-Resource Section:
   a) Do you have separate section for e-resources: Yes / No
   b) Is this e-resources facility free for users: Yes / No

4. Status of Digital Reference Services:
   a) Does library has its own website: Yes / No
   b) Does library has reference librarian: Yes / No
   c) Does library provides digital reference services: Yes / No
   d) Please tick the following digital reference services provided by your library:
      I) Online / Digital Services:
         i) Web – OPAC: Yes / No
         ii) Subject Portal / Subject Gateways: Yes / No
         iii) Web Database / Bibliographic Database: Yes / No
         iv) Collaboration with National/International network: Yes / No
         v) Institutional Repository: Yes / No
vi) Link to e-resources (e-books-journals-thesis etc.): Yes / No
vii) Link to web-sites: Yes / No
viii) Electronic documents delivery services: Yes / No
ix) Online Currents Awareness services: Yes / No

II) E-mail Based:
i) e-mail reference: Yes / No
ii) Ask a Librarian: Yes / No

III) Reference Services:
i) Question Point Reference Service: Yes / No

IV) Real Time Reference:
i) Chat Reference Service: Yes / No
ii) Instant Messaging Service: Yes / No
iii) Voice over Internet Protocol (VoIP) (Audio Chat or internet Phoning): Yes / No
iv) Chatter botter: Yes / No
v) Video via Reference: Yes / No
vi) Video Conferencing: Yes / No

V) Web form Service:
i) Web form: Yes / No
ii) Frequently Asked Questions (FAQs): Yes / No

VI) Web based Reference Service:
i) Bulletin Boards: Yes / No
ii) Web contact centre: Yes / No
iii) Search Engine Reference Services: Yes / No
iv) Web based user education: Yes / No
v) User feedback from service: Yes / No
VII) Web 2.0 Services:
   i) Library Blog: Yes / No
   ii) Twitter: Yes / No
   iii) Library Facebook Service: Yes / No
   iv) Social Media (WhatsApp, Skype etc.): Yes / No
   v) Others: Yes / No
      If yes please specify ____________________________

e) How do you provide Digital Reference Services: Through
   i) Internet via Website: Yes / No
   ii) CD-ROM: Yes / No
   iii) Online service vendors: Yes / No
   iv) Others: Yes / No
      If yes please specify ____________________________

f) Digital Reference Services subscribed by You:
   i) Full Text: Yes / No
   ii) Abstract: Yes / No
   iii) Bibliographic: Yes / No
   iv) Numeric: Yes / No
   v) Graphic: Yes / No
   vi) Others: Yes / No
      If yes please specify ____________________________

g) Which criteria do you prefer for selecting Digital Reference Services:
   i) Quantity: Yes / No
   ii) User Demand: Yes / No
   iii) Cost effective: Yes / No
   iv) Authenticity: Yes / No
   v) Back Volume facility: Yes / No
   vi) Accessibility: Yes / No
   vii) Others: Yes / No
      If yes please specify ____________________________
h) Which selection criteria you use for Digital Reference Service:
   i) Through catalogue: Yes / No
   ii) Search through internet: Yes / No
   iii) Recommendation of faculty, researchers, students: Yes / No
   iv) Free online trial: Yes / No

i) How do you evaluate Digital Reference Service for subscribing?
   i) Review by expert: Yes / No
   ii) Trial before use: Yes / No
   iii) Cost: Yes / No
   iv) User need: Yes / No
   v) Coverage: Yes / No

j) Usage of Digital Reference Service:
   i) Does users use Digital Reference Service frequently: Yes / No
   ii) Which users use Digital Reference Service at high extent?
       Faculties / Researchers / Students
   iii) Which Digital Reference Service is used at high extent?
       --------------------------------------------------------------

iv) Are users satisfied with Digital Reference Service: Yes / No
    If yes please tick: i) Convenience ii) Availability iii) Remote Access iv) Cost Effective v) Others (specify)
    -----------------------------------------------
    If no please tick: i) Inconvenient ii) Non availability
     iii) Technical Problem iv) Cost Expensive
     v) Others (specify) -----------------------------------------------

k) Other aspect related to Digital Reference Service:
   i) Does staff appointed for providing digital reference service: Yes / No
   ii) Problems faced while providing digital reference service:
       Technical / Monetary / Others (Please specify)
       ---------------------------------------------------------------
iii) Does staff training arranged for providing digital reference service: Yes / No

iv) Does provision for digital reference service in library budget: Yes / No

v) If yes, then what is percentage to the total budget of library? 

vi) Providing Digital Reference Service is cost benefit / effective: Yes / No

vii) Do you consider user needs while providing digital reference service: Yes / No

viii) Do you organize user education for use of digital reference service: Yes / No

ix) Problems faced by you while providing digital reference service: Please Specify __________________________

x) Rank the use of digital reference service:
   1. Faculties
   2. Researchers
   3. PG Students
   4. UG Students
   5. Administrative Staff
   6. Others

xi) Are you charging any cost from users to use digital reference services: Yes / No

   If yes please mention the charges per year
   1. Faculties
   2. Researchers
   3. PG Students
   4. UG Students
   5. Administrative Staff
   6. Others
1) Suggestions / future plan if any for improving digital reference service:

__________________________________________________________________

Name of Respondent: __________________________ Designation: ______________________

Signature with Seal: __________________________

Thank you for your co-operation
Evaluation of digital reference services in Engineering college Libraries affiliated to university of Pune

Questionnaire 2

FOR USERS (Faculties / Researchers / Students)

1. Personal Information:

   Name: ___________________ ___________________ ___________________ 
   (First) (Middle) (Surname)

   Sex: Male ( ) Female ( )

   Age Group: Below 20 ( ), 21-25 ( ), 26-30 ( ), 31-35 ( ), Above 35 ( )

   Status: Teacher ( ) Researcher ( ) Student ( )

   Name of the College: ____________________________________________

   Dept / Branch: ___________________________________________________

2. Digital Reference Services in Library.

   Following is the list of digital reference services in library. Please tick which you know and use. (In Case of Your Library)

   I) Online / Digital Services:

      i) Web – OPAC: Know ( ) Use ( )

      ii) Subject Portal / Subject Gateways: Know ( ) Use ( )

      iii) Web Database / Bibliographic Database: Know ( ) Use ( )

      iv) Collaboration with National / International network: 

          Know ( ) Use ( )

      v) Institutional Repository: Know ( ) Use ( )

      vi) Link to e-resources (e-books, e-journals, e-thesis): Know ( ) Use ( )

      vii) Link to web-sites: Know ( ) Use ( )

      viii) Electronic Documents delivery services: Know ( ) Use ( )

      ix) Online Currents Awareness services: Know ( ) Use ( )
II) E-mail Based:
   i) e-mail reference:                 Know ( ) Use ( )
   ii) Ask a Librarian:               Know ( ) Use ( )

III) Reference Services:
   i) Question point Reference Services: Know ( ) Use ( )

IV) Real Time Reference:
   i) Chat Reference Service:         Know ( ) Use ( )
   ii) Instant Messaging Service:     Know ( ) Use ( )
   iii) Voice over Internet Protocol (VoIP)
        (Audio Chat or internet Phoning): Know ( ) Use ( )
   iv) Chatter botter:                Know ( ) Use ( )
   v) Video via Reference:            Know ( ) Use ( )
   vi) Video Conferencing:            Know ( ) Use ( )

V) Web form Service:
   i) Web form:                      Know ( ) Use ( )
   ii) Frequently Asked Questions (FAQ): Know ( ) Use ( )

VI) Web based Reference Service:
   i) Bulletin Boards:               Know ( ) Use ( )
   ii) Web contact centre:          Know ( ) Use ( )
   iii) Search Engine Reference Services: Know ( ) Use ( )
   iv) Web based user education:    Know ( ) Use ( )
   v) User feedback from service:   Know ( ) Use ( )

VII) Web 2.0 Services:
   i) Library Blog:                  Know ( ) Use ( )
   ii) Twitter:                      Know ( ) Use ( )
   iii) Library Face book Service:   Know ( ) Use ( )
   iv) Social Media (Whats App, Skype etc.): Know ( ) Use ( )
   v) Others:
       please specify


3. Experience of using digital reference services:
   i) Less than 6 months
   ii) 6 Months – 1 year
   iii) 1-2 Year
   iv) 2-4 Year
   v) More than 4 Year

4. Frequency of using digital reference service:
   i) Daily
   ii) 2-3 times a week
   iii) 2-3 times a month
   iv) Once in month
   v) None

5. Time Spent while using digital reference service:
   i) Less than 1hr a week
   ii) 2-3 hrs. a week
   iii) 5-6 hrs. a week
   iv) More than 6 hrs. a week
   v) More
   vi) None

6. Most frequently used digital reference service:
   _______________________________________________________________
   _______________________________________________________________

7. From which place you use digital reference service:
   i) In library
   ii) From Home
   iii) At Internet Centre
   iv) Through Smartphone
   v) Other (Specify):

8. Purpose of using digital reference service:
   i) Educational
   ii) Research
   iii) Teaching
   iv) Other (Specify):
9. Problems faced while using digital reference service:
   i) Slow access speed
   ii) Find relevant information is difficult
   iii) Downloading Speed
   iv) Privacy
   v) Any other (Please Specify)

10. How do you use digital reference service:
    i) By asking Library Staff
    ii) Directly through College Website
    iii) Any other (Please Specify)

11. Did you think that information got through digital reference service is authentic:
    Yes / No

12. Are you Satisfied with digital reference service:
    i) Fully
    ii) Partially
    iii) Less satisfied
    iv) No Comments

13. Do you get information in digital reference services as needed by you:
    i) Yes
    ii) No
    iii) Partial

14. Support from Library Staff for using Digital Reference Service:
    i) High
    ii) Average
    iii) Less
    iv) No comments

15. As compared to traditional documents Digital Reference Services are:
    i) User Friendly [ ] Or Not [ ]
    ii) Time Saving [ ] Or Not [ ]
    iii) More expensive [ ] Or Not [ ]
    iv) Easy [ ] Or Not [ ]
    v) Effective [ ] Or Not [ ]
16. How did you get information regarding Digital Reference Service:
   i) Library / College Website
   ii) Friends
   iii) Library Brochure / Manual
   iv) Library Staff
   v) Teachers
   vi) Library Bulletin
   vii) Any other (Please Specify)

17. Using Digital Reference Service is:
   i) More Interesting
   ii) More challenging
   iii) Easy
   iv) Difficult
   v) Any other (Please Specify)

18. In terms of time:
   i) Time saving
   ii) Time consuming
   iii) Any other (Please Specify)

19. In terms of cost:
   i) Costly
   ii) Less Costly (Cheaper)
   iii) Any other (Please Specify)
20. Your Expectation from Digital Reference Service and any Suggestions:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Name of Respondent: _______________________  Designation: ___________________

Signature with Seal: _______________________

Thank you for your co-operation.
Emerging new technologies for better library services-
Satish Padme & Uddhav Bharati 99
Rahul Viswé & Vijay Jagtap 107
Applications of mobile devices in academic libraries-
Dr. P. Venkateshwar Rao & B. Kumar 114
Cloud technology in digital library-
Ravindra Mangle 120
Application of cloud computing in libraries-
Rupali Oak 126
Use of ERP system in HEIs-
Sanjay Aher 132
Construction of subject gateways using Google Sites as a free web tool-
Supriya Kuber 139
Social networking and libraries-
A.R. Wathore 147

Section-II DIGITAL LIBRARY PRACTICES

Digital Library-
Dr. B.B. Aher 150
The concept of digital library-
R. Bankhele 156
Digital libraries in new era of information services-
Bhagyashree Tamhane 158
Digital preservation-
Jyoti Shankpale 163
Collection and usage of E-resources in the knowledge society-
Kanika Deb Nath & K.C. Sinha 166
Digital library practices-
P.E. Avhad 174
Digital library preservation and its strategies-
Dr. R. Ghule 180
Digital communication tools and modern librarianship-
R.D. Khamkar 183
Electronic publishing and academic libraries-
Dr. Rajendra Marwade 187
Digital reference services-
Dr. R. Palthankar & Uday Jadhav 191
DIGITAL REFERENCE SERVICES: A REVIEW

Dr. Rajiv R. Paithankar
Toshniwal Arts. Commerce & Science College, Sengaon, Hingoli.

&

Mr. Uday Maruti Jadhav
Camp Education Society's
Dr. Arvind B. Telang Senior College Nigdi, Pune.

Abstract:
The article reviews activities of digital reference services, its various types and present scenario. The advantages and functions are highlighted. Overview of digital library and digital reference services is given.

Keywords: Digital library, Digital Reference Services, Virtual Reference Service.

Introduction:
Mechanism of production and delivery of goods change according to requirement of the same. With discovery of new technologies, Libraries are changing accordingly. Information and communication technology has great influence on libraries. Libraries are providing various new services. Easily available digital information is the advantage of internet. A number of libraries are beginning to offer web based reference services. Many libraries provide reference services electronically over internet through their websites. One of the most significant developments in reference services these past several years has been the emergence of the digital reference services (Granfield, 2008). Libraries are using digital reference services to attract young and techno savvy generation towards library. As in digital references physically visit to library is not necessary. It can be accessed from anywhere.

Evolution of Digital Libraries:
Digital Library is organized collection of multimedia and other types of resources which are available in computer process able form. Digital libraries rapidly became the term to signify the digital counterpart of traditional libraries. Digital library is later stage of electronic library. In digital library high speed optical fiber are used for LAN and the access is over WAN and provide a wide range of internet based services. This shift from electronic library gave birth to new range of reference services. In this range digital reference is latest trend of digital age.

Digital Reference Service (DRS):
Many terms are used to describe the study of digital reference such as virtual reference, real time reference, chat reference, live reference. All share a central concept; the use of software and the internet to facilitate human intermediation at a distance.

Digital reference services began in the mid of 1980s but have developed rapidly in recent years. Digital reference provides more alternatives and flexibility to users, especially those operating within a virtual learning environment.

Also known as virtual reference services, digital reference service (DRS) is “reference service initiated electronically, often in real-time, where patrons employ computers or other Internet technology to communicate with reference staff, without being physically present” (RUSA, 2004).

“Digital Reference Services are internet based Services that employ human experts or intermediaries to provide information to users” Whitlatch (2003).

CTBC'sIRJ Vol.2, Iss.1, January 2015
According to James, "Digital Reference Service is the provision of direct, professional assistance to people who are seeking information at the time and point of need."

According to Smith, "Emphasis on use of print as well as digital reference services provided over the internet and can involve the use of both print & digital resources."

**Digital Reference Services: Present Scenario:**

A number of libraries have now begun to offer web-based reference services and number of recent studies report the current practice of reference services provided by libraries. The provision of DRS in academic libraries is a response of librarians to the ever growing information needs and changing information seeking patterns and behaviour of the clients – who are becoming less visible in the library.

The British library provides special reference services for business, patent, scientific, technical, medical and environmental information.

Research by Janes (Janes, 2000) found that 45 percent of academic libraries and 12.8 percent of public libraries offer some type of digital reference service. This research was based on digital reference with reference to human intermediated assistance to users through the internet.

Research done by Magamma, M (2013) States that 10 selected engineering college libraries in Visakhapatnam are providing online/digital services-including library websites, Web-OPAC, subject portals, web-database, collaboration with national, international network, and links to e-resources.

In India IIT and IIM libraries are automated and now they have access to more than one thousand electronic journals. In most of the higher learning and research institutes in India such as Tata Institute or Fundamental Research, Indian Institute of science, Indian statistical Institute of Physics, All India Institute of Medical Science (AIMS) have been providing web based reference services to users. Other types of libraries are in developing stage. Most of university libraries have taken steps to provide digital reference and information services.

These are-
- Web OPAC;
- Access to bibliographic databases;
- Access to subject gateways;
- Link to web sites;
- Access to electronic resources;
- ASK a Librarian;
- Subscribing e-resources;
- Electronic document delivery services;
- On-line current awareness services;
- E-mail;
- Web-form based reference services;
- Chat-reference service;
- Video-conferencing or web camera;
- Instant Messaging (IM);
- User orientation and Feedback;
- Bulletin board service;
- Library websites
UGC-Infonet is a nationwide communication network for Indian universities launched by the University Grants Commission. The INFLIBNET, Ahmedabad has launched N-LIST program for accessing e-resources of various publications and made available to colleges in India.

Need of DRS:
1. Increasing and multidirectional user demands.
2. Invention of technology.
3. To serve five laws of library science.
4. No need to visit library physically i.e. users convenience.

Advantages of DRS:
1. DRS provide support to find required information electronically.
2. Information is available without physical boundaries.
3. Provides online and real time assistance.
4. Provides round the clock 24/7 assistance for information users.
5. Provide services to remote users.
6. Convenient to use from users point of view.
7. Expands the scope of service.
8. Can cover maximum users.

Conclusion:
Digital reference service is powerful set of tool that is used to fulfill multidimensional and changing user demands. Physical boundaries have been destroyed by DRS. Users can access any information at any time from any point of the world. It gives library modern touch. It has changed reference services from physical reference desk to online reference desk.

References:


A Special Edition
National Conference 2016 on

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Transforming India
Fostering Nation by Embracing and Enabling Technology, Innovation and People

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- Reference Library Services in Digital Environment.
- Digital Libraries in the Modern Age
- Digital Library Resources and Services in ICT Era
- What are Intellectual Property Rights (IPR)?

Organised By
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<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the Article</th>
<th>Contributed By</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emerging Challenges of The Banking Sector After Reform</td>
<td>Shilpa R Dubey</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>Understanding Smart Cities: As An Approach Towards Digital Transformation of Cities</td>
<td>Maninder Kaur</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>A Research Paper on Digital Marketing: Strategies, Advantages &amp; Disadvantages</td>
<td>Mrs Titekar Urmila Shivnath, Prof. Dr. M. B. Sonawane</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>Digital India: Transforming India</td>
<td>Vaishali Chaudhary, Divya Kumari</td>
<td>31</td>
</tr>
<tr>
<td>5</td>
<td>Greening The Indian Hotel Industry For Sustainability &amp; Profitability</td>
<td>Prin. Ajay Kumar Rai</td>
<td>35</td>
</tr>
<tr>
<td>6</td>
<td>E-Governance In Maharashtra Healthcare Sector</td>
<td>Prof. Jyoti Gaikwad</td>
<td>40</td>
</tr>
<tr>
<td>7</td>
<td>Digital Marketing Of Academic Library Services Using Customized Mobile Application</td>
<td>Ms. Supriya Kuber</td>
<td>45</td>
</tr>
<tr>
<td>8</td>
<td>Nurturing India By Enabling Digitization Of Academic Environment In Higher Education</td>
<td>Prof. Vidyal K. Deshpande, Ms. Tejasri Phapale</td>
<td>54</td>
</tr>
<tr>
<td>9</td>
<td>Impact of Digital Transformation Considering Multidisciplinary Integrated Scenarios in Different Domains</td>
<td>Puskaraj Ramesh Bachavat,</td>
<td>59</td>
</tr>
<tr>
<td>10</td>
<td>Digital India: Transforming India: Innovative Hiring Through Digitalization</td>
<td>Novina S. Ahuja</td>
<td>62</td>
</tr>
<tr>
<td>11</td>
<td>Need And Importance of Digital Library &amp; Challenges Face By The Library For Building of Digital Collection In 21st Century</td>
<td>Prakash B. Jadhav</td>
<td>66</td>
</tr>
<tr>
<td>12</td>
<td>Reference Library Services in Digital Environment</td>
<td>Uday Maruti Jadhav</td>
<td>72</td>
</tr>
<tr>
<td>13</td>
<td>Digital Libraries in The Modern Age</td>
<td>Asst. Prof. Anand G. Pawar</td>
<td>76</td>
</tr>
<tr>
<td>14</td>
<td>Digital Library Resources and Services in ICT Era</td>
<td>Dr. Sheetal Deepak Naik, Mrs. Pallavi Sandeep Chhillare</td>
<td>79</td>
</tr>
<tr>
<td>15</td>
<td>What Are Intellectual Property Rights (IPR)?</td>
<td>Dr. Shantashree S. Sengupta</td>
<td>83</td>
</tr>
<tr>
<td>16</td>
<td>Digital Wave in CRM</td>
<td>Jui Amale, Dr. Vijay Kulkami</td>
<td>88</td>
</tr>
</tbody>
</table>
Digital Library: Issues, Challenges and Opportunities
Reference Library Services in Digital Environment

Uday Maruti Jadhav
Librarian
Camp Education Society's
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Abstract:
Reference service is one the most important services of library. This article attempts to describe reference services of library in digital environment. This explains how traditional reference service is changing from personalized to technology enabled remotely accessible service. This article elaborate concept, elements and modes of reference service in digital era. Present scenario and various digital reference services are also enlisted.

Keywords: Reference service, digital library, digital reference service.

Introduction:
Reference services, sometimes referred to as "reference and information services", refer to the personal assistance provided to users in the pursuit of information (Bunge, 1999). Provision of such personalized information services has remained the main theme of the library and information field. The importance of these services grew over time with the addition of new technologies and services in libraries. Bunge (1999) categorized reference services into three broad groups:

1) information services that involve either finding the required information on behalf of the users, or assisting users in finding information;
2) instruction in the use of library resources and services (broadly defined as information literacy skills); and
3) user guidance, in which users are guided in selecting the most appropriate information sources and services.

The main part of a reference service is the reference interview, which includes a personal discussion between a user and the reference librarian. This is traditional view of reference service. As growing technology changes the scenario of every service is changing. As surrounding changes, libraries are changing. Due to invention of computer, internet, digital technology and mobile technology present libraries are also changing accordingly. This has impact on reference service also.

BACKGROUND OF REFERENCE SERVICES:
Library services are consistently changing from the traditional, to automated, to hybrid, to digital. Technological upgradation has played a key role in reference librarianship in the twenty-first century. Tele service began to appear along with traditional personal and postal reference services early in the twentieth century (Bopp, 1995). In the 1960s, libraries began to explore new technologies such as microfilm and microfiche, tapes and sound recordings. The 1970s and 1980s brought about significant changes with the emergence of full-text databases and electronic card catalogs in many libraries (Grohs, Reed, & Allan, 2003). Eventually the electronic catalogue databases became the online public access catalogues (OPACs) providing local as well as remote access.

Through OPACs, the users can search their queries using keywords linked by logical operators AND, OR and NOT. Invention of CD-ROMs then many libraries moved from CD-ROM to providing databases through the Internet. The Internet introduced new possibilities and interactive technologies such as e-mail, chat, and instant messaging to the reference desk (Penka, 2003). According to asowitz (2001), many libraries and organizations have responded to an increased need for
formal methods of remote communication between
information seekers and information professionals by
providing reference service via the Internet, or digital
reference service, to their users. Wask (2003) traced the
origins of digital reference services to the library field,
where libraries sought to augment traditional services by
providing reference assistance in an electronic
environment. Lankes (2000) gives five reasons for moving
to electronic reference services:
1. Increasing access to resources beyond the library
2. Lack of geographic constrains for users
3. The need to differentiate services to different
populations of users in the face of shrinking
4. Increases in complexity of information resources and
the need for specialized knowledge
5. New options for answering reference questions
   (Lankes, p. 187)

Academic libraries were the first to provide digital
reference services in the early 1980s
(Gross, McClure, & Lankes, 2001). One of the first
services to go online was the Electronic Access to
Reference Services (EARS) launched by the University of
Maryland Health Services Library in Baltimore in 1984
(Wask, 2003; quoted from Weise and Bergendale, 1996)

Elements of Reference Service:
Three basic elements are incorporated in reference
service –
1) Information or Knowledge Base.
2) User or client – now likely to be a member of the
new cyber community in which the library
operates.
3) Information professional or Librarian, who plays
vital role of intermediary assisting and advising
the user in their information seeking

Evolution of Digital Libraries:
The Digital Library is organized collection of multimedia
and other types of resources which are available in
computer process able form (10)

Traditional libraries gradually changed into
electronic library. Electronic library gradually changed to
digital library. In digital library high speed optical fiber are
used for LAN and the access is over WAN and provide a
wide range of internet based services. This shift from
electronic library gave birth to new range of reference
services. In this range digital reference is latest trend of
digital age.

Concept of Digital Reference Service (DRS):
Digital reference service is only an
advancement of the same traditional services which is
emerging as natural solution to meet the user’s
information needs in changing technological environment.
Many terms are used to describe the study of digital
reference such as virtual reference, real time reference,
chat reference, live reference. All share a central concept;
the use of software and the internet to facilitate human
intermediation at a distance (4)

Digital reference services began in the mid of 1980s but
have developed rapidly in recent years. Digital reference
provides more alternatives and flexibility to users,
especially those operating within a virtual learning
environment. (5)

Also known as virtual reference services, digital
reference service (DRS) is “reference service initiated
electronically, often in real-time, where patrons employ
computers or other Internet technology to communicate
with reference staff, without being physically present”

"Digital Reference Services are internet based Services
that employ human experts or intermediaries to provide
information to users" Whitelatch (2003).

According to James, "Digital Reference Service is
Provision of direct, professional assistance to people who
are seeking information at the time and point of need."
According to Smith, “Emphasis on use of print as well as digital reference services provided over the internet and can involve the use of both print & digital resources.”

Elements of Digital Reference Service:
According to Linda Berube, DRS incorporates following elements:
1) The User
2) The Interface (web form, e-mail, chat, video etc.)
3) Electronic as well as print resources.
4) The information professional.

Modes of Digital Reference Service:
Categorized into two types:
1) Asynchronous: This mode involves a time delay between the receiving question and providing answer, e.g. e-mail reference services, reference via Web etc.
2) Synchronous: This transaction takes place in ‘Real Time’ with an immediate response to the query i.e. interaction between the user and reference librarian is live therefore it is also called Real Time Digital Reference Service.
   e.g. Text based Chat / Instant Messaging, Video conferencing etc. (1)

Digital Reference Services: Present Scenario
A number of libraries have now began to offer web-based reference services and number of recent studies report the current practice of reference services provided by libraries. (2).
The provision of DRS in academic libraries is a response of librarians to the ever growing information needs and changing information seeking patterns and behaviour of the clients – who are becoming less visible in the library.
The British library provides special reference services for business, patent, scientific, technical, medical and environmental information (2).

Research by Janes (Janes, 2000) found that 45 percent of academic libraries and 12.8 percent of public libraries offer some type of digital reference service. (4).
This research was based on digital reference with reference to human intermediated assistance to users through the internet.

Research done, by Magamma, M.(2013) States that 10 selected engineering college libraries in Visakhapatnam are providing online/digital services including library websites, web-opac, subject portals, web-database, collaboration with national, international network, and links to e-resources (6)

In India IITs and IIMs libraries are automated and now they have access to more than one thousand electronic journals. In most of the higher learning and research institutes in India such as Tata Institute or Fundamental Research, Indian Institute of science, Indian statistical Institute of Physics, All India Institute of Medical Science(AIMS) have been providing web based reference services to users. Other types of libraries are in developing stage. Most of university libraries have taken steps to provide digital reference and information services. These are:
- Web OPAC;
- Access to bibliographic databases;
- Access to subject gateways;
- Link to web sites;
- Access to electronic resources;
- ASK a Librarian;
- Subscribing e-resources;
- Electronic document delivery services;
- On-line current awareness services;
- E-mail;
- Web-form based reference services;
- Chat-reference service;
- Video-conferencing or web camera;
- Instant Messaging (IM);
- Library websites
- Online Pathfinders.
- UGC-Info net is nationwide communication network for Indian univer

Conclusion:
Library and library services are consistently changing from the traditional, to automated, to hybrid, to digital. Accordingly library reference services are also changing. Traditional reference service is personalized and face to face. Now it is changed to remote access. Again it may be asynchronous (with time delay) and synchronous (in real time or online). New concepts like digital reference services, web 2.0, reference 2.0 are emerging. This helps in satisfying user’s changing demands. Libraries are changing according to digital surrounding. It is helpful to attract user which are technosavy.

Bibliography:

A). Research papers:

B). Books:

C). Seminar/Conference/Review proceedings:

D). Websites: