CHAPTER II

REVIEW OF LITERATURE
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2.1 Introduction

This chapter provides an account of studies carried out by professionals, and the views of scholars, in the field of digitization and digital preservation, of heritage collections in India and Iran, as well as in other countries. It covers various aspects of digitization and digital preservation of cultural heritage, such as: digitization of cultural heritage collaboration, cultural digital archive model, digitization and electronic copyright, open source software, integrated access system, open archival information system, standards and metadata and user behaviours.

It also covers some projects which have been taken on digitization and digital preservation, such as: Humanities Media Interface Project, and Electronic Resources Preservation and Network program. Organizations like IFLA, UNESCO and National Libraries in different countries which have taken efforts on digitization and digital preservation of their heritage collections.

The investigator has conducted a detailed literature survey of the topic by scanning CD-ROM database of Library and Information Science Abstract (LISA) and online databases such as Library and Information Science and Technology Abstracts (LISTA) and Electronic Management Research Library Database (EMERALD), Science Direct, Vidyanidhi and Internet from 1969 to date. After scanning, references were selected, recorded and are stated as follow:

2.2 Studies on Digitization and Digital Preservation of Cultural Heritage in India

People like Kognuramath and Angadi (2010) and Srivastava and deu Kanungo (2010) have examined various types of preservation of traditional documents, as well as preservation of digitized forms of documents, using related technologies. The authors also describe various steps involved in the digitisation process, The Optical Character Recognition (OCR) software used and its advantages over other OCRs, the search interface used, browsing and searching facilities, navigation facilities provided in the CD, etc.
According to Arora (2009) digitisation and digital preservation are related to each other in a number of ways. One of the main goals of digitisation is to preserve rare and fragile materials by making them accessible to multiple numbers of users simultaneously. In India, digitisation and preservation are a major focus of libraries, which have been building their in-house databases and have begun subscribing to electronic resources and other computer-based services since the mid-1980s. The author discusses the challenges involved in preserving digital content and looks at a number of digital preservation strategies.

According to Bist (2009) digitization is an important aspect of developing digital libraries, as it opens up new avenues of access, use, research and preservation of valued information resources. The Gandhi Smriti Library of Lal Bahadur Shastri National Academy of Administration (LBSNAA), Mussoorie, has taken up the digitization of non-copyright rare and fragile documents for the Digital Library of India (DLI) project, which is being realized by Centre for Development of Advanced Computing (C-DAC), Noida. The library is also planning to develop its own scanning facilities, for digitizing the institutionally produced literature. Bist attempts to describe the digitization initiatives, and highlights the challenges and policy plans, for developing a digital library at the Institute.

Lalitha (2009) and Mani (2009) examined different aspects of photographs and the importance of digitization of such materials, while presenting different techniques adapted in different projects, at different places for posterity, as well as for easy accessibility and enumerates the importance of the metadata adhering to Dublin Core Metadata Standards. Mani also discusses about digitisation, its need and how to preserve the digitised documents.

Bansode (2008) says that the purpose of her paper was to describe, the digitization of rare materials in one Indian university. The author highlights the digitization activities undertaken by Shivaji University Library to preserve rare materials. Bansode attempts to calculate the costs incurred in the digitization process and finds that digitization is the solution for the preservation of, and access to, rare manuscripts, and provides the complete budget required for the digitization of manuscripts and suggests best possible preservation and access strategy, according to the local needs of the users. The author provides valuable insight into the
development of digital libraries in India. It is useful for setting up the infrastructure required for digitization and a guideline for preservation and access to rare materials.

Devi (2008) says in Manipur, they are losing manuscripts through decay and improper handling. Current progress in the field of information and communication technology offers a potential solution to the problem. Through large-scale digitization projects, manuscripts can not only be stored and preserved, but also made available to the public. This paper highlights the importance of the Manipur manuscripts collection and the necessity to preserve the collection for future generations.

Kaur (2007) states that preservation of digital materials for the benefit of present and future generations are an urgent issue to address. The author explores various strategies and methodologies for preserving digital heritage materials; discusses issues concerning digital preservation (DP); enjoins upon the National libraries to take the responsibility for DP, with the co-operation of several stakeholders the Government, Publishers and IT industry; gives an overview of initiatives taken by the National libraries world-wide, for preserving digital heritage materials; and discusses the Indian scenario. It also focuses on the pressing need for the national library, state libraries, museums and other libraries to work together more closely, to successfully organize digital archiving in the 21st century.

Varatharajan and Chandrashekara (2007) state in India, a substantial number of libraries and information centres have initiated digital library activities. Indian society has created and preserved the resources of traditional and cultural heritage in various forms; however, thousands of ancient books and manuscripts remain in perishable palm leaves, and urgently need digitization. The authors describe some of the digital libraries and institutional repositories of India.

Bhatnagar (2006) describes the digitization process in an academic library context, summarizing the advantages and disadvantages, and considers its future prospects. They also discuss the creation of the Web page of the Indian Institute of Technology (IIT) Kanpur library, India, looking at what has been lost in the process as well as gained.
Kumari and Oak (2005) in their paper describe a pilot project at the National Informatics Centre, Bangalore, to digitize information on the collection of materials, in the Karnataka State Archives and the Gazetteer and Archaeology Department. These include documents of varying sizes and in various languages; maps, manuscripts and files, and district Gazettes, as well as objects in museums and Archaeological sites under Karnataka State control.

Majumdar (2005) reports the initiative taken by the Indian Government Introducing the National Mission for Manuscripts is the right step towards preserving these culturally significant works. The Indian libraries that have these precious collections have suddenly gained importance and are benefiting financially. The ultimate aim of the mission is to identify such rich heritage, register them wherever available, preserve them and provide the surrogates for worldwide dissemination. The author attempts to provide details on the entire gamut of this issue.

Ramana (2005) presents a brief overview of digital preservation, digitization of manuscripts and preservation techniques, which are currently in use in India. It highlights the role played by multimedia technology, in digital preservation of Indian manuscripts. It projects also the manuscript resources, and manuscript conservation centres in India. The author also states the requirements in promoting preservation of digital materials.


Sharada (2005) discusses some of the important issues that arose in digitizing documents in Indian languages and linguistics at the Central Institute of Indian Languages, Mysore, suggests some solutions and summarizes the value of such digitization.

According to O'Keefe (1996) the British Library Oriental and India Office Collection have recently acquired a group of birch bark scrolls written in the Kharosthi script, probably dating from the first or early second century AD. A joint British Library/University of Washington Early Buddhist Manuscripts Project has been established which will involve several scholars in years of study. Decipherment,
analysis, comparison with existing texts and palaeographic research will be required, and the editorial process prior to publication will be assisted by image digitization of the manuscripts. The potential significance of these new manuscripts for Buddhist studies is immense.

Oddos (1994) describes a scheme for the digitization of the General Archives of India in Seville, applied to old documents for their preservation and ease of access. The scheme provides a stock management information system, a documentary management system, a service for users, and a system of communication of numbered documents.

Panigrahi (1986) states the Nehru Memorial Museum and Library was founded in 1966 and the library moved into its new, air-conditioned building in 1974. It comprises the manuscripts division, oral history division, research and publications division, reprography and preservation branch, and the library reading areas. A major achievement is the acquisition, maintenance and preservation of private papers and institutional records. These comprise original correspondence, notes, diaries, speeches and institutional proceedings. An ongoing project is the microfilming of old Indian newspapers in English and regional languages.

2.3 Studies on Digitization and Digital Preservation of Cultural Heritage in Iran

Bahmanabandi (2009) describes the concept of eArchive, discusses their advantages and disadvantages, and, introduces some examples. The substantial role that these archives play in creating scientific relations, between Northern and Southern countries is also discussed. In the end, some reservations that may exist in relation to development and use of such archives in Iran are brought into consideration.

Najmabadi (2009) states that a digital archival project, headed by a team of Qajar-period scholars has been launched at Harvard University, to preserve, link and offer access to primary source materials, related to the social and cultural history of women in Qajar, Iran. The archive will make available private family holdings, such as written documents, and other cultural objects.
Shadanpour (2008) states that the emergence and widespread use of computer technology and networking caused creation of new forms of information sources, and significant changes in techniques, methods, and methodologies of collection, preservation and dissemination of these sources. National libraries and national archives, as the main bodies in charge in this area, are facing great challenges. In dealing with these challenges, what can lead to reasonable and useful actions are the right perception of the world conditions and its progresses, as well as logical, realistic and futuristic managerial and technological approaches. Some of the dimensions of this issue are dealt with in this article, with an eye on what has been done by the National Library and Archives of Iran.

Soheili and Khalili (2008) say archives and archive materials are the memories of the past. These centres and materials have not been distanced from changes in information and communication technologies. These materials are nowadays moved onto the Web, and are accessible in Websites. The digital archives desk is one of services that is the result of development in information and communication technologies. Due to the lack of familiarity with this kind of service, and the lack of standards for designing such a service, it has been undermined in Iran. The authors present a model for the digital archives desk, for the National Archives of Iran, based on the content analysis of digital archives desks available abroad. The results showed that, there was a significant gap between the results acquired from the content analysis (present state), and library and information specialists' opinions (favourable state). Results of the study were also are indicative of the fact that designers of web sites do not care for users' information needs. In the end, an appropriate model was developed and introduced, for the digital desk of the Iranian National Archives, on the basis of the comments received from experts.

According to Alidoost and Saberi (2007) Electronic Theses and Dissertations (ETDs) are a new generation of scientific documents which are digital-born, and all of their provision processes are carried out digitally, from conceptualization and writing, to archiving, collection building and organizing. Therefore, intellectual and academic institutions including universities worldwide are increasingly moving towards utilization of these documents. The digital nature of ETDs makes them different from their printed counterparts in terms of production, preservation, maintenance, access and copyright. The authors present some other ETDs' issues including multimedia.
application, copyright, access, preservation, formatting; user training and their effects on libraries which are discussed in detail.

Gholamhosseinazadeh (2007) presents the use of information technology and digitalization, and how it has made changes in various fields, for several years. The aim of this research was to study how Information Technology (IT) is used in storing and retrieving manuscript copies in the libraries of Iran. The findings of the research showed that, 60 percent of libraries had digitalized their manuscript copies, and there were only two libraries that had computerized 100 percent of the information regarding its manuscript copies. Among all of these libraries, the libraries of Qoom city achieved a more distinguished status than other cities of the country, in using information technology and digitalization of manuscript copies. Also the results showed that it was evident that the libraries under review lacked sufficient specialized staff, and had problems with location of library and quality of information technology used.

Moghaddam (2007) says that with the growing number of scholarly journals in electronic format, long-term preservation of scholarly electronic journals has become one of the most important issues in digital libraries. Accessibility of scholarly journals on the Internet and electronic publishing in general is causing a shift in the responsibility for archiving journals from libraries, to agreements between libraries and publishers. The author focuses on some of the important issues surrounding preservation of digital resources, especially scholarly electronic journals, and presents a study on the archiving policies of the following publishers: Elsevier, Springer, Taylor Francis, Oxford University Press, and IEEE.

Bennett (2006) opines the challenges faced by librarians, with the emergence of computer technology. Challenges in communal access to digital resources; preservation of digital materials; and problems in making information systems both cost-efficient and affordable.

According to Tehranipour (2006) audiovisual materials are artefacts related to the recent centuries. In recent decades, the cultural value of these materials has become more obvious. Moreover, an extreme increase in the, diversity of carriers, audiovisual works and challenges of technological development have caused us to pay more attention to safeguarding and preservation of these materials, and the copyright
of producers of audio-visual works have become more essential. Tehranipour indicates various concept and characteristics of this profession, and then. Gives examples of these characteristics in audiovisual archiving and finally the current condition of this profession in Iran and the world in general is described. It concludes on the necessity to distinct this profession from other parallel professions.

According to Nageshineh (2005) digital preservation refers to an important aspect that most Iranian digital library initiatives lack. This component is of security. While a digital library may be misconceived as an information supply space without a physical form, the same security concerns in force for operation of a physical library are valid. A digital library can provide a tool whereby the user can authenticate the same material, without compromising sensitive watermark key data. Watermarks must be impervious to premeditated alterations and tampering. A national digital watermark assignment centre is proposed for sharing the burden of development and distribution of such security features to developers of required contents.

Niknam (1991) discusses the state-of-the-art of conservation, preservation and restoration in Iran, focusing on activities in the following institutions: Astan Quds Razavi Central Library in Mashhad, the National Archive of Iran, the Cultural Heritage Organisation, and the National Library of Iran.

2.4 Studies on Digitization and Digital Preservation of Cultural Heritage in Other Asian Scene

Jiazhen and Daoling (2007) have tried to obtain first-hand data, on the main challenges in preserving digital resources in libraries, archives and information centres in China. The authors consider that the long-term preservation of digital resources in China face two critical difficulties: firstly, the pressure on preserving digital resources has not been fully recognized and so the relevant training in the management and operation of digital preservation is absent. Secondly, government departments attach little importance to this field, and lack uniform guidelines. Therefore, the authors suggest that relevant international conferences or workshops be held in China, and that a working group, led by the National Development and Reform Commission of China should be set up, to plan the construction, sharing and maintenance of Chinese digital resources. The data and analysis in this paper would greatly help international colleagues understand the status regarding the preservation
of digital resources in China. This research is the first of its kind undertaken in China, and will provide a new vision for international peers and organizations involved in digital documentary of heritage items around the world.

Xiangdong and Zhiqing (2004) describe the work undertaken by the National Library of China (NLC), Chinese People's Republic, in the restoration and preservation of precious Chinese cultural materials, and the publicity and educational activities associated with these works. The NLC's priorities in preserving materials include: the saving of ancient books on the verge of extinction; ensuring the safe transference and absolute security of books, by means of regulations and technologies; the reproduction and dissemination of literatures through digitization and publication; and the encouragement of a common understanding among people of the need to cherish and protect these cultural materials for posterity. The new Preservation and Conservation (PAC) China Centre was created to promote these preservation activities throughout the country.

Lee (2010) aims at the status of collaboration in cultural heritage preservation in East Asia, including digital projects, and to suggest practical improvements based on a cultural structuralism perspective. The author addresses aspects of successful collaboration in cultural heritage digitization in East Asia. Lee also indicates the difference in collaboration of cultural heritage digitization, between regions such as Europe, and the unique situation in East Asia. If collaboration between the countries of East Asia were implemented, then such a community could deal with the issues of cultural heritage, by having a standard scheme or policy.

Abd Manaf and Ismail (2010) indicate that the purpose of their paper was to explore and understand, the state of the art of managing digital resources, focusing on the availability of risk strategy practice, by cultural institutions in Malaysia, in order to maintain and preserve their digitised resources. The multiple case study approach was adopted, where three selected cultural institutions participated. One of the significant findings was the ability of the institutions to sustain their digitised resources. The authors discuss the issues related to the risk management of digital resources in Malaysian cultural institutions. They also give a comparative evaluation among three main cultural institutions in Malaysia. Manaf and Ismail highlight the crucial elements, which need to be addressed, to ensure the sustainability and the
successful implementation of any digitization project. They present findings for the dissemination of the knowledge, specifically in the management of digital preservation, of cultural resources available in Malaysia.

Abd Manaf (2007) in her study examines the current state of digitization initiatives by cultural institutions in Malaysia. The study adopted an exploratory survey, to examine the state of cultural heritage digitization. The findings and discovery of the study are significant, in providing a comprehensive background and scenario of organization, description and retrieval of local content resources, in electronic forms in Malaysia. The outcome of the study would contribute to the knowledge in managing digitized cultural and heritage resources, in cultural and heritage institutions in Malaysia.

According to Abd Manaf (2008) the purpose of the study was to uncover the perceptions of information professionals about the establishment of a National Digital Cultural Heritage Repository Centre (NDCHR) in Malaysia. She adopted a modified Delphi study to identify the factors that contribute towards the establishment of an NDCHR in Malaysia. The results showed that the establishment of an NDCHR required collaboration efforts among different types of cultural institutions in Malaysia. Abd Manaf says the findings and discovery of the study were significant in providing a general framework, to establish an NDCHR in Malaysia. She reports the outcome of the study will contribute toward the establishment of a central repository for digital cultural heritage information in Malaysia.

According to Beasley and Kail (2009) the National Archives of Singapore (NAS) had launched a one-stop portal called a2o, which provided access to cultural and heritage information dating back to the 17th century. Among the resources found in the portal are databases, photographs, maps and plans, oral history audio files and other audiovisual recordings. The site also provided an overview of archives, and offers important information about the NAS research process, as well as online exhibitions that serve as interactive versions, of the institution's touring exhibits. This is a remarkable initiative that should open Singapore's cultural repository, both to a new generation of Singaporeans and current researchers.

Wah (2004) presents the views of the Director of the National Archives of Singapore on the guidelines on reformatting and preservation, prepared for the
Preservation of Research Library Materials Committee of the Association of Research Libraries (ARL). He argues that the document should have included the option of using digital techniques to capture non-dynamic and text-based archival records and store them on silver halide microfilm. The National Archives of Singapore has taken this approach since 2000.

According to Hsiang et al (2005) the size and variety of cultural digital archives have growing dramatically in recent years. An industry that is built around the construction and applications of digital archives is gradually coming into shape. The author describes the business models of the cultural digital archives industry and analysis is drawn largely from the interaction with about 150 companies that had participated in various national digitization programs in Taiwan. The authors have summarized the business activities into five categories. They are (a) digital archive databases, usually in Web-accessible form, (b) integrated databases, usually on a specific subject such as paintings or plants, (c) products from creative reproduction of digital objects, (d) digital content services delivered through hardware device and (e) digitization technologies, software and services.

Ezeani (2009) says that in 2008 the University of Nigeria, Nsukka embarked on the process of digitizing all its legacy and scholarly works such as thesis, projects and publications of scholars in journals, books, and inaugural lectures. The aim was protection of original documents, and improving remote access and visibility for scholars. The project had not been without problems. The author aims to elucidate some of these problems and offer solutions for the continued success of the project. Ezeani provided an examination of the digitization initiative of the University of Nigeria, Nsukka. The challenges included legal aspects, training, infrastructure, and stakeholders. Ezeani describes the process of a digitizing project in a developing country, in general.

Lyall (2009) opines that the difficulties and challenges faced by developing countries, in preserving and providing access to their cultural heritage, citing the case of the island of Satawal, now part of the Federated States of Micronesia. Navigators from Satawal used no mechanical aids, but employed knowledge of the sun, stars, currents, waves, cloud formations, birds and marine life, to sail several hundred miles from one tiny coral atoll to another. The story of the traditional navigators from
Micronesia represents a metaphor for current day navigation between the archives of the world.

2.5 Studies on Digitization and Digital Preservation of Cultural Heritage in African Scene

M’kadem and Nieuwenhuysen (2010) present the readiness of academic researchers in History in Moroccan universities, to change their habits and ways of accessing old manuscript collections, from direct access, to on/offline access to digitized versions of the same documents. A survey was conducted with a sample population of about 30 researchers, both students and teachers. This user study concluded that though people appreciate the possible existence of a digital library for manuscripts (online or offline) they have some hesitation to use it solely because they are afraid of losing a precious and fruitful human interaction with the private holders of manuscript collections. The study is considered as a basis for future studies that could enhance the concepts and the methods, needed for digitization in Moroccan.

Kalusop and Zulu (2009) say the purpose of their paper was to present the findings of the baseline study on the state of digital heritage material preservation in Botswana. The study was part of a three-country United Nations Educational, Scientific and Cultural Organization (UNESCO) Digital Heritage Preservation Project, on the state of digital material preservation in Africa, involving Botswana, Ethiopia and South Africa. The study used the survey method consisting of various components of data collection strategies including fieldwork, document research, observations and the holding of a national consultative seminar an additional data input tool. The field study involved visiting 26 institutions that were identified as having the capability or the potential, of managing heritage materials in the country. The findings revealed a weak policy formulation on digitization both, at the institutional and national levels; weak legislative framework for digital preservation; ill-defined national digitisation co-ordination, for digitisation activities at institutional, Regional and National levels; lack of awareness about the potential of digital preservation, by national heritage institutions; a dearth of human resources for digitization; and lack of common standards on digital heritage material preservation in Botswana. Although the study was limited to institutions dealing with digital heritage materials preservation, the outcome of the study shed more light, on the challenges of preservation of digital materials, in most of the institutions in Botswana. The author
presented useful strategic policy options, for the management and preservation of
digital materials in Botswana, and other countries of Africa, facing a similar
environment. There is a dearth of literature on preservation of digital heritage
materials in Africa, and this study provided useful insights that are unique and
comparative to experiences that exist on this subject.

Ramatlhakwana (2009) say that the advent of Information and Communication
Technologies (ICTs) tools has enabled many possibilities for the digitization of the
African heritage. Digitization of the African heritage makes it easier to share and
access digital information across the world using different ICT tools. In as much as
digitization has enabled the African heritage to be converted from text, audio and
images into digital format, leading to improved preservation of cultural and historical
materials, this was not without challenges. The critical challenge emanates from
whether it is the ICT or the people, who have to determine the material, which
qualifies to be of African heritage. Another equally important challenge is whether
digitizing the African heritage will not be seen as intrusive into places, which have
been seen and held as sacred. The author reports there is then the challenge of
overcoming a hurdle, which develops when ICT is expected to take over, and to
replace traditional practices of preserving and providing access to African heritage.
The prospect of introducing new technology into a traditionalist environment may
pose a problem, if the traditionalists view the technology as trying to change the way
they have been relaying their history and traditional practices. The last challenge
relates to the authenticity of digitized heritage. Ramatlhkwanaw discussed that
digitizing the African heritage is not just about converting material from analogue into
digital format, but encompasses its acceptance and use. The acceptance and use will
be achievable only, when the above challenges are appreciated and ways found to
address them.

Johan Lor (2005) has tried to determine if repository libraries in developed
countries have a role to play, in the preservation of the digital resources of developing
countries. Literature-based conceptual analysis of categories of digital resources
produced in developing countries; the capacity of African institutions and
stakeholders to preserve African digital resources; and issues and challenges, to be
faced by repository libraries in preserving these resources still exist. African
institutions currently do not have the capacity to collect and preserve this material. It
is possible for repository libraries in developing nations to play a role in ensuring the long-term preservation and accessibility of digital material from Africa, if they take into account certain technical, organizational, economic, political, legal and ethical aspects, especially the “soft” issues.

### 2.6 Studies on Digitization and Digital Preservation of Cultural Heritage in European Scene

According to Ceynowa (2010) the Bavarian State Library is one of the largest European research libraries. Extremely precious manuscripts, rare printed books and comprehensive special collections, from thousands of years of cultural heritage, characterize the library’s unique collection profile. Responding to the challenges of the digital age, it is a primary strategic objective of the Bavarian State Library, to digitize as soon as possible its unique collections, which are a good part of its written cultural heritage, and to make them usable for the world. Aiming for this strategic objective, the library undertook several large-scale digitization projects, which will bring more than 1.2 million books online, during the next few years. The deployment of state-of-the-art robotic scanners, as well as a public-private partnership with Google, which are part of this digitization strategy, is described in detail. The authors conclude on the implications for the future role of libraries, especially as “bricks and books” institutions. In the rapidly changing information landscape are also briefly discussed.

Kail (2010) states that Ireland's libraries work to preserve its rich cultural heritage, while striving to provide a contemporary range of services and access points. Ireland's museums and libraries are preserving its illuminated and other historical manuscripts, and finding ways to digitally present, and provide access to materials, related to contemporary historical events, and cultural contributions. Local libraries also offer unique digital contributions to the nation's ongoing preservation and resource-access efforts. The authors report on some of the exhibits and online resources that offer a glimpse into both Ireland's history, and its contemporary library services.

Neudecker and Tzadok (2010) describe how web-based collaboration tools can engage users, in the building of historical printed text resources, created by mass digitisation projects. The perceived risks, such as new errors introduced by the users,
and the limitations of engaging with users in this way was set out, with the lessons that can be learned from existing activities, such as the National Library of Australia's Newspaper website, which supports collaborative correction of Optical Character Recognition (OCR) output. The authors discuss the work of the Improving Access to Text (IMPACT) project, a large-scale integrating project, funded by the European Commission, as part of the Seventh Framework Programme (FP7). One of the aims of the project was to develop tools that help improve OCR results, for historical printed texts, specifically those works published before the industrial production of books, from the middle of the 19th century.

Balk and Plowger (2009) say that the purpose of their paper was to address the most urgent challenges that libraries face, in the mass digitization of historical printed text. The authors report that in the EC-funded project IMPACT (Improving Access to Text), seven libraries, six research institutes and two private sector companies across Europe work together to address the challenges by the development of OCR software and technologies, which exceed the exactness of current state-of-the-art software significantly. The IMPACT solutions focus on the entire process of recognition, after the document leaves the scanner. Authors say the IMPACT solutions will allow for the first time the ability to transform large amounts of digitized historical texts, into electronic text, with a minimum of manual interference, and a significantly improved accessibility for the user.

According to Poll (2010) the NUMERIC project of the European Commission, started out to define units of measurement, and methods for assessing the current state of digitisation, in Europe's cultural institutions. The aim was to show, on the one side, the financial input into digitisation, and on the other side, the progress achieved in digitising the national heritage. Poll describes methods and results of the project, with special consideration to libraries. The central task of the NUMERIC project was to develop a framework for the collection of statistical data that would be most suitable, to give a national overview of digitisation. According to author, the project developed definitions, and data collection methods for the intended survey. After testing the survey in a number of archives, libraries and museums, the project team collaborated with nominated experts in each member country, for choosing an adequate sample of cultural institutions throughout Europe. Poll says that in spite of all differences, between countries and institutions, the project attempted an estimate of the present
state of digitisation in Europe. According to the statements of the responding institutions in the sample, only about 19 per cent of the analogue collections, in cultural institutions have as yet been digitised, for about 30 per cent, the institutions do not plan digitisation, and at least 50 per cent of the analogue collections in cultural institutions are still waiting digitisation.

Skarstein (2010) reports that during the course of the last six months the National Library of Norway has signed agreements with three leading newspapers, ensuring cooperation in the field of digitisation. These agreements contain three elements: constant delivery of material to the national library's digital storehouse, collaboration on the digitisation of newspapers of historic importance, and the right for the newspapers concerned to be made accessible in digital form, throughout the library system. Several other newspapers are queuing up to sign similar agreements.

Westeel (2009) also argues that the advent of digitisation in heritage libraries has radically changed the promotion, communication and distribution of content, making it necessary to modify methods of collection management, in order to meet the needs of new categories of users.

Wood (2008) describes the digitisation of “Hansard”, the official report of debates in the UK Parliament. The project undertaken jointly by the House of Commons and House of Lords Libraries started in 2005, with the selection of AEL Data of Chennai, India, as supplier. AEL Data proposed a very high degree of accuracy, impressive generation of metadata and an affordable price. The contract specifies text conversion, to an accuracy level of 99.5 percent. A complete run of “Hansards” from 1803, to the general election of 2005 has been captured, amounting to about 2.75 million pages.

Jankovic (2000) discusses the programme of International Symposium on the Digitization of the European Cultural Heritage. The main aim of the symposium was to review European digitisation, projects that intended to preserve cultural heritage, and provide access to a wide range of historical and cultural resources in electronic format.

According to Lyn Elliot (1998) at many recent museum conferences, participants have demonstrated exciting projects in presenting cultural heritage knowledge in
digital form, whether as online resources, or fixed support products such as CD-ROMs. Presentations have outlined the technical challenges, which participants have resolved, and have explored the specific content, which has been assembled, but it is striking to note how few speakers address either the business issues involved in the decisions to create such resources, or audience response to the products.

According to Van der Graaf and Nauta (2010) issues related to the preservation and conservation of born-digital material objects by Dutch libraries, museums, archives were addressed. The pilot research project Digitaal Erfgoed Nederland (The Digital Heritage of the Netherlands) aimed at assessing the current state of managing born-digital objects and the policies in place to preserve such material in this country was reported. It was noted that preliminary results indicate that this kind of national heritage is in danger of being lost or neglected by institutions charged with the conservation of cultural material of national significance. Suggestions how to approach the acquisition of digital collections were made, pointing out the difficulties inherently imbedded with this type of object, e.g. their complexity, software-dependence or technological obsolescence of equipment for their reproduction.

According to Mulder (2004) in recent year’s plans have been unveiled in numerous countries, including the United States, U.K, France and Germany for digitizing the national printed cultural heritage. In the Netherlands, Utrecht University library has made a major start in digitising material, from its special collections. In order to identify user requirements, 14 members of teaching departments were selected to participate in the project. Guidelines covering the selection and scanning of material, as well as the format of scanned images have been compiled. To date 130 books have been digitised.

Otegem (2003) presents a portrait of the Netherlands Royal Library, the Koninklijke Bibliotheek (KB), which is also the national library. The KB has expertise in digitization, conservation and restoration and is coordinating the “Memory of the Netherlands” cross-digitization project that will enable users to access more than 20 archival, library and museum collections. Research into techniques for the long-term conservation in electronic form of legal deposit material is another of the KB’s activities.
According to Dobratz and Astrid (2009) scientific knowledge, historical documents and cultural achievements are now frequently and sometimes exclusively found in machine-readable format. Repository organizations for long-term memory storage are now facing new challenges, in connection with their mission to collect and preserve digital holdings. The criteria established by Germany's “Network of Expertise in Long-Term Storage of Digital Resources” (NESTOR), offer a framework for developing trustworthy long-term repositories, and guidance for the evaluation of sustainable conservation measures.

Tonta (2009) reports that the Balkan Peninsula has a very rich cultural heritage, but the constant political upheavals in the region have affected the development and preservation of their cultures. The author aimed to review the internet infrastructure and networked readiness levels of the Balkan Countries, which are conducive to scientific co-operation and preservation of digitized cultural heritage. Tonta says that the internet facilities and the scientific production of the Balkan countries were identified using published sources, and Thomson's Web of Science database. A game-theoretic approach was used to expound the consequences of wars, and the adverse effects of the nation-building process on cultural heritage artefacts. Balkan countries lack sound internet infrastructures, hindering their contributions to the world of science and stifling scientific co-operation among themselves in terms of joint papers. Coordinated efforts have yet to comment to streamline the digital preservation, of the unique cultural heritage of the Balkan countries.

Ivan (2009) says the common framework for the digitization of and online access to European cultural heritage, as well as for the preservation of European cultural materials in digital form was set out by two important EU documents issued in 2006. Over the past two years, the prototype of the multilingual portal called “Europeana” was established. Ivan argues that they are only halfway towards ensuring the effective operation of the European Digital Library. EDL can only reach its full potential, if a sustainable business model is elaborated, for its future development. He gives an overview of the achievements in the field of digitization of cultural materials in Hungary, and on the European level.

Varnienė-Janssen (2010) presents the lessons learnt, from the digitisation initiative of the Lithuanian National Bibliographic Agency (the Centre of
Bibliography and Book Science) at Martynas Mažvydas National Library of Lithuania, and other memory institutions, the Lithuanian Art Museum and the Lithuanian Archives Department, which provide authoritative bibliographic descriptions for the national collection. The author expounds on the developments, application and updating of formats and standards used for recording bibliographic information, and cultural content, provision of access to it, establishment of the Integrated Virtual Library Information System and the common Web portal of the cultural heritage.

Indergaard (2010) outlines the strategies and initiatives proposed in the Norwegian Government's first report the focus being on the development of libraries that can offer improved service, and serve as a meeting place promoting culture and knowledge. The second report promotes the digitalization of cultural heritage, and use of information and communication technology. The proposed model library project, meanwhile, aims to create a library that meets the needs of the public, to remain well informed and knowledgeable on societal developments.

Skarstein (2010) highlights the strategy of the National Library of Norway for the digital preservation, and dissemination of its cultural heritage. The National Library launched the Web site Bokhylla.no, which makes accessible in full text digitized works from the 1690s, 1790s, 1890s and the 1990s. In the government report of 2009, it emphasizes the need to focus information and communication technology efforts on institutions possessing a national responsibility, and competence and strategies for digital development. Accessibility and the development of national search programs, and joint search facilities are other focus areas of the National Library.

Kashimura (2007) describes digital archive as a system, for preserving valuable digital information obtained by the digitization of cultural material, in a secure and reliable manner and for using it effectively. The Humanities Media Interface (HUMI) Project has constructed internal digital archives of the digital facsimiles, for preservation and digital archives for web publishing. For the latter, image servers are utilized to show images to users.

Kollarova (2007) acquaints readers with results, visions and some conceptual questions of digitizing historical collections in the Central Library of the Slovak Academy of Sciences in Bratislava (Slovakia). The author explains approaches to
digitizing of written cultural heritage, as well as the question of digitizing strategy involving choice of documents, and pays special attention to the first digitized historical document.

Wojciechowicz (2007) has reported on the workshop on digitalization of cultural heritage held in National Library in Warsaw, Poland. The digitalization project of Polish cultural heritage was discussed in the context of European Union (EU) policies and subsidies promoting such work in member countries. Practical aspects of the digitalization work were addressed, including staff training, material selection criteria, legal and procedural matters, copyrighting and related issues of intellectual property rights, quality standards, technical and financial aspects, logistics, etc.

According to Wright (2004) digitization is used for preservation of audiovisual material. The author reports that the EC Project “Presto” surveyed the holdings and status of ten major broadcast archives, a significant portion of total European broadcast archives, including some of the largest individual collections. He says the main findings are that, approximately 75 percent of this material is at risk or inaccessible, and that the collections are growing at roughly four times the rate of current progress in preservation work. Wright gives further results of the project, and gives practical guidance for preservation of audiovisual material. “Presto” demonstrated the effectiveness of the “preservation factory” concept for major broadcast archives, a way to reduce cost while still maintaining or even increasing quality. There is now a new European Commission (EC) Project, “Presto-space”, which will make the preservation factory available to small and medium-sized collections.

Macgregor and Nicholson (2003) describe a major digitisation programme aimed at improving online access to UK cultural resources, from the UK’s museums, libraries and galleries, for lifelong learners and others. The programme provides free access, to important areas of the countries diverse cultural, artistic and community resources.

Kupriene and Prokopcik (2008) say that professionals representing library, archives and museums communities are now dealing with a new challenge, preservation of digital information. Representatives of cultural heritage institutions admit that the issue of long-term digital preservation becomes topical. The Digital
Preservation Europe (DPE) project is responsible for coordination of digital preservation activities in Europe. Based on the analysis of former training activities in this field, and a review of relevant training materials, as well as on the results of a questionnaire, that was distributed to digital preservation Europe project partners representatives of archives, libraries, universities, working in the digital preservation field, compiled a training programme, and is now organising training courses for specialists in digital preservation. The result showed the needs of training on digital preservation and the aims and principles of relevant training programmes.

According to Larsen (2005) in December 2004, the Danish parliament passed a new act on legal deposit, which brought together all regulations concerning the collection and preservation of works published in Denmark, irrespective of type and format. The act covers works published in a physical format, works published on the Internet, radio and television broadcasts, and motion pictures. The responsibility for collecting and preserving this material is shared by the Royal Library, and the State and University Library. Additional funding was secured to develop a system to meet the challenges of Internet harvesting and web archiving, and the new Danish Net Archive was ready to operate, when the new law came into force on 1 July 2005.

Gosart (2004) discusses the state of library preservation as the main problem of library management in Russia, during the time of transition to digital environments. The first principal project, to elevate Russia to the ranks of the technologically advanced, started as recently as 1990s, and although having had some success, the country's digital resources remain grossly inadequate to support the growing public demand for information and education. Despite its state of retardation, the problems of preserving digital sources in Russia are evident to concerned specialists in the fields of informational science and archive work. There is a promise to continue the necessary training and education that will link the National Russian Library system, with more collaborative projects, and with leading international organizations.

Nielsen (2001) states that the Danish Commission on cultural heritage are faced with the fact that funding is insufficient to meet the increasing public pressure for access, with consequent problems relating to collection, security, storage, physical conservation, and digitization. Some material will be lost, and not everything can be preserved. Priority must be given to preserving what has already been collected, and
is threatened with destruction. With sufficient funds, there need be no conflict between short-term promotion and long-term preservation. The result showed that a total cultural conservation plan was needed.

Thorhauge (2001) reported that with new buildings for some national cultural institutions the physical framework is well prepared, but the virtual side needs further development, although Kulturnet Denmark, bibliotek.dk, and Denmark's Electronic Research Library have provided a start. Given limited resources, the selection criteria must be examined. There are broadly two types: research based documentation of the past and educationally motivated promotion. While promotion is decisive, it presupposes research and conservation. We must therefore secure optimal storage, and prioritize threatened objects. Digitization must be increased, but faces the technical problem of retrieval, and the legal problem of copyright.

Chernina (1996) describes briefly the techniques used for the preservation of cartographic materials in the National Library of Russia using lamination with plastic film: mostly polyethylene, but also using polyamide film and restoration paper, both with polyethylene underlay.

2.7 Studies on Digitization and Digital Preservation of Cultural Heritage in the Australian and New Zealand Scenarios

Knight (2010) gives a brief description of the digital preservation programme at the National Library of New Zealand, and details are provided of the system, for the National Digital Heritage Archive (NDHA), developed with help from Ex Libris, and marketed as Rosetta. A small survey of “staff attitudes” to the NDHA was also carried out. Knight presents key factors to be considered by others developing a digital preservation programme to include: definition of strategic drivers; choice of a suitable business model; defining the exact purpose of the digital preservation programme; deployment and implementation; staffing aspects; and how to get started. The author concludes that the National Library of New Zealand has been a leading organisation in digital preservation and its experiences will be of relevance to many other libraries throughout the world.

According to Kail (2009) Australian and New Zealand libraries possess resources that provide a glimpse into each nation's fascinating historical and cultural treasures. The National Library of Australia offers digital collections and online exhibits, related
to many aspects of Australian life, culture, and environment. The library's collections range from images to newspapers, Web archives, and music and dance materials that encompass all of Australian society, including indigenous aboriginal cultures. The National Library of New Zealand maintains a Web site offering access to various collections and information in both English and Maori, while Archives New Zealand, and also offers a wealth of material on New Zealand's history.

According to Daniel, Chern and Yen (2007) the purpose of their study was to gather some empirical, baseline information on the perceived needs of end-users of digital cultural heritage resources. The research design involved a mixed quantitative and qualitative approach; a user survey comprising self-administered, semi-structured questionnaires, seven face-to-face semi-structured interviews and one focus group. They reported the findings outline and the barriers users faced in using New Zealand digital cultural heritage resources. They also highlighted the user needs, features and characteristics, they most desire, in digital cultural heritage resources.

Mason (2007) addresses the concepts associated with permanence, digital culture, digital technology, social change, and cultural institutions, in relation to collecting digital cultural material. He also focuses on changing collecting practices of the Alexander Turnbull Library at the National Library of New Zealand for electronically published material, with the benefit of legal deposit.

Graham (2003) gives a brief introduction to the Heritage Collection at Auckland City Libraries in New Zealand, and notes the significant public support, and commitment given to the preservation of heritage material. He says Auckland City Libraries are doing much to ensure the ongoing preservation, and improve access to original heritage resources, which are of national significance. The author also describes some current and future projects.

2.8 Studies on Digitization and Digital Preservation of Cultural Heritage in the American Scenario

According to Donaldson and Conway (2010) the aims of their study was to describe and interpret, the Preservation Metadata Implementation Strategies (PREMIS) implementation process, to gain more insight into why barriers to the adoption of PREMIS exist, as well as how to overcome them. They suggest that use of PREMIS requires adaptation, in which an organization must make changes, in
order to use PREMIS, and vice versa. They also suggest that there are clearly defined steps involved in the PREMIS implementation process, and that the nature of this process is iterative.

Eschenfelder and Caswell (2010) present the circumstances under which Cultural Institutions (CI) should seek to control non-commercial reuse of digital cultural works. The authors describe the results of a 2008 survey of CI professionals, at U.S. archives, libraries and museums, which gathered data on motivations to control access to, and use of digital collections, factors discouraging control and levels of concern associated with different types of unauthorized reuse. The analysis presents three general themes that explain many of the CI motivations for control: ‘controlling descriptions and representations’; ‘legal risks and complexities’; and ‘getting credit: fiscal social costs and revenue.’ The authors argue that CI should develop a multiplicity of access, and use regulations that acknowledge the varying sensitivity of collections, and the varying level of risk, associated with different types of reuses. It concludes by offering a set of examples of collections employing varying levels of reuse control (from none to complete) to serve as initial proceeding.

According to Otto (2010), preservation of audiovisual heritage is critical, and technical metadata is at the heart of any effective preservation program. He reports the efforts of Rutgers University Libraries, to implement the Audio Engineering Society's (AES) draft “Audio Object” scheme, AES-X098B, to extend it for moving images, align it with existing standards, and integrate it with technical metadata for text, three-dimensional objects, and graphics. Otto compares several existing and emerging technical metadata standards, provides a description and assessment of the AES scheme and concludes with an application profile for several New Jersey repositories.

Cruse and Sandorel (2009) present an introduction to the special issue of library trends journal, which focuses on the ground-breaking efforts of numerous partners, within the Library of Congress National Digital Information Infrastructure and Preservation Program (NDIIPP). NDIIPP has grown from an experimental program, into a true partnership of concerned organizations working together, to sustain access to digital information that is critical to scholarship, and cultural heritage nationwide. Topics include new perspectives on sustainability; preservation of specific types of content, including Web content, cultural heritage and special collections, and the
format and metadata standards to support ingest, management, and migration of
digital content; interoperability, data transfer and storage and the future of digital
preservation systems.

According to Doug, Michael and Noell (2009) increasingly complex programs,
for the collection, study, preservation, storage and display of digital images of cultural
heritage require the integration of large amounts of data. These data ensure the
integrity, identification and persistence of the digital resource. Effective data and
metadata standards, as well as protocols for integrating disparate data sets are crucial.
The Walters Art Museum has addressed these challenges, with two very different
programs for the creation of exemplary digital data-sets: (a) ‘The Digital Palimpsest,’
the result of a 10-year spectral imaging study of the Archimedes Palimpsest, and (b)
‘The Islamic Digital Resource,’ the digitization of the Walters' collection of Islamic
illuminated manuscripts.

According to Habing et al (2009), the National Digital Information Infrastructure
and Preservation Program (NDIIPP), supports the digital preservation efforts of the
Library of Congress, by contributing research and software to help society GET,
SAVE and KEEP its digital cultural heritage. Project activities include building Web
archiving tools, evaluating existing repository software, developing architectures to
enhance existing repositories' interoperability and preservation features, and
modelling next-generation repositories for supporting long-term preservation. The
authors describe the development of the Hub and Spoke (HandS) Tool Suite, built to
help curators of digital objects manage content in multiple repository systems while
preserving valuable preservation metadata.

Hoffman (2009) discusses the digital library program of Illinois called Digital
Past, which was developed in 1998, through a state-funded Illinois Educate and
Automate grant that converted the records of fifteen libraries in the North Suburban
Library System (NSLS), into digitized form. The author notes that the pioneering
libraries digitization techniques had evolved from zip disks, to web entry, to
uploading through OCLC's Contented, content management software.

Middleton (2009) says that the digitization projects that are showcased in this
theme issue are improving access to primary sources that document women's lives in
places as diverse as Italy, Iran, and Muncie, Indiana. Other collections focus on
African American women at the University of Iowa, an underappreciated French American author and the pioneering efforts of women in government and law. The author provides an overview of the content of the collection, noting its historical significance, and the types of materials in the collection.

Rhoads and Neacsu (2009) present the role of the United States law library community in the preservation of digital legal information. Through an online survey of state and academic law library Directors, it was determined that those represented in the sample, recognize that digitally born legal materials are at high risk for loss, yet their own digital preservation projects had primarily focused upon the preservation of digitized print materials, rather than digitally born materials. Digital preservation activities among surveyed libraries have been largely limited by a lack of funding, staffing and expertise; however, these barriers could be overcome by collaboration with other institutions as well as participation in a large-scale regional or national digital preservation movement, which would allow for resource sharing among participants.

Trehub (2009) reports that the Alabama Digital Preservation Network (ADPNet) is a geographically distributed digital preservation network for the state of Alabama, and the first working state wide Private Lots of Copies Keep Stuff Safe (LOCKSS) Network, in the United States. Inspired by Auburn University's experience with another LOCKSS-based initiative, the MetaArchive Cooperative, ADPNet was designed as a low-cost, low-maintenance digital preservation solution for libraries, archives, museums and other cultural heritage organizations in Alabama. It was also designed to be a model for other states and consortia, with an interest in exploring a distributed digital preservation solution.

According to Bell (2008) Canadiana.org is a new independent, non-profit alliance of partners, including Library and Archives Canada, from all parts of Canada's cultural heritage. Research broadcasting and publishing communities, chartered to raise funds, donations and grants received and to act as the overall coordinator and facilitator for digitization initiatives, and related enduring access services, and preservation infrastructures. Working with Library and Archives Canada under the framework of the Canadian Digital Information Strategy, Canadiana.org has a ‘master plan’ to facilitate a coherent national digital information strategy. The community has
developed a bilingual metadata toolkit, to suit most types of material, as an option for those who need it. The community also supports a powerful bilingual public access indexing and discovery portal system, to enhance the search and discovery of local digital collections, of all types, across the country.

Davison and Donahue (2007) report on the digitization of the Acquired Immune Deficiency Syndrome (AIDS) poster collection, of the University of California, at Los Angeles Biomedical Library. The collection consists of 625 AIDS posters, from 44 countries, the posters purchased in August 2004, were issued by a variety of institutions and organizations, to educate and warn people about AIDS, and to offer advice and information in visual form. Some are more blunt and graphic than others, and they come in many styles.

Plumer and Belden (2007) opine that hundreds of Texas institutions hold significant collections that document the cultural heritage of the state and provide significant resources for researchers including students, scholars and genealogists. Unfortunately, search in Google, Yahoo! or other search engines are not likely to find these resources, unless someone else has copied them often without giving the original institutions credit. The Texas Heritage Digitization Initiative (THDI) strives to make the resources from museums, libraries, archives and other institutions more broadly available online. THDI was specifically established to enhance access, to distribute special collections of cultural heritage materials increase collaboration among interested institutions, assist smaller institutions and organizations with digital projects and collaborate on grant-seeking efforts.

Turner (2006) highlights the Library Service and Technology Act (LSTA) grant funded California Local History Digital Resources Project (LHDRP), as a case study of a collaborative state wide program, involving three primary groups: cultural heritage institutions, grant funding agencies, and digital library service providers. The author explores how the infrastructure of the California Digital Library (CDL) is utilized to preserve and promote public access to digitized local history collections, and discusses challenges and technical solutions to integrating heterogeneous resources into METS-based repositories. Project building blocks are also discussed including digital object encoding and transmission tools, scanning services, metadata and imaging standards and training programs.
Cherry (2004) describes North Carolina Exploring Cultural Heritage Online (ECHO) a World Wide Web portal developed as a collaborative undertaking of the state's cultural heritage agencies to provide state wide access to special collections, and a digitization programme, sponsored by the State Library of North Carolina. Details of the portal itself, the role of best practices and standards, continuing education functions, needs assessment, the grant programme, collaboration and decentralization are presented.

According to Arlitsch et al (2003), the J. Willard Marriott Library at Utah University has digitized 30,000 pages from three weekly Utah newspapers, from the period of 1889-1922 and made the collections freely available on the Internet. The authors describe a new method for digitizing historic newspapers developed in a partnership between the University and two commercial organizations. Utilizing optical character recognition (OCR) and newspaper processing technology from iArchives, Inc., and the contented digital collections software suite, the new method recently prototyped by the university presents a viable and affordable digitization method, to cultural heritage institutions nationwide. In particular, the process can be implemented incrementally making it affordable for both small and large collections, and its technology supports many different digital formats not just newspapers.

Chepesiuk (2002) describes the activities of two major US libraries, helping in the work of the preservation of Islamic materials, in libraries and manuscript repositories, in Indonesia and Malaysia. The libraries in question are the Library of Congress, which has a field office in Jakarta, Indonesia and Cornell University Library, which has been carrying out preservation activities in Southeast Asia since 1983.

Bennett and Sandore (2001) have designed a model environment for collaboration on digitization projects, the Digital Cultural Heritage Community Project (DCHC) focusing on digitization of materials from central Illinois museums, archives and libraries, for integration into elementary grades' social science curricula. Support from the Institute of Museum and Library Services' National Leadership Grants, Model Program of Cooperation enabled a group of central Illinois libraries, museums and elementary schools to develop the underpinnings of a new community. Together the participants in this community built a framework for digitizing primary
source materials, on common teaching themes, according to the Illinois Board of Education Learning Standards, and providing free access to those materials, organized through a simple search interface.

Kneale (2000) provides details of the preservation and conservation of neglected library materials at the library of the Joint Astronomy Centre (JAC) in Hilo, Hawaii. Mould found on the books and bound journals were treated with diluted bleach, books were cleaned along with the shelves, book case walls, window sills, desks tables and ceiling vents.

Marilyn (1999) describes the process of digitization of a journal to preserve and provide access to the contents, on the World Wide Web. The journal chosen “The Canadian Architect and Builder” was the only professional architectural journal, published in Canada, before World War I. The original printed version is in an extremely fragile state, and the digital version will provide electronic access to the contents.

Pinckney et al (1995) discuss the issues facing New York State Public Libraries regarding preservation of materials. The authors state that although much research has been conducted regarding preservation in research and academic libraries, very little has been done in public libraries. The study examined the literature for references to preservation methods, control of the library environment, education, organization and government involvement. In order to evaluate current trends and attitudes of these libraries towards preservation, questionnaires were mailed to directors of the central libraries of the New York State Public library systems. The results indicated that New York State public libraries were quite aware of preservation problems, seem to know the issues involved and agreed that preservation of library materials was important, yet they allocated very little of their library budgets to preservation. The problem of acidic paper was perceived as less damaging to collections than other factors, such as book handling, the use of book drops, and unfavourable environmental conditions. The authors also stated that temperature and humidity control was practiced, but mostly for human comfort, rather than for preservation of library materials.
2.9 Role of UNESCO and IFLA in Digitization and Digital Preservation

Ching – Chih (2008) opines on the significance of Global Memory Net (GMNet), and World Heritage Memory Net (WHMNet) to researchers worldwide. GMNet is a multi-year international digital library project, backed by the U.S. National Science Foundation, launched in July 2006 to provide a model global digital library of unique cultural, historical and heritage image collections. It uses Integrated Multimedia Content Retrieval System (I-M-C-S), to furnish fast, effective retrieval and delivery of resources, on indigenous culture and art. WHMNet is another project, made possible through the alliance of the United Nations Educational, Scientific and Cultural Organization’s (UNESCO) World Heritage Center, that uses GMNet's I-M-C-S technology in the provision of its services.

According to Harvey (2007), UNESCO's Memory of the World Programme is one response, to the challenges of preserving cultural heritage. The author describes its activities, indicates its relationship to other large-scale programs, to promote understanding of the importance of preserving heritage, introduces the Australian Memory of the World Program as a case study, and examines some of the issues surrounding the program.

De Lusenet (2007), Mastumura (2004) and Tomiko (2004), have discussed about the UNESCO charter, on the preservation of digital heritage adopted, in October 2003. It is important for affirming the role of national heritage institutions, and extending existing systems for preservation of documentary heritage, to cover digital materials. This approach has distinct advantages, but has also been criticized for taking too narrow a view of the dynamic diversity of the digital environment, particularly as found on the Web. The charter is examined in the context of UNESCO programs on culture, to indicate its relevance for UNESCO's mission and to point to political aspects of digital preservation that cannot be ignored.

Vannini (2004) and Abid (1998) have discussed about Memory of the World Program. Vannini reports that in 1992 UNESCO created the Memory of the World Program. This is an international effort to safeguard documentary heritage that is at risk, to democratize its access and to raise awareness about its importance. The Program recommended the creation of Regional and National Committees to announce its objectives and to identify the documentary collections of relevance at
worldwide, regional, national and local levels. These would be incorporated into the Memory of the World Registers and so facilitate their preservation and access through the most convenient means.

Webb (2003) presents a very brief review of the Draft Charter on the Preservation of the Digital Heritage submitted to the UNESCO. The author focuses on the results of discussions, concerning the draft that took place at the Regional Consultation Meeting for Asia and the Pacific regarding readiness for digital preservation, covering digital publishing; electronic records; audiovisual materials; data collections; digitization; networks; community-based digital heritage; and current arrangements for managing digital resources.

Feather (1996) reviews the preservation of library materials with particular reference to: definition of the problems involved in preservation; media, materials and the environment; preservation of digital information; preservation policies and library use; physical aspects of preservation (library buildings, library materials); management issues involved in preservation; and the experiences of organizations and institutions in preservation, (British Library, IFLA, UNESCO).

Baryla (2009) says the IFLA PAC core programme is dedicated to the preservation and conservation of library and archive heritage. Baryla presents the programme's history, strategic plan, training and information activities, as well as future developments and priority themes - digitisation, sustainable architecture and economic issues. The UNESCO partner programme Memory of the World is also presented in an inset text box.

Koga (2009) reports an overview of the author's experience at the 2009 IFLA Conference held in Milan, Italy. He focuses on the Government Information and Official publications (GIOPS) session, where discussions centred on government information, as cultural heritage, along the lines of the overall conference theme of libraries building on cultural heritage. The author discusses preservation of government information through digitization, including projects in the U.S., China, India and Botswana.
2.10 Digitization and Cultural Heritage

Rieger (2010) opines one of the critical matters is to consider the implications of Large-Scale Digitization Initiatives (LSDIs), for our programs. Although most LSDIs efforts thus far have focused on general collections, it is inevitable that the attention will soon be turned to special collections. With the current networked information environment and increasing reliance on digital content subscriptions, rare manuscript collections increasingly define the uniqueness and character of individual research libraries.

According to Schmidt and Colombo (2009), the digitisation of cultural heritage and linguistics texts has long been troubled by the problem of how to represent overlapping structures, arising from different markup perspectives (‘overlapping hierarchies’), or from different versions of the same work (‘textual variation’). These two problems can be reduced to one by observing that every case of overlapping hierarchies is also a case of textual variation. Overlapping textual structures can be accurately modelled either as a minimally redundant directed graph, or more practically as an ordered list of pairs, each containing a set of versions, and a fragment of text or data.

Conway (2008) describes the technological horns of the dilemma - technology as a potent threat, to the core principles of the library profession, versus technology as an alluring tonic - is brought to attention. The dilemma is most pronounced, in the face of, the wholesale digitization of cultural heritage. The author discusses the impact of mass digitization on preservation and the mitigating factors for preservation leadership.

Giri (2006) says that digitization reduces the gap between the documents, and its users. One of the prominent characters of a digital library is its frankness or openness, in the arrangement of data. Digital information, which is kept in a website, can be equally accessed by all its users. However, the library, which has a long history of existence, cannot digitize all its documents overnight. So each library of excellence has a hybrid nature, in which both the digitized documents are coexisted, with the vast resources of non-digitized documents. The author attempts to know the causes of information hiding in traditional libraries and to find out the solutions through the implementation of digital technology.
Ken (2005) argues in addition to business planning, efforts to build collaborative networks, empower content providers, and engage end-users are central to developing sustainable programs. The author says readers gain a quick overview of some of the key issues that digitization programs face.

Michel (2005) presents issues related to digitization, in the context of the historical role, and purpose of academic special collections. He presents a comparison of current issues related to digitization, to historical issues related to the management of traditional print special collections. Technology has not dramatically altered the role of special collections in academic libraries. He suggests providing non-special collection librarians with a better understanding of, or different perspective, on the popular notion of “digitizing special collections”, and of special collections historically and generally.

Rao (2005) describes the tools and technologies developed for preservation, archiving, replication and dissemination of rare and rich artefacts. Capture model and conversion model, and the hosting model are described. The author notes that the dynamic data entry, “Wizard” preserves the contents by digitization, enters metadata and stores them in a database.

Sharma (2005) discusses the implications of providing digital format of the contents of databases of the journals, articles and abstracts, and explains the purpose of digitization of old, fragile and deteriorating documents of scholarly value, and multidimensional access to information contained in them. The author emphasises the role of professionals, in this new environment.

Alonzo and Roy (2003) explore the essential archival functions of a tribal repository, and address special concerns tribal archivists may face, in managing these unique institutions. Electronic media and the Internet, pose a number of concerns and possibilities for tribal archives, and tribes as a whole. Funding is perhaps the most important factor in supporting digitization projects. There are a number of ways that archives, libraries and museums of tribes can obtain financial support. Funding agencies such as the Institute of Museum and Library Services (IMLS), the National Park Service and the National Historical Publications, and Records Commission, all administer both competitive and non-competitive grants, in support of museums, libraries and archives.
Battisti (2002) deals with evaluating heritage materials and digitizing collections. Contributions are considered and technical solutions adopted to address particular problems when scanning historical documents and manuscripts. Also difficulties encountered when handling very old editions of scientific documents, scanning mathematical reviews, machine-readable manuscripts and automatic detection of document structure when scanning archival registers, provision of metadata and document structure, and scanning archival records in colour.

Mattison (2002) presents select web sites which provide useful sources of information, for digital heritage collections, and other cultural materials, available worldwide. The web sites are the result of the current growing trend for countries to digitize their cultural materials to make them more widely available. In addition to a section devoted to guides and directories, the specific web sites are arranged by country, and cover digital heritage collections in Australia; New Zealand; Austria; Germany; Belgium; France; Ireland; Italy; Netherlands; Portugal; England; and Scotland. Guides to European digital periodicals are included, along with a special section, devoted to digital heritage print collections, and periodicals in Canada.

Reid (2000) describes the challenges of new technologies and advantages of digitization. The Internet offers remote access and digitization programmes but so far, these programmes have concentrated on the digitization of items or of selected primary source materials, and there is also a need for other programmes (‘digital exhibitions’) to be developed, with a greater emphasis on collaboration and interpretation, aimed at the non-academic or casual user.

Fonss (1998) deals with the exciting prospects, but also the problems, when historical archives want to go digital, and implement new technologies in order to improve access to their holdings. He present experiences from recent projects carried out by Aarhus State and University Library, Denmark.

Bearman (1994) reports the impact on the custodians of the cultural heritage of a nation, libraries, archives and museums on the digitization of their resources and the prospect of clients not having to visit the physical site of these resources.
2.11 Digital Preservation

According to Conway (2010) the cultural heritage preservation community, now functions largely within the environment of digital technologies. Preserving Digital Information presented an insightful and visionary framework, for digital preservation in 1996. Preservation in the Age of Large-Scale Digitization, explores the implications for preservation practice of the digitization of books, by implication, our cultural heritage in general. Conway concludes with recommendations and observations, on making difficult choices.

According to Boyle, Eveleigh and Needham (2009) focus on the local authority archives sector and an outcome of collaborative work the Digital Preservation Coalition (DPC) and the National Archives (TNA). They discuss the drivers for the survey, outline the survey findings, and highlight the main themes found from both the survey and a consultative meeting, which took place with representatives from the sector, as a follow-up. The authors conclude with future steps needed to keep the momentum ongoing.

Gill (2009) presents an overview of selected projects that use digital modelling to study or illustrate ancient sites, focusing on new areas of interest, including virtual collaborative environments, online applications used in pedagogical contexts, reconstructions of large-scale spaces, and the digital preservation of cultural heritage sites.

Caplan (2007) states there are differences in the American and European approaches to supporting and organizing preservation initiatives. US institutions would benefit from wider outreach and education efforts. The implications are left to the reader, but may suggest, that more reflection on the goals and strategies of the preservation community is in order. The author identifies a need to develop and support distributed centres of excellence, to promote digital preservation provide expertise to other institutions, and to organize sharing and training opportunities for their constituencies.

According to Clareson (2006), the Northeast Document Conservation Centre, with funding from a National Leadership Grant, from the Institute of Museum and Library Services (IMLS), conducted an online survey in 2005, on digital collection
policies and practices. Although the findings clearly illustrate the growing presence of digitization in libraries, archives and museums, there is a distinct lack of policy, to deal with the preservation of these items, once they are created. Utilizing the results of the email survey, NEDCC convened a colloquium of digitization and digital preservation experts in July 2005, to discuss the digital preservation needs of cultural heritage institutions, and how to begin addressing those needs.

Rajendran, Rajendran and Kanthimathi (2005) discuss that digitization should minimize handling of damaged materials, but the imaging process is demanding and must be done with oversight by preservation staff, and with a high enough level of quality to ensure the reusability of the archival electronic file for as long as possible. The authors also focus on the scope and needs of digital preservation and various types of available preservation methods.

Ram, Malik and Malik (2005) state that large libraries and archives centres, have established proper preservation programs for traditional materials, which include regular allocation of resources for preservation. They suggest incorporating protective measures to arrest worsening of materials, curative measures to restore the usability of selected materials, and the incorporation of preservation needs and requirements, into the overall program planning. The authors represent the challenges of digital preservation to libraries, and some solution for the problem of preservation.

Spence (2005) aims to examine how technology presents both problems and opportunities for the historian, the researcher, small organizations and cultural heritage institutions. Ways of safeguarding historical material in digital form are suggested and the role of cultural heritage bodies, as managers of sustainable digital collections is examined. Lack of funding for the traditional collecting bodies suggests that new mechanisms for dealing with digital archive collections need to be found. Managing digital material from its creation moves responsibility back to owners, but can provide a platform for effective transfer to new custodians, at the appropriate time. The author gives the challenges facing the status quo and sets out some radical ideas concerning the creation, acquisition, management and preservation of digital records, and the roles of the key stakeholders, in the cultural and historical domains.
McDonald (2004) states digital information is exploding, and it is being used for research, scientific, business, industrial, and personal and entertainment purposes. The author notes that to preserve this new way of creating and storing information is extremely important. The author suggests that advocacy in educating the public, designing best-practice policies, and using various preservation techniques is necessary.

Natarajan (2004) argues the need for preserving digital objects and their characteristics are discussed with the preservation requirements and storage considerations. He explains the managerial issues, challenges and the preservation strategies. The managerial aspects of digital preservation and planning requirements are given along with the advantages of digital access, and the problems faced for preservation. The technical issues like intellectual property rights, societal and legal issues, access issues and policies, quality control, financial issues and human resource management etc, are also discussed in detail. Limitations and standards for the digital preservation are given at the end of the article.

Shukla and Chaturvedi (2004) state progressing technologies of Multimedia Messaging System (MMS), has changed the way of presentation of ideas and facts, because of their unique interactive feature. They examine the importance of multimedia as a powerful tool for instructions, and how it has significantly influenced the present process of teaching, learning and presentation in any field. MMS has made it easy to store, organize and disseminate information in digital form.

Glosiene and Manzuch (2003) state the challenges of digital preservations in museums, libraries and archives. They note that political, economical, technological and social changes reveal some consistent tendencies, such as the democratization of the concept of cultural heritage, growing significance of memory institutions as the guards of democracy, cultural diversity and tolerance, and interaction of cultural and economical sectors. However, memory institutions often give a priority to the most visible technological transformations taking place in information society and demonstrate the lack of a strategic approach to digitized and digital heritage management programmes.

Gupta et al (2003) list the challenges for data preservation for information professionals. With recent innovation in networking technology, with its global, and
availability in a downfall in pricing trends, it is possible to create, distribute, access, archive and preserve the information at relatively low cost. The authors describe the data preservation model for a research digital library in terms of principles, selection and challenges faced, during establishment of a digital library. The authors also conclude with some strategies, for digital data preservation.

2.12 Open Source Software

Morrissey (2010) opines that Free and Open Source Software (FOSS) brings many benefits to digital preservation; however, it is not “free.” If the context in which, free and open source software tools are created and employed is examined it becomes clear that: the sustainability of any software (FOSS, custom or commercial) to ensure the preservation of the digital heritage will depend on careful assessment of and provision for the costs (implicit and explicit) entailed, in the production and continued employment of these tools.

2.13 Integrated Access System

Timms (2009) describes one avenue for beneficial and effective collaboration, between the cultural heritage siblings of archives, libraries and museums: by creating integrated access systems. In the digital era, it is easier and more sensible to pool resources to provide streamlined and richer service to the clients of these institutions. Researchers are more likely to care about having access to a resource, than knowing who owns it. The author discusses various options for creating integrated access systems; these include federated searching, metadata aggregation systems, the collection-level description method, and various hybrid systems.

2.14 Digital Archive Information Management

Barratt (2009) examines the impact of the Internet, on archives and archiving activity amongst user groups; and looks at applications that could be shaped to match these trends. The role of the historian will evolve to encompass an interpretation of contemporary and recent evidence, often user generated, as one moves from paper record keeping and document creation, to a digital and online world. The author attempts to provide a discussion on the changing roles of professional historians and archivists, in the twenty-first century, as the Internet makes archived documentation and personal heritage, more widely available on the worldwide web.
Pattuelli (2011) opines on the design requirements and the potential usefulness of a domain-specific ontology, to facilitate access to and use of a collection of digital primary source materials developed by the Library of the University of North Carolina at Chapel Hill. During a three-phase study, an ontology model was designed and evaluated, with the involvement of social studies teachers. The findings revealed that the design of the ontology was appropriate to support the information needs of the teachers, and was perceived as a potentially useful tool to enhance collection access. Pattuelli says that the primary contribution of his study is the introduction of an approach to ontology development that is user-centred and designed, to facilitate access to digital cultural heritage materials.

2.15 Open Archival Information System Model

Spence (2006) has examined the Open Archival Information System (OAIS) model from the perspective of small organizations, and to offer a tentative methodology for the provision of a standard framework, to serve the movement and preservation of digital materials, and associated metadata between organizations, maintaining OAIS compliance throughout. He offers a structured analysis of the ingest function, moving through three scenario-based transfers of digital materials, using Lavoie's economic models for digital preservation to demonstrate the relevance of the function and sub-functions. It also provides a conceptual example, of how the OAIS model can be used in a multiple transfer context, working through three scenarios for one function of the standard. The author addresses the difficulties of practical implementation of the OAIS model, and suggests a way forward for achieving seamless transfer of digital records that can be used by both small donor organizations and larger receiving institutions.

2.16 Standards and Metadata

Murthy (2005) describes the experience of digitization of information from conceptualization, choice of standards and guidelines, co-ordination between information technology experts, and library professionals, to operating the final system. He emphasizes the importance of securing consent for archiving and sharing resources globally from concerned parties. He highlights efforts made to use digital library software in a network environment and the importance of metadata and
vocabulary management tools in accessing, searching and retrieving digital documents.

2.17 Collaborative Digitization Program (CDP)

According to Fisher (2003), the Colorado Digitization Program is an ambitious programme that brings together resources to promote the cultural heritage of the state of Colorado and offers numerous training programmes.

According to Garrison (2001) the Colorado Digitization Project (CDP) began in 1998, and is a collaborative initiative involving Colorado’s archives, historical societies, libraries, and museums. The project is creating a union catalogue of metadata records and has developed tools for the creators of metadata records, the assignment of subject headings and the use of name headings.

According to Allen (2000) and Bishoff (2000) as a state wide collaborative among cultural heritage institutions the Colorado Digitization Project (CDP) is demonstrating how collaboration among libraries, archives, historical societies and museums can support an enhanced digital collection of primary resource material. The project's goal is to increase access to the special collections, and unique resources of the cultural heritage institutions through digitisation. The CDP received a two-year grant from the Institute of Museum and Library Service (IMLS), with the goal of further developing and increasing the amount of digital resources.

2.18 Electronic Resource Preservation and Network Program (ERPANET)

Ross (2004) addresses the challenges caused by digital preservation that poses a major obstacle to the creation of Europe as a dynamic and economically successful knowledge-based society. Electronic Resource Preservation and Network (ERPANET) the European Commission's major activity under the Fifth Framework Programmed of Funding aims to help public and private sector institutions across Europe, to improve their knowledge about digital duration and preservation, and to enhance their practices.

2.19 Digital Preservation and User Behaviour

Frost (2004) discusses some of the user behavioural elements involved in the use of digital preservation reformatting techniques, in the light of guidelines on
reformatting and preservation programmes based on digitization, prepared for the Preservation of Research Library Materials Committee, of the Association of Research Libraries (ARL).

2.20 Digital Preservation and Intellectual Property

According to Vezina (2010), cultural institutions play an invaluable role, in preserving and providing access to elements of the cultural heritage of indigenous peoples and traditional communities. Yet these preservation and promotion activities may sometimes conflict with the intellectual property (IP) rights, and interests of indigenous peoples and traditional communities in their traditional cultural expressions (TCEs). Careful management of these IP rights and interests by cultural institutions including sound and audiovisual archives may help resolve some of the existing tensions and may pave the way for a better understanding of the responsibilities that emerge when dealing with collections of TCEs. The author offers some background information on the World Intellectual Property Organization (WIPO), and its program on TCEs. It then examines the challenges that TCE-holding cultural institutions may face and how the management of IP rights can contribute to overcoming such challenges. Lastly, the author presents the activities of WIPO in the very specific area of traditional cultures, indigenous peoples and IP.

Whalen (2009) discusses intellectual property and licensing issues, with the digitization of special collections in libraries and the fair use law, and whether permission is needed from the rights holders before a library can digitize a document. Whalen also discusses negotiating points and what usage contracts should address.

Johnson (2000) discusses about digitisation and electronic copyright, throughout Europe, and institutions in the cultural heritage sector (libraries, archives, museums and galleries) that have been taking steps towards making available their collections in digital form, for education, research and for the general public. The author describes current and recent research in this area, with particular emphasis on pan-European initiatives, and future directions.

Cornish (1994) states that a legal deposit is an essential element in preservation programmes, but is quite separate from copyright legislation, in most countries. The ability to copy something for preservation is determined by such factors as the age of
the material, its format and the reasons for making the copies. Cornish also say that the different processes of photocopying, microfilming and electronic conversion and all pose specific legal questions, and create difficulties. The author also says that the end product of preservation programmes can themselves be copyright works which need to be protected. The author opines that as the use of electronic media grows, so the legal issues surrounding preservation need to be studied with care.

2.21 Summary

The above review revealed that, there were several studies conducted within countries, on digitization and digital preservation of cultural heritage.

But studies in India and Iran showed there was a lack of research on digital preservation of the cultural heritage. These countries have a rich cultural heritage and need to concentrate on studies regarding digital preservation, and the particular needs of its users. It also demonstrated that some Asian countries, such as Malaysia and Singapore have taken positive good steps towards digital preservation of heritage resources and more studies in this aspect.

As regards countries of Africa, there were still challenges on digital preservation, such as a dearth of human resources, and lack of awareness about the potential of digital preservation.

In European countries, a number of projects like NUMERIC, HUMI, European Commission project, Digital Preservation Europe Project have been taken up, to develop a framework for their heritage resources.

In New Zealand and Australia, they offer digital cultural heritage online, and both National libraries provide National digital heritage to scholars.

In the American scene also, the Library of Congress National Digital Information Infrastructure and Preservation Program (NDIIPP) has grown from an experimental program, to a major source of digital information that is critical to scholarship and cultural heritage nationwide. Organizations like IFLA, UNESCO have also focused on digital preservation of cultural heritage. “Memory of the World Programme” is one of the responses to the challenges of preserving cultural heritage.
The review also showed that, the software mainly used for digital preservation was “Open Source Software” which brought many benefits to digital preservation. Open Archival Information System model (OAIS) offers a tentative methodology for the provision of a standard framework, to serve the movement and preservation of digital materials, and associated metadata between organizations.

Collaborative Digitization Program (CDP) is an ambitious program that brings together resources, to promote the cultural heritage of the state, and to offer numerous other programmes.

Hence, many studies have been done on digital preservation of cultural heritage, in different regions and many organizations have focused on the importance of that. But in India and Iran there were lack of study on this aspect. Therefore, the investigator felt the necessity to study the state of digitization and digital preservation of the heritage collection both in India and Iran, to understand the challenges faced in the select libraries and accessibility of the collections that have been digitized, and the ongoing programmes in this field.