CHAPTER - 1

INTRODUCTION
1.1 Introduction: -

It is rightly said that “library is a powerhouse of knowledge”, the center of intellectual life and the heart of an institution. It occupies an important place in the modern education system. It enables one to share the experiences of many persons by reading about their thoughts and achievements. One of the characteristics of the last few decades has been the remarkable growth in the technological means of collecting, processing and transmitting information. Technological change has forced publishing, editing, translating, database creation, computing, teaching and learning and librarianship into newer and closer relationships. A large part of the world’s information is now produced digitally, and most of this exists in digital form only. The web functions as a resource for information and communication as well as a cultural space where a diversity of materials are produced and easily accessed. Much of these digital materials are potentially of lasting cultural value, and new, pro-active strategies need to be developed to ensure that it is saved for posterity. Peter Lyman and Varian Hal [1] mentioned the world’s total annual production of print, film, optical and magnetic content which is shown in the table 1.1 According to their survey there are 25 million computer tape drives installed in the world at present. These drives provide storage capacity for all range of computers - from desktop personal computers to the most mammoth supercomputers. Fred Moore estimates that the amount of data stored on tape is between 4 and 15 times the amount of enterprise data on disks and that there is about $1 billion per annum of computer tape media sold worldwide In the year 2000, 1 billion 3.5 inch floppy disks, each capable of storing 1.44 megabytes and 88 million removable 100 megabyte disks and 25 million removable 1 gigabyte disks, were produced for the world. This has created many problems and challenges before librarians. Prominent among these relate to the acquisition, storage, retrieval and its proper preservation for future generations.
Table 1.1 World information productions

<table>
<thead>
<tr>
<th>Media Type (Sources and Year)</th>
<th>Unique Items per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books (UNESCO 1996)</td>
<td>968,735</td>
</tr>
<tr>
<td>Newspapers (ISSN 1999)</td>
<td>22,643</td>
</tr>
<tr>
<td>Scholarly journals (Ulrich's 2000)</td>
<td>40,000</td>
</tr>
<tr>
<td>Mass-market periodicals (Ulrich's 2000)</td>
<td>80,000</td>
</tr>
<tr>
<td>Newsletters (Oxbridge Directory 1997)</td>
<td>40,000</td>
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<tr>
<td>CD - Music (1998)</td>
<td>90,000</td>
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<tr>
<td>CD - ROM (1998)</td>
<td>1000</td>
</tr>
<tr>
<td>DVD video (1999)</td>
<td>5000</td>
</tr>
</tbody>
</table>

Figure 1 World information production

It is clear from the above figure 1.1 that books are produced at larger scale as compared to other media. Books are still have more use and considered as the authentic source of information. Librarians have been busy for ages preserving the valuable materials for human kinds.
Preservation of library material is a serious problem in today's librarianship. Libraries are concentrating more on dissemination of information rather than preservation of library materials. Techniques for organization and dissemination of information are developing very fast, but preservation field remains largely neglected. Information and communication technologies have made an indelible impact on our daily lives, but it has also become an integral part of our society. It has created a new economy, put forth new services and resulted into powerful information sharing through Internet. An enormous amount of benefit has emerged from the information infrastructure, while some benefits have not yet been visualized. Computer and communication technology is the bridge between traditional libraries and digital libraries. And now, digitization is emerging as a new technique of preservation of library materials. Digitization refers to the process of translating a piece of information such as a book, sound recording, picture or video into bits. Bits are the fundamental unit of information in a computer system. Turning information into these binary digits is called digitization.

Anne Kenney [2] has observed that digital technology has the potential to revolutionize access to material and to change radically the library's role in making resources available. Many organizations and universities are carrying out research in this field. This ongoing activity has resulted in the codification of technical practices and need for the standardization. There are many problems and challenges of digitization on which the suitable solutions are not within sight. Basically there are two main motives behind digitization: first digitization is undertaken for the preservation of old and fragile materials and second it is carried out to provide more access to original materials. Most creators of rare and valuable material are aware of the damage that can happen to the original material. In many cases, it is
found that when the document is in bad condition, then it is withdrawn from the circulation. Physical handling is one of the most destructive things that can damage the fragile material. Digitization is now regarded as one of the recent methods of preserving the original materials.

Chapman and Kenney [3] have conducted the most recent study on the future of the hybrid approach for the preservation of brittle books (brittle means digital and microfilm). This study reported that though there were predictions about microfilm that it could be replaced by digital imaging, the study found that digitization may have increased the access to material, but it does not guarantee their continual preservation. This study rests on the assumptions that ‘until digital preservation capabilities can be broadly implemented and shown to be cost-effective, microfilm remains the primary reformatting strategy’. In this regard Michael Lesk [4] advocates three principles of digitization. These are

a) A digitization program should have certain intrinsic features. It should be integrated into the fabric of library services. It should be focused primarily on achieving the mission, related objectives, be funded from the predictable streams of allocation and include a plan for long-term maintenance of its assets.

b) Selection of material for digitization is more complex as compared to acquiring the born-digital materials, because selection involves many activities which covers the nature of material, future demand, cost required to convert and copyright etc.

c) Digital technology and its costs are constantly changing; as a result, budgeting models that make comparisons between libraries can be meaningless or downright misleading.

Even though there are some limitations to digitization, digital technology has made it easier to write books, easier to save their contents and infact
easier to save everything being written. With the advent of digitization, information technology and communication technology, the digital library (DL) field has emerged as an important application area. Distinct from traditional libraries, digital libraries process large collections of digital objects and provide on-line information services. They are very important for archiving and utilizing human knowledge records in the new-networked world. The fundamental reason for building a digital library is to provide better access and effective delivery of information to end-users. By sitting at a personal computer connected to a communication network, scholars can access more recent information rather than visiting a library. In digital library, information is provided at the users' desk. Printed documents are convenient to read, but finding information from them is very difficult. In digital libraries, computer power is used to browse, retrieve, filter and transmit information. Computers are very useful for reference work where information can be searched from many sources at a time and displayed on the user's desk. Number of people can share information simultaneously from number of terminals. It is very easy to update the information in digital environment. In digital library, information is available round the clock perennially and is rendered in more user-friendly ways i.e. text, pictures and audio-visual formats.

1.2. Need for the present study:

The importance and challenges of digitization have attracted many researchers to undertake research on its various aspects. Some of the well-known digital library related research areas include cataloguing of digital resources (metadata), interoperability between heterogeneous collections, communication protocols and standards, search engines, information visualization, usability, and human computer interaction issues. While tremendous attention has been paid to the study of how to make a better digital library, very little focus has been given on simplifying the process of building a digital library. A digital library is a complex
information system. It is an integration of many application fields of computer science such as information retrieval, databases, and hypertext. To build a digital library, many questions need to be answered: what is the specification of the content to be stored; how is that content organized, structured, described, and retrieved....

Due to recent developments in computers and communications, a more conducive environment prevails in developing countries like India for library automation, modernization, and digitization. Several proposals have been made in India for creation of digital libraries and digitization using computers and communication technology. Further many organizations are developing their own databases. Several institutions are offering CAS and SDI services using database updates tapes. There is an increased awareness of software packages and online searching using CD-ROMs and Internet. The present decade can aptly be called 'Digital Library decade' as today's librarianship revolves around digital library and digitization. As compared to traditional libraries, digital libraries have some special features and advantages. One of the greatest advantages of digital library is that, in this system, information in different formats can be stored. Digital libraries not only store information from books and periodicals but also from photographs, manuscripts, museum artifacts, audio-video material, films, maps etc. When the information is digitized and made accessible over a network, it becomes universally available. Any person, in any language can access this information at any time and anywhere on the earth. At the same time, digital library and digitization have raised many problems with respect to its management, information retrieval and preservation of digital information. Interoperability, scalability, information reliability are some of the issues on which the success of the digital library depends. Some of the problems faced by the present generation librarians are –
Whether a full-fledged digital library is feasible in reality?

What is the future of the traditional library in this digital era?

What are the basic components of digital library?

Can digital library replace the traditional library or will it be complementary to it?

What is the life span of digital material?

Can digitization provide a long-term solution to the preservation of library material?

What is the future of digital information in face of technological obsolescence?

What are the economical, political and technological implications of digital library and digitization?

1.3 Objectives of the study -

The present study has been undertaken to find out solutions to the problems mentioned above. Therefore the objectives of the study are

1. to study in detail the traditional methods of conservation and preservation of library materials,

2. to assess and take a review of the state-of-art of an existing digital library,

3. to study the various methods and procedures of digitization,

4. to digitize selected rare material from the library and study the problems therein

5. to present a digital library model for university libraries.
1.4 Research methodology:

Research is a means to the advancement of knowledge and science; but fruitful research study appears to be almost impossible without the proper understanding of research methodology. Methodology in the research is a way to solve some problem to unfold the probable answers, to test a hypothesis. As there are many means and methods of reaching a particular city (by bus, train, air or boat) likewise there may be many methods to solve the problem in research. The researcher has to select one of them or sometimes use two or many methods, which would be appropriate for his inquiry. Science is both an organized body of knowledge and a method of modifying and extending what is known by means of careful research. Scientific methods of inquiry are generally regarded as the most productive avenues to the creation of verified knowledge. The ultimate goal of science is the accumulation of complete, verified knowledge bearing upon nature and the physical world and also an understanding of the knowledge. Observation, measurement and quantification are fundamental elements of scientifically conducted inquiry. According Carl Hampel [5] two enduring human concerns have provided the principal stimulus for man's scientific efforts. One of them is of a practical nature. Man wants not only to survive in the world, but also to improve his strategic position in it. This makes it important for him to find reliable ways of foreseeing changes in his around and if possible controlling them. The second basic motive for man's quest is independent of such practical concerns, which lies in his sheer intellectual curiosity, and deep and persistent desire to know and understand himself and his world around. A scientific explanation may be regarded as an answer to a why questions.
Normally, research investigations in social sciences are done by carrying out sample or detailed surveys, census of different socio-economic aspects. In some cases it is necessary to go to the root of a problem by studying its history embodied in a variety of old and new literature and exploring out the difficulties and drawbacks causing the problem and recommending the suggestions to overcome the difficulties and set right the problem. The research tools like interview, questionnaire, observations, personal visits etc. are used to collect data. In the field of science, the research is carried out by analyzing and interpreting the results of a scientific experiment, or by recording or monitoring an observation of phenomena.

Digital library and digitization is a new area of research in library and information science discipline, which requires clarifying the concepts. A conceptual framework serves to describe and explain the major facets of an investigation. It identifies the key factors and assumed relationship between them. First it identifies who and what will be examined. Second, it postulates relationships between the persons and the factors being investigated. According to Keeves and Sowden [6] such presumed relationships can influence the order in which information is assembled and the type of information collected, as well as the extent of details obtained. The conceptual framework also provides a map of the research work of the field being investigated. According to them following things should be considered while developing a conceptual framework.

a) Use a diagrammatical rather than narrative format.
b) Expect to revise the framework successively.
c) Encourage each research worker in a team to develop a separate framework and compare the different versions.
d) Avoid a global level of generality that is not specific enough to provide focus and identify bounds, and is not so general that it cannot be proved wrong.
e) Employ prior theorizing and previous empirical research to test the framework.

Once the framework has been developed it can be used for formulating specific research questions. The research questions advanced for study require successive refinements. Priorities need to be proposed, and the number of questions to which answers are being sought need to be reduced to a manageable size. Once the research questions have been identified, the collection of evidence must be preceded by identifying cases to be studied. A multi-case design addresses some research questions in a number of setting using similar data collection and analysis procedures in each setting. It seeks to permit cross-case comparison. The number of cases should be manageable from the point of time and money. It would seem from experience that 15-20 cases are the maximum amount of evidence that one person can work with for a detailed non-statistical analysis.

For solving such problems one can use historical method, descriptive and diagnostic method. Sadhu and Singh [7] point out that there can be four different approaches to solving a research problem viz.

a) Historical approach
b) Case study approach
c) Descriptive approach
d) Experimental approach

The nature of the present study required the data to be collected from various Indian Universities and established digital libraries in developed countries. Therefore policies, standards and best practices adopted by these institutions are essential to frame a model digital library. Under these circumstances the most appropriate method is descriptive method along with conceptual framework.
According to Whitney [8] descriptive research is fact finding with adequate interpretation. The basic caution to the neophyte here is that the descriptive method has to be something more and beyond just data-gathering. If it is not reflective thinking then it is not a research. The true meaning of data collected should be reported from the point of view of the objectives and the basic assumptions of the project underway. The problem of research is not solved unless a proper tool is selected for data collection. Data required from the respondents and data required to clarify all the ideas in the mind of the researcher are to be collected in the research properly.

An attempt has been made to acquire the latest, pertinent, diverse and comprehensive information using the survey of literature; questionnaire, field observation personal visits to organizations and its websites where the digitization work is being carried out. Some pertinent information has been collected through e-mails and discussion with library and information scholars and experts. The survey, according to recent social science terminology, is an organized attempt to analyze, interpret and report the present status of a social institutions, group or area. It deals with a cross-section of the present, of duration sufficient for examination—that is, present time, not the present moment. Its purpose is to get groups of classified, generalized and interpreted data for the guidance of practice in the immediate future. Further, Whitney [9] says that descriptive research may be in terms of surveys and critical analyses of available data in printed form. This is informational analysis or library research, as it called at times. It constitutes one technique of historical research, as history deals with records of the past. The utility of this method has been pointed out by many social scientists. Taking into consideration the advantages cited above and the feasibility of this method for the present problem, the researcher adopted descriptive method for the present research.
Now it should be noted here that Internet has become an important source of current information in any field of research, which is popularly used by many researchers. The Internet is best seen as a complement to research strategies, which include use of libraries, journals, conference proceedings, questionnaires and personal interviews. The unique facilities made available by the Internet should be exploited to enhance the research strategy. One of the primary advantages gained from using the Internet is immediacy. Whereas it can take up to 18 months or longer to have work published in a journal, a paper can appear on the Internet as soon as the word-processed document has been converted to HTML (Hyper Text Mark-up Language) and placed on a server. Internet research has now become a well-accepted methodology. John Branston and Eric Blouin [10] mention that Internet can be used as a tool of data collection. They are of the opinion that Internet has saved not only the time of researcher but also his money and energy of searching information from libraries. The Internet has been recognized as a speedy tool of data gathering brides being cost effective. This has enabled a shift in research practices. Larger samples make possible both more global surveys, and allow us to perform more rigorous statistical analysis. So the investigator used Internet extensively for collection of the data. As the concept digital library, digitization, digital preservation has recent origin; it is found that very few books and journals are providing information on these topics. So electronic resources mostly from Internet has been used in the present research.

Questionnaire is a tool of data collection, which is used more frequently in mail survey research than other methods of data collection. According to Good and Hatt [11] schedule is the name usually applied to a set of questions, which are asked and filled in by the interviewer in face to face with another person interaction.
A structured questionnaire containing thirty-one different questions was framed to get information on various aspects of digitization and digital library. The main goal of this questionnaire was to find out what type of material is being selected for digitization, whether any type of policies have been framed to undertake digitization activity, by which method the material is being converted, what standards are adopted etc. It was decided to select all Indian Universities and DLI-2 projects from developed countries for this survey. The purpose was to find out the present scenario and future prospects of these organizations. The survey would result in determining the basic infrastructure and amenities required for digital library. Though there were more 235 universities listed by AIU in the Universities handbook, it was decided to select only those universities, which have the e-mail facility because communication technology is one of the important ingredients in establishing a digital library. These e-mail addresses were obtained by visiting the INFLIBNET website. It was found that out of 235 universities only 200 universities have e-mail facility, and these universities (including agriculture and deemed universities) were selected for this survey. The field of digital library is well established in few developed countries. So 25 digital libraries form DLI-II have been selected. These libraries are from diverse field and would be useful in comparing the present situation of Indian digital library with the well-developed digital libraries.

1.5 Review of literature: -

According to Busha & Harter [12] Literature search (or literature review) is an attempt to identify, locate and synthesize completed research reports, articles, books and other materials about the specific problems of a research topic. It is an essential link in the process of research. It helps one to know what the other researchers in any specific field do. The
subject of digital library and digitization is multi-faceted and the literature available is extremely broad ranging. An attempt has been made to cover number of works that go beyond discussions of the digitization processes itself and its direct applications to closely related topics of information search and retrieval. This broad review also includes topics like collection development, digital preservation, copyright and intellectual property right, and some prominent surveys undertaken in this new emerging field. The main objective of this review is to provide an account of the technical processes involved in digitization, their applications and implementation issues as they are represented in the research and professional literature. The Libri [13] issue of 1999 traces the detailed account the term digital library which is shown in the table 1.3

1.3 Literature growth on digital library

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
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</tr>
<tr>
<td>1991</td>
<td>2</td>
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<tr>
<td>1992</td>
<td>3</td>
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<td>1994</td>
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<td>197</td>
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<tr>
<td>1998</td>
<td>152</td>
</tr>
<tr>
<td>2000</td>
<td>2714</td>
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The investigator scanned various tools to find out the information on this topic. It was observed that as compared to printed materials, electronic materials were more easily available. Following table 1.3, the represent the comparative output of LISA and ISA CD-ROM search.

Table 1.3 LISA and ISA search output.

<table>
<thead>
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<tbody>
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<td>Digital libraries</td>
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</tr>
<tr>
<td>Digitization</td>
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<td>273</td>
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<tr>
<td>Digitization projects</td>
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<td>2</td>
</tr>
<tr>
<td>Digital library projects</td>
<td>417</td>
<td>4</td>
</tr>
<tr>
<td>Preservation</td>
<td>5128</td>
<td>1879</td>
</tr>
<tr>
<td>Copyright</td>
<td>4145</td>
<td>1669</td>
</tr>
<tr>
<td>Storage media</td>
<td>1214</td>
<td>269</td>
</tr>
</tbody>
</table>

Among the printed source, the newsletter Library Hi Tech News is probably the best single source for information about the funding and
progress of digital library projects. Another information source, which stand out, are the American Library Association’s Library Technology Reports, which are invariably thoroughly researched, exhaustive in coverage, extensively documented and highly authoritative. William Saffody’s report in this series is probably the single most useful publication on the subject. It is also found that very few researchers have completed doctoral work relating to this field.

Robert Karl France [14] carried out a doctoral research work on “Effective, Efficient Retrieval in a Network of Digital Information Objects”. Digital libraries provide services to large communities. Digital library collections have several characteristic features that make search difficult. They are typically very large. They typically involve many different kinds of objects, including but not limited to books, e-published documents, images, and hypertexts, and often including items as esoteric as subtitled videos, simulations, and entire scientific databases. Even within a category, these objects may have widely different formats and internal structure.

This thesis presents MARIAN and argues that it is both effective and efficient. MARIAN is a digital library system designed and built to store, search over, and retrieve large numbers of diverse objects in a network of relationships. It is designed to run efficiently over large collections of digital library objects. It addresses the problem of object diversity through a system of classes unified by common abilities including searching and presentation. Divergent internal structure is exposed and interpreted using a simple and powerful graphical representation, and varied format through a unified system of presentation. Most importantly, MARIAN collections are designed to specifically include relations in the form of an extensible collection of different sorts of links. MARIAN presents a powerful and flexible platform for retrieval on large, diverse collections of networked
Chilvers's [15] work emphasized the need for metadata in digital environment. Information objects in digital form are like other forms, which move through life cycles. They are created, edited, described and indexed, disseminated, acquired, used, annotated, revised, re-created, modified and retained for future use or destroyed by a complex, interwoven community of creators and other owners, disseminators, value-added services, and institutional and individual users. The pursuit of knowledge is a process in which the emergence of new knowledge builds on and reconstructs the old. Knowledge cannot advance without consistent and reliable access to information sources, past and present. In order to provide a consistent means of access for digital objects, systems of citation, description and classification is needed. For this reason most popular, the MAchine Readable Cataloguing (MARC) formats encoding cataloguing rules have been defined. MARC refers to a family of formats (e.g. USMARC, UKMARC, UNIMARC) created for the exchange of bibliographic and other related information in machine readable form, containing a rich variety of elements related to resource identification and discovery. This study provides a comprehensive account of metadata, its structure and uses.

The vast amounts of information produced in the world are now for a large part in digital and include a wide variety of materials: text, databases, audio, film, and images. They range from medical records to movie DVDs from satellite surveillance data. Reid, P.H. Robert [16] has made many recommendations in this regard. According to him preservation of digital heritage requires proactive strategies and a cooperative effort by both the producers and keepers of information. The support of (national) policies...
and legislation is needed to enable heritage institutions to meet these new challenges. New frameworks have to be created, tasks and responsibilities redefined, new forms of cooperation established. Technological problems are huge and only partly understood, and issues of rights and ownership more complex than ever before.

Institute of Museum and Libraries Services (IMLS) [17] conducted a survey on the status of technology and digitization in the nation's museums and libraries in the year 2002. The purpose of the survey was to collect information on the use of technologies, digitization activities, and related plans and policies of libraries, museums, and State Library Administrative Agencies across the country. The survey consisted of four sections: a) Background on the respondent: demographic information on museums and libraries, including type, size, and location, b) Status of technology: current and planned use of technology, funding sources, use of technology in programming, c) Digitization plans, practices, and policies: current and planned digitization activities, funding sources, hindrances, digitization goals and materials being digitized, policies in use, and collaboration activities and d) IMLS role: how IMLS should support implementation of technologies and digitization in individual institutions and within the museum and library communities. The survey results quantify, for the first time, the current status of technology use and digitization activities by museums and libraries. Libraries' technology use is pervasive, particularly the basic technologies that automate and support services to the public.

The Research Libraries Group is an international consortium of close to 160 members, including universities and colleges, national libraries, archives, historical societies, museums, independent research collections, and public libraries. RLG commissioned a study on digital preservation. In early 1998, RLG funded a study by Dr. Margaret Hedstrom and Sheon Montgomery [18] of the status of digital archiving in its member
institutions. The primary purpose was to assess whether guidance, education and training, storage, and digital preservation services are required, in order to develop digitization activities. Some of the prominent findings of this survey are mentioned below. Out of 54 responses almost half of the member institutions acquire digital materials and nearly two-thirds are involved in conversion activities. The most common formats for archival master files of converted images are TIFF; text files with mark-up, JPEG and PDF, GIF, and ASCII. Most institutions do not have established methods for digital preservation beyond transferring some material to new storage media. Lack of staff expertise is a common problem both in institutions with digital preservation responsibilities and in institutions that have not yet assumed responsibility for digital materials.

Preservation Science Survey Report [19] presents an overview of recent research in the preservation of three information carriers: paper, film and photographic materials, and magnetic tape. It covers significant developments internationally over the last five years and concentrates on emerging technologies that have the potential for large-scale application. The survey focused attention on developments of methods for preserving analog materials held by libraries and archives on paper, film, and magnetic tape. Below are some observations made about preservation science. This survey reports that Preservation science is moving steadily away from the investigation of individual artifacts and individual conservation problems. Preservation managers are becoming more interested in passive measures than in active conservation and are often limiting real treatment and restoration to a very small part of their collections. An active interface between preservation science and conservation practice is essential.

A rural virtual health sciences library project [20] reports the results of the Shared Hospital Electronic Library of Southern Indiana (SHELSI) research
project, to determine whether access to a virtual health sciences library and training in its use would support medical decision making in rural southern Indiana and achieve the same level of impact seen by targeted information services provided by health sciences librarians in urban hospitals. Based on the results of a needs assessment, a virtual medical library was created and various levels of training were provided. Virtual library users were asked to complete a Likert-type survey, which included questions on intent of use and impact of use. At the conclusion of the project period structured interviews were conducted. The impact of the virtual health sciences library showed a strong correlation with the impact of information provided by health sciences librarians. Both interventions resulted in avoidance of adverse health events. Data collected from the structured interviews confirmed the perceived value of the virtual library. It concludes that, while librarians continue to hold a strong position in supporting information access for health care providers, their roles in the information age must begin to move away from providing information toward selecting and organizing knowledge resources and instruction in their use.

Laura Micham and David Faulds [21] carried out a survey of status of digitization in Great Britain. Great Britain has more than 100 universities, out of these only 24% universities have digital collection. Basically this survey was conducted to find out the existence of special collection in these libraries. The report mentions that 45 libraries (54.5%) have special collection but its existence on WWW is only 40%.

National Library of Canada [22] conducted a national survey on digitization activities in 1997. This survey was undertaken to determine more comprehensively the extent of digitization activities within federal government. The questionnaire was sent 194 chief information officers and senior information managers. The response rate was 74% and
findings are well motivated. It was found digitization is being carried out in many federal institutions without some type written policies and guidelines. It is also observed that TIFF file format is used in many institutions.

Ron Rocker, [23] college librarian from Middlebury College Library undertook a small study group. The main goal of this project was to examine the issues in digitization projects. Another aim was to establish policies, standards, and priorities about digitization. The questionnaire was sent to college librarians. The findings and recommendations of this survey are not available as yet.

LONGITUDE: the users in the digital landscape by L. Berube [24] reports briefly on the work of EARL, the Consortium for Public Library Networking, in embarking upon an 18-month study to develop and test a toolkit of long-term longitudinal qualitative survey methodologies. LONGITUDE, the Library Networking Toolkit for a User-Driven Environment, is designed specifically for public library implementation. It aims to not only look at the behaviour, over a period of time, of users in a digital library environment, but will also offer a practical method for measuring that behaviour.

Traditional online search services such as Dialog, DataStar and Lexis provide a wide range of search features (Boolean and proximity operators, truncation). Search features of digital libraries by A. G. Smith [25] discusses the use of these features for effective searching and argues that these features are required, regardless of advances in search engine technology. The literature on online searching is reviewed, identifying features that searchers find desirable for effective searching. A selective survey of current digital libraries available on the World Wide Web was undertaken, identifying which search features are present. The survey indicates that current digital libraries do not implement a wide range of search features. Less than half include controlled vocabulary, under half
have proximity searching, only one enabled browsing of term indexes and none of the digital libraries enable searchers to refine an initial search. 
Suggestions are made for enhancing the search effectiveness of digital libraries; for instance, by providing a full range of search operators, enabling browsing of search terms, enhancement of records with controlled vocabulary and enabling the refining of initial searches.

Education for digital libraries by A. Spink and C. Cool [26] examines the state of education in digital libraries and reports findings from an international survey of library and information science (LIS) and computer science faculty, and Web sites, regarding digital libraries courses worldwide and curricula at the institutions. Results show that, currently, few schools offer courses specifically in digital libraries. While many schools have not developed Digital Library (DL) courses, they are aware of the need to develop curricula in this growing area of research and practice. Selected examples of current DL course offerings are also provided to illustrate the variety of current DL courses. The World Wide Web based Diglib Education Collaboratory being developed at Rutgers University is discussed as an example of collaborative efforts amongst faculty at diverse locations. From experience of teaching a digital libraries course, students currently enrolled in DL courses often have mixed, and only vague, notions of both the nature of DLs and the content of courses devoted to their study.

Access to reading material by D. Streatfield [27] Reports results of a questionnaire survey, conducted among 1000 scholars and researchers, across all the main subject disciplines, in 2 Northern Ireland universities (Queen’s University, Belfast and Ulster University), to determine their need for scholarly and research materials; how, when and where they obtained these materials; problems experienced in finding, obtaining and using them; and ideas for improving present arrangements in this area.
Structured interviews with 20 University staff explored some of the more complex aspects of support for academic research. Further interviews with 30 Librarians and other key informants and a mini survey of scholars and researchers in Ireland were planned. The study Recommends improvement of access to existing legal deposit collections for researchers and scholars, extension of specific legal deposit arrangements to cover digital materials, enhancement of existing libraries and information services in Northern Ireland to improve the support for researchers and scholars and appropriate planning and managerial arrangements to ensure successful development of the library and information infrastructure.

Awareness and use of digital collection by scientists - a study in RRL, Bhubaneswar by J. R. Sahu et al [28] Paper presented at the Fifth National Convention for Automation of Libraries in Education and Research (CALIBER-98), at Bhubaneswar, 4-5 March 1998. A survey of the opinion of the scientists of the Regional Research Laboratory, Bhubaneswar, was conducted in order to find out the budget allocation on electronic publications, use of computerized library services like online, CD-ROM and Internet. For effective management of information, the library administration should take into consideration the opinion of the scientists and provide e-mail and Internet based services. Suggests a network of libraries and information centres in Bhubaneswar, to share resources.

Digital libraries, special libraries and social work practitioners by M. Watson [29] Reports results of a questionnaire survey to identify the issues which have an impact on the use of digital library developments by special libraries and social work practitioners in the UK. The aims of the
research were to identify how recent developments in the field of digital libraries may have an impact on special libraries in the social welfare sector in terms of their role as: information intermediaries; information consumers; information providers; and the information needs of their users.

R. Gartner [30] reports on visits to digital library projects in Japan and Japanese institutions engaged in digital library research. These included the HUMI (HUmanities Media Initiative) Project, based at Keio University; and NACSIS (National Center for Science Information Systems). He also visited two universities, which were engaged in research programmes on digital libraries. He discusses the implications of the findings for UK libraries.

A survey on the impact of digital reference on librarians and library users was carried out by C. Tenopir and L. Ennis [31] following up to a 1991 survey of USA University reference librarians on the impact of digital media. 68 librarians responded. The survey covered changes in attitudes, use instruction, workload and the workplace environment. Changes over the past few years have been profound. There are more sources and options for sources, higher user expectations, greater reliance on new technologies and moves to serving remote users. Often reference staff is working with less budgets and smaller staffs.

A survey of recent advances in optical and multimedia information technologies was conducted by D. Jessop [32] in 1996 which covers: CD-Recordable, CD- ReWritable, cable modems, Personal Digital Assistants, Digital Video Disc, interactivity and virtual worlds, advertising on the World Wide Web, intranets, and intranets and CD-ROM networks. Includes URLs of several Web sites giving further information on recent developments.
I. K. R. Rao [33] contributed an article to a special issue on collection development in the context of networking and electronic publishing. Considers the significant impact of CD-ROM databases, the Internet and the development of digital libraries on collection development. Discusses challenges in this regard, arguing there is a need for a survey of all the available sources on various networks. More effective techniques are also required to search and store the downloaded data. Policies for collection development need to take into account recent advances in information technology and their impact.

J. Lyon [34] presents a survey of current projects and future plans by art museums to provide information and a digitized art archive on the Internet. Most museums now have a Web site for information and discussion. The National Museum of American Art's site has a range of virtual exhibitions, which allows them to show objects for which there is no physical display space in the museum. Research projects under way in the USA and Europe will explore issues surrounding interoperability of networks for open multimedia access to major museums and galleries with the aim of accelerating the digitization of collections and ensuring their accessibility to the public. The Getty Information Institute, in collaboration with publishers worldwide, is aiming to create a virtual database for the arts with controlled vocabularies and structured information protocols, which will be searchable as a single file over the Web.

Informal research on digital images on the Web by R. Gibboney [35] contributes to a special section on digitization in Colorado. Describes research carried out on the technical aspects of images on the Web prior to conducting a digitization project at the University of Northern Colorado, which involved scanning manuscripts, research notebooks, photographs, and other materials from the James A. Michener Special Collection.
Several hundred images on dozens of web sites were studied and data was recorded from small preview thumbnail images, full-screen size access images, original and scanned formats, dimensions in pixels and scanned size, and the relationships between thumbnail and access images. Outlines the results from this survey, which revealed little in the way of guidance for standards and consistency. Emphasizes the need for developers of digital online collections to share their philosophies and practices in order to improve processes and products.

Directory of digitized collections: IFLA PAC/UAP project [36] to compile a Comprehensive listing of digitized documents held by libraries worldwide reports on the project, undertaken by the IFLA Core Programmes for Preservation and Conservation (PAC) and the IFLA Universal Availability of Publications (UAP), to carry out a questionnaire survey of preservation digitization programmes in major cultural institutions worldwide, in order to establish a virtual library of digitized collections worldwide.

The Colorado Digitization Project [37] provides access to unique resources and special collections held by Colorado's libraries, archives, historical societies and museums. The Web site brings together the digitized collections produced through the collaborative efforts of all these organizations. Notes the purpose of the Project and the Task Forces set up to implement and administer it. Final launch of the scheme followed a questionnaire survey of over 300 Colorado libraries, archives, historical societies and museums and work conducted by the Website Task Force in designing a suitable Web site.

Representatives of 20 Canadian libraries have formed the Canadian Initiative on Digital Libraries [38] to work together to improve access to digital resources. In addition to fostering cooperation within the library
community, the initiative will establish liaison and collaboration with other sectors involved in Canada's electronic information infrastructure. The National Library of Canada has conducted a survey of digitization in libraries of all types, and identified a number of issues needing immediate attention. Principles have also been drafted for the establishment of various standards.

N. Smith and H. R. Tibbo [39] considers the role of the creation of electronic texts (e-texts) in libraries and electronic versions of library materials in the vision of the future for both libraries and the humanities. Many academic libraries are becoming producers of information as well as filling the traditional role of being archival repositories. Reports results of a survey of libraries hosting text digitization projects which considered: factors involved in selecting texts to digitize; factors involved in selecting editions to digitize; approaches to text conversion; preferred encoding schemes; typical level of text encoding; preferred methods of providing bibliographic access to library created e-texts; preferred archive site for library created e-texts; organization responsible for revising e-texts; and preferred methods of staff and user training. Presents a framework of the issues and challenges facing librarians as they consider implementing e-text projects. Concludes that a well-planned alliance between the university library, computing centre and faculty can result in the successful implementation of e-text projects.

As part of a survey run by UNESCO [40] in cooperation with IFLA and ICA to develop a World List of Endangered Library Collections and Archive Holdings as a First step in the Memory of the World Programme, the National Digital Library distributed a questionnaire on preservation activities to national libraries in Asia and to 300 libraries in Japan in Summer 1997. This was part of the Memory of the World project. The questionnaire covered: general information about the libraries, information
about the collection, details of nationally significant materials, preservation procedures and policies, preservation training and staffing and international cooperation.

Concern for the future: preservation management in libraries and archives by P. Eden [41] combines the results of two questionnaire surveys of preservation policies, conducted by Loughborough University, Department of Information and Library Studies, to compare the ways in which librarians perceive and carry out preservation management and how their perceptions and activities compare with those of archivists, for whom preservation plays a more central role in their working practices. The first project was based on a questionnaire survey of 682 UK academic, national, public and special libraries. The second project was based on a questionnaire survey of 290 archives and record offices and interviews with 25 librarians, archivists and conservators. Discusses appropriate issues including: attitudes to preservation; selection for preservation; resources available; external funding; increasing use of library and archive collections; photocopying demand; past neglect; and digital technology. Although librarians and archivists may have different attitudes to preservation, preservation managers face similar problems regardless of profession. Digitization can offer researchers distant access to surrogates of important materials via networked systems but there needs to be a coherent and comprehensive UK national preservation strategy.

Jerome L. Hartke [42] had carried out a survey in 1998 to determine the lifespan of CD-R media. This study provides an example of CD-R quality evaluation that properly forecasts interchange and longevity. Test results clearly indicated that all discs were not alike, even if their colors were similar. Cost pressures have resulted in a broad matrix of stampers, dyes, metallizations, and processes. No correlation was observed between CD-R quality and dye type (cyanine or phthalocyanine), metallization (gold or silver), or recording speed (2X-8X). Quality is primarily determined by
efforts at the manufacturing facility, and depends less on types of dyes or metallizations. Good discs would be expected to satisfy all interchange and longevity requirements. Marginal or defective discs might be readable in high quality drives, but could fail in others. Degradation from handling or storage might cause poor quality discs to become unreadable while better discs could still function.

1.6 Organization of the study: -

The study is divided into following seven chapters.

Chapter- I is an overview of the entire research work, which includes the brief introduction, need of the study, objectives of the study. It traces the need and purpose of the present research work through a comprehensive literature survey. It presents in short, the development of digital era in general and digital libraries in particular. It also provides a short account of research methodology adopted and scope the of the study.

Chapter - II assesses the need and importance of conservation and preservation of library material. It discusses the various methods of conservation and preservation of library material adopted by librarians through the ages. It illustrates in detail the different types of library materials and their deteriorating agents and preventive measures advocated. At the end, this chapter opens the issue of digitization as one of the preservation techniques.

Chapter III is a further elaboration of the concept 'digitization'. It furnishes authentic and in-depth information on digitization. It comprehensively covers the need, definitions, advantages, and limitations of digitization. The backbone of the chapter is the 'digitization-process', which includes the selection of the materials for digitization, different digitization methods, storage media, file formats used and application of metadata etc. This
chapter also indicates in detail the different types of digitization tools required for the process of digitization (scanners and digital camera). These tools are described with their unique properties and technical details.

Chapter V is entirely devoted to the discussion and development of a conceptual framework of the term 'digital library'. It traces the genesis and development of digital library and deliberates the detailed account of the pioneers of digital library. It is very difficult to understand this new concept in isolation, so efforts have been made to compare and contrast it with traditional library, electronic library, hybrid library and virtual library. A comprehensive literature search has been made to trace the numerous definitions and the opinions of experts on this topic. Each and every definition is critically analyzed to provide the unique properties, advantages, limitations, components and salient features of digital library.

The success of the digital library system solely depends upon the appropriate software package used for the purpose. The researcher has collected the information on different type of software packages available on Internet.

Chapter IV examines the practical experience of digitizing the diversified rare material. The said material includes rare books, manuscripts, old maps, unique audio video material, photographs, illustrations, microforms etc. Unique properties and salient features of these materials are described in detail as preventive care and unique precautions are needed before digitization. The success of digitization depends upon the integration of various activities that are discussed in this chapter.

Chapter VI is principally undertaken to provide a digital library model for university libraries, which is based on the practical work carried out at
Jayakar Library, University of Pune. Since the scope of the present research work is limited to rare materials, efforts have been made to identify unique and useful material. The material incorporated in this model is digitized using Minolta book scanner and flatbed scanner. Other materials like maps, audio and video clips have been downloaded from the Internet. A navigational tool has been designed by using Greenstone Digital Library Software package.

This model has been prepared after analyzing the data, received from the Indian universities. The questionnaire was sent (online and printed) to all 235 universities and research organization recognized and listed by Association of Indian Universities. It is found that the librarians are confused about digitization activity and no substantial work has been carried out in India. Taking into considerations the requirements of university libraries, this model is designed. It will help and provide some type of guidelines to undertake digitization activity in university libraries.

Chapter VII presents conclusion, finding, recommendations and suggestions.
References


