CHAPTER II
LITERATURE REVIEW

2.1 Introduction

The review of relevant literature starts with a compilation of bibliography on the subject of study and states that "The review forms an important chapter in a thesis where its purpose is to provide the background to and justification for the research undertaken".

In this chapter an endeavor has been taken to provide an overview of various aspects and issues of this study through a review of literature. Review of literature is the indispensable component of every research.

As the past, present, and the future are inseparably interrelated and interdependent, the researcher has to be familiar with the research of the past. Only then the researcher will be able to conduct a constructive research and contribute to the existing body of knowledge in a particular field.

Based on this review, following categories have been made on the basis of subject coverage to present the related articles very systematically.

2.2 Digital Library
2.3 E-Content resources
2.4 E-Content Management Systems
2.5 E-Content library hardware and software
2.6 Digital library and E-Content access / Architecture

Omwenga et al (2005)\(^1\) discusses "A Structured E-content Development Framework" Using a Stratified Objectives-Driven Methodology". This study proved that although there is no silver-bullet to process e-content development, the use of the "objective-driven structuring technique" proved to be an effective method that enables logical braking-up and sequencing of the e-content.

Hayes and Maurice (1992)\(^2\) defined good instructional design from the point of view of the learner in their article which presents instructional design that
Instruction should build on what has gone before, in a logical, sequential manner, and should be broken down into small learning units or modules. Then the sequence in the features of good instructional design is outlined as follows: occupational analysis and training needs analysis; establish modules; write objectives; prepare test items; design the instruction, the importance of evaluation and validation as part of the instructional design process is stressed.

Brown A. et.al (2005)\(^3\) discuss the design of e-learning content that it requires understandings in education, multimedia content, resource publication and electronic technologies, that claims to divide the process of designing e-learning content.

The Study by Fox E.A. (1995)\(^4\) shows how to make a better digital library. Very little focus has been on simplifying the process of building a digital library. The importance and challenges of digital libraries have attracted many researchers. Some of the well-known digital library related research areas include classification, interoperability between heterogeneous collections, communication protocols and standards, search engines, information visualization, usability and human computer interaction issues.

In Goncalves M.A. (2002)\(^5\) the author discuss about the digital library which is a complex information system. It is an integration of many application fields of computer science such as information retrieval, databases and hypertext. To build a digital library, many questions need to be answered: what is the specification of the content to be stored; how is that content organized, structured, described and accessed; what kinds of services are offered (e.g., searching, browsing, personalizing, collaborating); how do patrons use those services and interact with each other in the DL environment.

In VennervarBush (1945)\(^6\) the concept of digital libraries was given a clear expression as “a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility.” One might imagine extending the idea, so this device could be operated from a distance, but in the time of Bush, telecommunications were relatively primitive. Since the idea of Memex was
proposed before digital storage technologies, Bush had all the contents on microfilm.

The author Haring D. (1968)\(^7\) believed then that computer-based digital libraries would be faced with operating on two basically different types of data that which is digitally stored and that which is photographically stored in some microfilm.

Bing Wang (1999)\(^8\) presented that the work on formally modeling digital libraries is much less mature than for other information systems. One of the early attempts is Wang’s “hybrid system approach for supporting digital libraries”

According to William saffady (1995)\(^9\): A library that maintains all, or a substantial part, of its collection in computer accessible form as an alternative, supplement, or complement to the conventional printed and microfilm materials that currently dominate library collections. Used in this context, the term "collection" denotes the documents that a library acquires or maintains.

Rabindra K.Mahapatra (2012)\(^10\) examines the status of the digitisation of agricultural libraries in India and the role of the Indian Council of Agricultural Research in developing new digital initiatives in content creation and agricultural digital library management. It elaborates upon the tools and technologies required for agricultural digital libraries management. The study most striking feature of such a digitization procedure is to create digital contents because without creating contents in digital forms, libraries will not be able to provide services in electronic formats. There is no doubt that some advance libraries have started to provide contents in digital formats and taking steps as to how the contents are converted into digital formats and made available on the network, CD-ROM and other services where hypertext format is of utmost use.

The author Rares Vasilescu (2009)\(^11\) discuss an alternative method of storing and managing content aiming at finding solutions for current limitations both in terms of functional and nonfunctional requirements. Content management systems use various strategies to store and manage information. One of the most usual methods encountered in commercial products is to make use of the file system to store the raw content information, while the associated metadata is kept synchronized in a relational database management system. This strategy has its
advantages but we believe it also has significant limitations which should be
addressed and eventually solved.

Nanaji Shewale (2012)\textsuperscript{12} discusses the methodology adapted for its
digital library building. The various processes involved were, Identification of the
vendor, identifying the documents to be scanned or digitised, overall work flow,
preparation of the metadata in excel, converting the data into Dublin Core XML
format and then finally uploading the metadata into DSpace server. Unique feature
of this digital library is the bulk upload of the metadata along with digital data files
of all the digital documents. The GIPE’s digital library uses open source software
DSpace for building its digital repository. Currently, repository holds more than
7500 digital documents.

Ian Rowlands (1999)\textsuperscript{13} presents an approach to a conceptual framework
for understanding the concept of digital libraries. A typology of digital library
research is described, based on Yates’ model of information work, and comprising
three interlinked domains: informational, technological and social. A conceptual
framework for digital libraries, or complex libraries in Walt Crawford’s
terminology, is developed on this basis. The aim of this paper is to use a model for
thinking or, more precisely, for understanding; understanding the meaning and
relations of concepts.

Gerardo Canfora (2002)\textsuperscript{14} discuss a new application of content
management based on a peer-to-peer platform. Several advantages of the peer-to-
peer paradigm within the content management context are discussed, such as the
improved scalability and flexibility of the system and the preserved ownership and
off-line control of content from content creators. In a future release of Content P2P,
in fact, the part of the utility to manage the local repository will be substituted by a
content publishing client that will be able to connect to any server peer of the
Content Group, and remotely access its repository in order to upload or update
content.

In Thomas Kunkelmann (2002)\textsuperscript{15} the author has presented the ongoing
work of integrating new automatic indexing and retrieval systems into a Content
Management System. The integration efforts described here are part of some
European-funded projects with partners from industry, broadcast organizations, and
research institutes. A CMS in the broadcast domain comprises a system that provides functionality for long term preservation of continuous digital media, as well as for annotation, retrieval, and re-use of the content.

Stefan Bergstedt (2003)\textsuperscript{16} focuses on similarities of CMS-Systems and eLearning systems and the possibility to transfer gained experiences from the field of CMS to eLearning systems. This leads to a set of demands that can be made on eLearning systems. The paper concludes with the thesis that transferring the principles of content management systems to the world of eLearning will result in better systems with the improved functionality we already know from current CMS. The basic principles are the separation of structure, content and presentation, an exactly defined workflow management and the management of content in the form of small units, so called assets. This leads to improved quality, better reusability and reduced costs.

Dimitrios Tsesmetzis (2004)\textsuperscript{17} describes that a CMS on the other hand offer this capability, among others. A combination of these two architectures could be obviously very interesting. Peer to Peer (P2P) networks become more and more popular nowadays. They offer the capability of locating and obtaining a file from all over the world very fast. As a result, P2P networks constitute the main cause for the network traffic. Besides their many advantages, these networks suffer from a very strong drawback: authentication-security. The extensive use of peer-to peer applications requires that there be specific mechanisms of certification and security in the system.

Gorrell Cheek (2011)\textsuperscript{18} suggests a prototype of our framework on a popular open source content management system. Most CMS platforms don't have manageable access control mechanisms that regulate third party applications. Unfettered and unchecked access of third party applications is a security vulnerability that puts web sites at risk. We introduce iLayer – an Application Access Control Framework for Content Management Systems. iLayer is a least privilege based model that protects content management systems from third party developed applications. iLayer makes policy recommendations to CMS administrators for third party applications. These policies are reviewed and set by the CMS administrator and enforced by the iLayer Framework.
Ferrari E. (2002)\textsuperscript{19} shows how a Digital Library Authorization System supporting content-based accesses to DL documents. The system also supports flexible specification of authorizations based on the qualifications and characteristics of subjects and varying granularity of authorization objects ranging from sets of library objects to specific portions of objects. This work in several directions. The first deals with content-based access control for images and videos. One of the problems is related to the difficulty of automatic recognition of image and video content. The second is related to extending developed system in order to deal with issues such as copyright, privacy, and integrity that are of critical importance to the DL environment.

Anuradha Iyer (2010)\textsuperscript{20} highlights the secondary data that enable the formation of information architecture and the information delivery mechanisms in digital library. This is a conceptual paper that speaks about various technologies, processes and architectures and functions that govern a digitized library system and Jun- they are integrated to deliver services to the users. The study made in this paper describes the techniques that are applicable to Digital Library System that will make the system not only performance efficient, but also cost effective and would provide increased customer satisfaction. This is a review article exploring different types of architectures and functionalities of digital library designs and their efficiency while integrating the entire architecture and the processes to leverage for the benefit of e-learning.

Indira Koneru (2010)\textsuperscript{21} focuses on how to impart IL instructions using the potential technologies. Among all the available options for imparting IL instructions, Web is preferred owing to its flexible nature to reach out to the target groups wherever they are and whenever they want to access the IL modules. A diligent effort is made to integrate ADDIE, the widely-used instructional design model for designing and developing IL modules. INFOSEEK, the five-faceted model presented under Design Phase provides a content framework for developing IL instructional programmes.

Francis Otto (2007)\textsuperscript{22} suggests a modularized data management model for P2P systems that cleanly separates the functional components, enabling the implementation of various P2P services with specific quality of service requirements
using a common infrastructure besides improving the data management in the P2P system. This model present the potential applications that could exploit the advantages can be provides. This work was to put up a framework that enhances data management capability for P2P systems. This model allows the use of existing algorithms for various modules with differing requirements depending on the requirements of the P2P applications. This model also allows us to put together novel systems using existing components.

Sreekumar M.G. (2005)\textsuperscript{23} expresses Indian Institute of Management Kozhikode's experience in creating a state-of-art digital library information system by seamlessly integrating and aggregating the print as well as the diverse and distributed digital content penetrating into its knowledge domain. The paper highlights significant features of IIMK's digital information system the content aggregation and the content integration strategies we adopted for designing a scholarship Web portal and developing a digital library using the 'Greenstone' open source digital library software. This study also highlights the role of libraries in promoting open access by setting up scholarly institutional repositories (IR). In summary, today's digital library information system is to be seen from a much wider and more holistic perspective, and provided with a much broadened meaning to hold and put together all the print, digital and electronic information available and accessible to the library.

Su-Hsien Huang (2005)\textsuperscript{24} discusses a content and service inference model (CSIM) to derive 15 relationships between content and services, and defines functions to manipulate these relationships. Adding the manipulation functions to query predicates facilitates the description of structural semantics of digital library content. Moreover, in search for digital library services, inferences concerning CSIM relationships can be made to reuse digital library service components. Highly promising with experimental results demonstrates that CSIM outperforms the conventional keyword-based method in both content and service queries. Applying CSIM in digital library significantly improves semantic queries and alleviates the administrative load when developing novel digital library services such as digital library query interface, library resource-planning and virtual union catalog system.
Ling Feng (2005)\(^{25}\) presented a two-layered digital library model. The aim is to enhance current digital libraries to support different levels of human cognitive acts, thus enabling new kinds of knowledge exchange among library users. The low layer of the model, namely, the tactical cognition support layer, provides users with requested relevant documents, as searching and browsing do. The upper layer of the model, namely, the strategic cognition support layer, not only provides users with relevant documents but also directly and intelligently answers users' cognitive questions. On the basis of this model divide the digital library information space into two subspaces, i.e., a knowledge subspace and a document subspace. The major contributions of the paper are twofold. First, the presented digital library information space extends the traditional role of digital libraries from information provider to information and knowledge provider. Second, the traditional simple keyword-based index schema is expanded to the strategic knowledge-based level, consisting of inter-related hypotheses that are backed by documents.

Kenneth Lavender (2005)\(^{26}\) examines the differences between questions asked electronically of traditional reference services and those asked of special collections services; it further explores how a better understanding of digital reference in special collections will facilitate the development of the tools and models needed to create a bridge between digital human intermediation at general academic libraries, special collections, and museums. The goal of this paper was to gain a better understanding of the types of users of and questions submitted to a special collections department. As special collections are similar in structure to museums, this understanding will allow developers of systems for digital reference services to create more robust systems that can encompass the needs of libraries and museums. The overall findings of this study are that users of special collections have much more specific information needs than users of general reference services; these needs are so specific, in fact, that general reference desks would not be able to successfully answer many of the questions.

San-Yih Hwang (2010)\(^{27}\) attempted to tackle the problem of automatic index construction for multimedia objects by employing Web usage logs and limited keywords pertaining to multimedia objects. The tests of two proposed algorithms use two different data sets with different amounts of textual information. Web usage
logs offer precious information for building indexes of multimedia digital libraries with limited textual information. The proposed methods generally yield better indexes, especially for the artwork data set. In this article, addressed the problem of index construction for multimedia digital libraries by developing two index construction methods, MCAT and MCLU. These two methods employ primitive keywords and usage data to develop an index. The empirical experiments reveal that compared with traditional content-based clustering methods, our methods, when applied to digital libraries with limited textual data, generate indexes that exhibit better content and usage entropies. For digital libraries with rich textual information, our methods offer better usage entropy, though at the cost of slightly worse content entropy.

Ushamujoo-Munshi (2003)\textsuperscript{28} explains various elements that have contributed to providing services in the changing information seeking patterns of users in the electronic environment, and the building of digital resource bases, while facilitating others to get involved in digital content creation activities. It is hoped that such endeavors shall help in the building up of a national digital knowledge resource base for the country, and INSA would in the process act as a facilitator. This study will be of immense help for determining particulars before initiating a project. This will also help overcome the bottlenecks that agencies have encountered during and before the execution of the digitization projects.

Giannis Tsakonas (2008)\textsuperscript{29} explores the concepts of usefulness and usability in the evaluation of an e-print archive. The results demonstrate that several attributes of usefulness, such as the level and the relevance of information, and usability, such as easiness of use and learn ability, as well as functionalities commonly met in these systems, affect user interaction and satisfaction. In this study a theoretical model for digital library evaluation was applied to assess the usefulness and usability of an open access digital library and it was attempted to demonstrate the significant content and system attributes and how they affect user interaction and satisfaction. These attributes request research attention and in depth analysis on each one will reveal more details and contribute to the overall evaluation of digital libraries.
Daniel G. Dorner (2004)\textsuperscript{30} observed that while the actual responsibilities of respondents varied, the levels of responsibility and time spent on activities related to digital resources have generally increased compared to 5 years ago, and those for non digital resources either have increased marginally, stayed the same, or gone down. Strong increases in consortia-related work featured prominently in the survey. This article reports on a research project that used four focus groups and a Web-based survey to determine the impact of digital information resources on the roles of collection managers in research libraries in five major countries.

Namkee Park (2009)\textsuperscript{31} examined the factors that influence people's adoption and use of a digital library system and tests the applicability of the Technology Acceptance Model (TAM) in the context of developing countries. The current study suggests that external variables that affect perceived ease of use and usefulness need to be considered as important factors in the process of designing, implementing, and operating digital library systems. Such consideration will help decrease the mismatch between system design and local users' realities, and further facilitate the successful adoption of digital library systems in developing countries. This study investigated the factors that influence behavioral intention to use a digital library system in different developing countries through the TAM framework developed by Davis (1986). The findings generally supported the hypotheses derived from the model as well as earlier empirical studies.

Elena Renda M. (2005)\textsuperscript{32} discussed a digital library not only as an information resource where users may submit queries to satisfy their daily information need, but also as a collaborative working and meeting space of people sharing common interests. Indeed, we will present a personalized collaborative digital library environment, where users may organize the information space according to their own subjective view, may build communities, may become aware of each other, may exchange information and knowledge with other users, and may get recommendations based on preference patterns of users. This study formalized a personalized collaborative digital library environment in which the user functionality may be organized into four categories: users may (i) search for information; (ii) organize the information space (iii) collaborate with other users sharing similar interests; and (iv) get recommendations.
Jin Ma (2006) introduced the six steps of metadata implementation for digital projects at the Pennsylvania State (Penn State) University Libraries: analyzing metadata requirements, adopting metadata schemes, creating metadata content, delivery and access, evaluation of metadata, and sustaining metadata maintenance. An array of technical, managerial, and organizational questions and issues of metadata implementation are discussed in the context of digital initiatives. This study proposes a coordinated metadata management approach based upon Penn State's experiences and best practices. The scope of metadata implementation in this article is within digital projects, the author hopes the principles and guidelines can be applied to metadata implementations in other areas such as metadata for a Web content management system, and metadata for institutional repositories.

Siddamallaiah H.S. (2010) discussed three components of libraries, web, and content in digital environment. It is important to create context by connecting various content; create connectedness through content and context; whereas librarians work to achieve both using 'science of librarianship' including creation of users-profile, filtering information for relevance, add values by creating context for the content and linking/access. The value proposition of web users is to make them understand (why and what of content) to improve understanding, connectivity and effectiveness in web based environment, and content acquisition including tools and spaces. Web 4.0 is projected as web OS with built-in intelligence to act parallel to human brain, including the semantics of social connections and mind enhancement technologies.

Laleci G.B. (2010) shows how a content management systems can be supported through a backend knowledge-base to semantically enhance the content annotation and discovery by also addressing. The developed tool which first semi-automatically explicate the content repository semantics to a knowledge-base and establish semantic bridges between this backend knowledge-base and the content repository. The repository content is dynamic to be able to maintain the content repository semantics while new content is created, the changes in the repository semantics are reflected onto the knowledge-base through the semantic bridges. The tool set is complemented with search engines that make use of the explicated semantics.
Rodrygo L.T. Santos (2008)\textsuperscript{36} suggested a framework for building digital libraries according to a componentized approach. The framework is divided in three layers: the data repository, the Web services, and the client. This architecture allows the distribution of the digital library components, which, by itself, leads to a greater flexibility of the system. Moreover, the use of Web services facilitates interoperability and standardized access to the system data, by human or machine users. The framework is accompanied by a wizard-like tool that implements a workflow process, driving the designer along the configuration of the framework. The framework and the configuration tool are evaluated in terms of several performance and usability criteria.

Sampath Kumar B.T. (2009)\textsuperscript{37} discussed to analyze and compare the contents and usability of six Indian Institute Management library Web sites and presents conclusions regarding the basic functions they perform. Library Web sites were evaluated according to a detailed checklist prepared specially for this purpose. Based on the findings of the study, in this section an attempt has been made to suggest a good recommendations, which will help to creator or designer of the Website to make library Website more interactive, attractive and workable. It will also be helpful to the user of the library Web site to evaluate its content, quality of information, design, structure, and organization of information. The present study made the following recommendations for improvement of library Websites.

Vijayakumar M. (2009)\textsuperscript{38} pointed out to determine the information content on the library web portals of IIT’s in India for better accessibility. It is observed from the present study that all the library portals of Indian Institutes of Technology are different from one another in many respects. IIT’s are identified as premier institutes of higher education and research in Technology in India. There is necessity that these portals must display detailed information, so as to know about the collection and services of these libraries online.

Mohamed Haneefa K. (2010)\textsuperscript{39} implicates to provide an overview of the contents and design of the online English newspapers in India. Twelve online English newspapers published daily in India were selected for the study. The study used website content analysis to assess the contents and design of these newspapers. A checklist was developed as the main tool for data collection and Microsoft Excel
was used as the tool for data analysis. The study shows that online English newspapers in India have a common pattern of contents, coverage, and design. Contents availability and access to the contents are the most prevalent options in these newspapers. Majority of the newspapers use Blog, RSS and Face book to connect with their readers. Web 2.0 technologies to engage readers. Online newspapers in India can exploit e-mail, blogs, RSS, web postings, live chat rooms, online polls and surveys, discussion forums, etc. to engage their readers. These tools and utilities will provide interactive communication, in the way to make the online newspapers a public sphere of discussion. E-mail can be used as easiest way of interpersonal communication between journalists and readers.

Simone Marinai (2004) observed a system that developed in order to retrieve information from digitized books and journals belonging to digital libraries. The main feature of the system is the ability of combining two principal retrieval strategies in several ways. The first strategy allows a user to find pages with a layout similar to a query page. The second strategy is used in order to retrieve words in the collection matching a user-defined query, without performing OCR. The combination of these basic strategies allows users to retrieve meaningful pages with a low effort during the indexing phase. The experimental results are made on 1287 pages and show the effectiveness of the integrated retrieval.

Maria Grigoriadou (2006) investigated the process of educationally meaningful content for personalized learning. To this end, the skills that authors of an Adaptive Educational Hypermedia system need to develop are also investigated. a paradigm of interactive content developed for INSPIRE, is described. Lastly, the authoring system developed to support different types of users, such as educators and learners, in authoring personalized content for INSPIRE, is presented. The design of the authoring system of INSPIRE was based on several researches in which learners studying AEH and educators were asked to develop content for INSPIRE following specific guidelines. Currently, the evaluation of the authoring tool of INSPIRE is on progress. In the near future we also intend to elaborate on involving learners in the content authoring and evaluation process. Moreover, we plan to extend the authoring tool functionalities to the adaptive dimension of INSPIRE.
Jeffrey Pomerantz (2006)\textsuperscript{42} highlighted on digital library-related topics from several corpora was performed, to identify the areas in which more and less work has already been performed on these topics; this analysis will guide the initial stages of this curriculum development. The work of graduates of those schools, as well as those connected with the annual JCDL-connected Doctoral Seminar, will yield benefits very quickly in the development and management of DLs and the provision of DL services. More broadly, this effort should help advance the DL area by ensuring a firm foundation and basis of understanding for all involved in learning, teaching, and R&D.

Badariah Solemon (2006)\textsuperscript{43} aims at building an updated and competitive solution by incorporating various administration and management facilities, appealing user interfaces and innovative and/or state-or-the-art methodologies to implement reusability, portability, and scalability. The prototype of the system is yet to be developed tentatively by benchmarking and leveraging the Macromedia MX Studio, ColdFusion MX and Flash Communication Server products. Current studies also have been done on a few languages such as ASP, PHP- Hypertext Preprocessor for the scripting language and MySQL for the database. In the future, we hope that RE-COMS will be able to cater and support the teaching and learning activities in UNITEN and other institutions.

Savan K.Patel (2011)\textsuperscript{44} shares his opinion comparing and mentioned CMS by Goggle page rank, their documentation support, their popularity, installation survey and many more. As open source CMS has its own advantages but out of so many only few like Joomla, Drupal, WordPress are popular in the market because of good functionality and support. This dynamic system clearly has numerous advantages over the more usual static website.

Ramakrishna (2009)\textsuperscript{45} says that digital library provides users a single window access to structured information from their desktop. A physical digital library has been created to enable access to different categories of documents such as journal articles, conference proceedings, standards, e-books etc., downloaded or purchased; access is free round the clock to in-house users.

Khoo (2009)\textsuperscript{46} discusses that digital library systems require evaluation for many reasons, such as supporting funding and sustainability and to give
feedback to digital librarians and digital library management on ongoing library operations. Available academic evaluation techniques may be high effort and seek higher levels of confidence and deeper claims than are needed or appropriate. Lightweight evaluation methods can therefore play an important role in digital library research.

Blasi (2009)\(^47\) analyzed that the digital libraries along two exclusive directions a) digitization and preservation of historical materials and b) creation of digital repositories and other digital services in universities. All theoretical and institutional efforts are oriented towards these two areas of interest. Libraries instead whose users are less interested in scientific articles and ancient manuscript or books.

Hakala (2009)\(^48\) focused on the digital library as a place that enhances informational and cultural heritage, where collections are digitally managed, preserved and are accessible by computers. The traditional metadata system that has served these functions well so far is about to become antiquated, since it lacks the ability to store certain important electronic data.

Tjondronegoro and Spink (2008)\(^49\) described the rapid advances of information technologies have allowed for the inclusion of vast amounts of electronic information in digital libraries. This electronic information initially was primarily text based, but it has expanded to include graphics, animation, audio, video and interactive media. Thus, the ability to help users easily, efficiently and conveniently retrieve multimedia information from the vast array available presents both an opportunity and a challenge for modern digital libraries.

Lor (2008)\(^50\) discusses the different types of digital libraries are identified and challenges in selection, acquisition, organization, preservation, resource discovery and access. Technological factors are not the main issue to be addressed. Rather, it is emphasized that political and economic challenges require attention. A rational and holistic discipline of digital resources management is needed to ensure that digital content can be handed down to posterity.

Bearman (2007)\(^51\) explains that the digital library developments in India began rather slowly in mid, 1990s and have gathered momentum at the turn of the century. Libraries of S & T organizations have developed a number of digital library initiatives. This may have to do with the fact that S & T libraries have greater
economic and human resources by far to undertake digitization programmes. Even in the library automation era, it was the S & T libraries that took the lead in computerization activities.

Goncalves et.al (2007)\textsuperscript{52} suggests that a model that is deeply grounded in a formal framework for digital libraries: 5S (Streams, Structures, Spaces, Scenarios, and Societies). For each major DL concept in the framework we formally define a number of dimensions of quality and propose a set of numerical indicators for those quality dimensions. In particular, we consider key concepts of a minimal DL: catalog, collection, digital object, metadata specification, repository and services.

Cabral Vargas (2006)\textsuperscript{53} explores that the digital library and proposes some guidelines as a starting point toward user satisfaction in digital information services. Digital libraries belong in the learning environment, with emphasis on learning and content, so that users learn something new. No pretence is made to deal with this issue in an exhaustive manner or to define concepts, but to establish a relationship between the two.

According to Gupta and Singh (2006)\textsuperscript{54} the digital library is conceptualized as local view that would have the same design as the web page of the library and offers a localized view of the digital library not extending the access to databases for which a specific library may not subscribe to. Such a library is not restricted to linear, print like documents and hence, may also be able to be accessed for different electronic media on different servers from one single entry point. The access to digital Library should be platform independent which could be accessed from any part of the world.

According to Kani-Zabihi (2006)\textsuperscript{55} the digital libraries, their requirements with respect to specific features may change. Involving users in digital library design should be an integral step in the process of building a digital library, in addition to the classic roles of evaluation and testing experts. Digital library design from a new perspective, giving users an opportunity to express their suggestions on future functionality and features of digital libraries.

Chowdhury (2006)\textsuperscript{56} point out the various technical aspects of digital library design (e.g. architecture, interfaces and search tools), there are a number of usability issues such as globalization, localization, language, culture issues, content
and human information behavior. Digital libraries are evaluated primarily with respect to their target users, applications and contexts. Although a digital library evaluation study may have several objectives, ranging from the evaluation of its design and architecture to the evaluation of its usability and its impact on the target users.

Shukla (2005) further discusses content creation as a new trend in IT and stresses the need to develop digital libraries and not digital collections. The author emphasizes that care should be taken to surround collections with appropriate metadata supplying context and interpretation to develop synergy.

Fast and Sedig (2005) emphasize that the reconceptualisation of digital libraries as interactive knowledge environments calls for applying information visualization techniques to bring about the transformative changes.

Bhattacharya (2004) discussed the development of digital libraries with respect to India and concluded that India’s attempt towards digital library development has been sporadic and partial.

Krishnamurthy (2004) focus the overview of digital libraries describing the Digital Library Initiative – Phase I and Digital Library Initiative – Phase II projects. He also touches upon research issues involved in digital libraries such as interoperability, collection development and management, preservation, cataloguing and indexing and reference services.

Many institutions and universities in developing countries experience great difficulties in accessing bibliographic resources. Witten (2004) discusses that digital libraries show up as an opportunity to resolve such problems, providing access to the most recent publications in a quick and reliable manner.

Harton et al. (2004) examined the analysis of the evaluation raised numerous problems found in evaluating digital libraries. A lack of research was highlighted in techniques to effectively evaluate digital libraries along with the issue that they as usability specialists do not have extensive knowledge and experience with digital libraries and can only evaluate using general guidelines established for systems, highlighting the research requirement for a usability evaluation technique specific to digital library evaluation.
Thong (2004)\textsuperscript{63} investigated to make effective users adaptations, research must involve finding out what the potential users already know, what their misconception and problems might be and what they would be interested to do and learn in a digital library environment. In order to increase the acceptance and relevance of a digital library contents to user’s needs, researchers should concentrate on user requirement analysis to discover expectations and content demands to incorporate into a digital library.

Jeevan (2004)\textsuperscript{64} attempted to find out the digital library development should be taken up as an additional task to populate the web sites with valuable in-house content like the research reports, publications of in-house researchers and so on. Digital library projects and developments in the country are so many, though a large number of them are only at an aggressively enthusiastic preliminary stage. Especially in developing countries, is a coordinated collaborative approach to bring in institutions and identifying content valuable for digitisation with sufficient monetary and infrastructure support.

Zaphiris et al. (2004)\textsuperscript{65} explore the application of information visualization in digital libraries and identify three key tasks in digital libraries, namely searching, browsing and navigation to which information visualization can make a contribution.

Fox and Urs (2002)\textsuperscript{66} says that the digital libraries are becoming the main repository library and information centers and as a result the design of user friendly interfaces to access, understand and manager digital library content has become an active and challenging field of study.

In an elaborate study of Witten et. al (2001)\textsuperscript{67} digital libraries give the ICT professionals a great opportunity in reversing the gap created by the ICT in these countries on the other hand, digital libraries have particular relevance in developing countries, since the traditional publishing and distribution mechanisms have failed tragically.

McCray and Gallagher (2001)\textsuperscript{68} gives an overview of issues concerning HCI, Usability and Accessibility of digital libraries. The system must be accessible to the vast majority of users regardless of disability, language or cultural differences.
The information should be easy to find using keyword searching. The interface should be intuitive with the keyword search easy to find as well as the ability to browse topics. Information should be optimised so that the retrieval of information is quick. Good indexing is vital so that the search terms can be well matched in results and results found quickly.

Sadagopan (2000)\textsuperscript{69} analysed that the availability of information at the fingertips but questions, where is knowledge. Digital libraries in the Indian context are discussed and highlights the opportunities available to library scientists for creating and accessing content in Indian languages.

Chen and Houston (1999)\textsuperscript{70} emphasise the four components that should reside in the digital library such as “Creating digital library content”, “Including and filtering information”, “Supporting universal access” and “Preservation”.

McDonough and Jimenez (2007)\textsuperscript{71} reviewed that the digital library community is increasingly concerned with long term preservation of digital materials. This concern presents an opportunity for strategic alliances between digital library units and preservation departments confronting the difficulties inherent in preservation reformatting of moving image materials. However, successful collaboration between digital library and preservation departments may require adjustments to the work practices of each group, including their creation and management of metadata and their definition of acceptable practice with respect to preservation reformatting.

Nagatsu and Kando (2006)\textsuperscript{72} explores the digitalization of information sources such as books or audio/visual media of the library holdings is an activity undertaken by many developers of digital library. Many of the digital content created by the developers are made available as part of the Web. The volume and types of digital content are rapidly increasing now. The development of information technology such as Internet and Web is affecting the activities of traditional library.

Schmetzke (2005)\textsuperscript{73} examined that the formatting and implementing policies to ensure barrier free access to all online resources to remedy the present situation in which librarians seem to neglect the question of accessibility when procuring databases or designing digitization projects. Describes how a web
accessibility task force at created a new online accessibility policy and the benefits which resulted from its implementation.

Mittal and Mahesh (2008)\textsuperscript{74} examines the digital libraries and repositories were explored to study their collections. Use of open source software especially for the creation of institutional repositories is found to be common. However, major digital library initiatives such as the digital library of India use custom made software. The collection size in most digital libraries and repositories is in a few hundreds.

DeRidder (2007)\textsuperscript{75} states that the software for digital libraries impacts usability, interoperability, support costs and the ability to migrate materials over time. Intelligent selection requires careful assessment of internal needs and resources, as well as careful assessment of the options. Other considerations may be preferences related to the goals of your library, such as support of metadata standards, interoperability with other systems and additional functionality.

Zargarayan (2007)\textsuperscript{76} suggest that the history of library automation, from its beginnings and describes the evolution and challenges faced by the library community on its difficult way to digitisation. The history of automation and computerisation of libraries has developed through 15 years a short time as measured by humans. An independent state faced a political and economic crisis, moved from a centralised economy management system to a market based economy. Libraries are also in a renovation and cardinal reconstruction process.

Weber (2006)\textsuperscript{77} suggested that the digital library software is facilitating the task of creating a digital library, once the preserve of big research libraries with large staffs and budgets, and providing the means by which smaller libraries can produce "do it yourself" digital libraries. Many of the commercial digital library software products were designed to provide other functions, such as blogs and content management systems, but which were found to be capable of being extended and adapted for use in producing digital libraries.

Fox (2006)\textsuperscript{78} discusses the open access publishing and open standards for metadata and protocols, they take a more active role in the testing and development of open source software. The open initiatives are motivation for libraries to be more
actively involved in the open source movement as an extension of traditional librarianship and as an enhancement to the digital projects and services.

Innocenti (2010) discussed an interoperability is a property referring to the ability of systems and organisations to work together. Today interoperability is recognized as a key step in the shift from isolated digital libraries toward a common information space that will allow users to browse through different digital libraries within a single integrated environment.

He, et.al (2010) explains the digital library technologies have powerful and flexible content management and access functionalities, whereas ontology helps teachers and students to link content materials to their learning objectives.

Bainbridge (2003) says that, the digital Libraries have received wide attention in the recent years allowing access to digital information from anywhere across the world. They have become widely accepted and even preferred information sources in areas of education, science and others. The rapid growth of internet and the increasing interest in development of digital library related technologies and collections helped accelerate the digitisation of printed documents in the past few years.

Gaur (2003) discussed the present state of digitisation in Indian management libraries focuses more on library automation and its facets rather than on digitisation or digital libraries.

Anne (2008) described the need for rethinking resource sharing to offer both library users and non-library users options to obtain the material they seek from both libraries and commercial sources.

Baruchson-Arib and Bronstein (2004) reported a Delphi study conducted in Israel during 1998-2000 to examine the views of library science experts regarding the future of library science profession and the skills of library science professionals due to developments in information technology. 40 experts participated in the study through e-mail. The questionnaire includes three main issues: traditional versus virtual library model, user-centered approach, and library professional’s skills and roles. A highly optimistic picture of the library science profession is drawn from the study. Library and information centers will survive, and both traditional and virtual model will co-exist in a symbiotic relationship. The
most salient skill the library professional is to acquire is the training role and act as
guides in information technology related issues. The LIS professionals need to
promote and market their skills and thereby acquire necessary social and
communication skills.

Bawden D., et.al (2005)\textsuperscript{85} approached to know about the education and
training of librarians for working in digital libraries and identify the important
competencies required by information professionals in creating and managing digital
libraries. The method used is literature analysis of the skill sets required by
librarians working with digital materials and evaluation of formal education and
professional development Programmes in the UK and in Slovenia. The study
assesses how the educational needs are met; the means by which competencies are
treated in LIS education and training, and the methods of developing the information
professions. Their findings show that formal education and continuing development
training cover aspects of the digital library environment, both in the UK and in
Slovenia. Curriculum development includes redesign of degree Programmes,
training courses and Digital library skills.

Bradley (2006)\textsuperscript{86} explores about various barriers and motivators for new
professionals who write for the professional literature. Authors from the ALIA New
Librarians' Symposium held in December 2006 in Sydney, Australia were surveyed
about their experiences of writing and presenting early in their career. Majority of
respondents would like to improve their research, writing and presenting skills.
There is a strong interest amongst new professionals to write and publish, as found
in the survey. They are motivated to make an impact on the profession and to
develop their own careers. However there remain many varied barriers, and a lack of
support structures to develop skills after graduating from library and information
qualifications. Encouraging the new library professionals to report on their
professional practice and providing the support for them to do so will be to the
benefit of their peers who will have greater access to knowledge about activities and
innovations in other libraries.

Breen et.al (2002)\textsuperscript{87} evaluated regarding the traditional library skills with
respect to information technology development in the workplace. It revealed that if
LIS courses are not re- oriented most jobs could have been missed by the library
professionals. The survey of this study established the extent to which the curricula of current information studies in the departments teach the relevant skills. It also assessed that there should be two courses under LIS one for employment in library sector, and other for information management. Authors pointed out that LIS courses must be adapted to provide professionals with the necessary skills to take new role in their working place.

Charlotte (2001)\textsuperscript{88} examined the background and general principles of resource sharing in engineering and science libraries and provides an understanding of the collections, electronic access, user expectations, and resource sharing necessary to meet the information needs of library clients.

Cibbarelli Pamela (1999)\textsuperscript{89} have discussed selection of library automation software is facilitated by knowing which products are designed for a specific type of library and by knowing how many other librarians have come to the conclusion that a particular product is the best product for automating their library. Overviews this information for the best-selling integrated online library systems (IOLS) products in the U.S. Presents a series of charts designed to provide a multi-year perspective on the percentage of market share for the major vendors of IOLS products in the academic, public, special, school, and consortia library market segments. Proceeding Published by Information Today, Inc., Medford, NJ.

Eells and Jaguszewski (2005)\textsuperscript{90} in the study of a task force of the University of Minnesota libraries, revealed that a list of core information technology (IT) skills that could be expected of all 300 staff including technical services, reference services and stacks maintenance. Once this list was developed, the task force designed and administered an online self-assessment survey to identify the computer skills of library staff. In the study the development of the core competencies and the administration of the assessment are discussed. Authors point out some recommendations for the future, including use of assessment reports and data gathered in the process to develop a training and professional development curriculum focused on the specific identified training needs of staff.

Hoskins (2005)\textsuperscript{91} investigates the ICT knowledge and skills of subject librarians at the university libraries of KwaZulu-Natal. A study population of 43 subject librarians, in the university libraries were surveyed by means of a mailed
questionnaire to establish in what ways subject librarians were using ICTs, what the level of ICT knowledge and skill was amongst the subject librarians, what problems the subject librarians faced in the use of ICTs and what their ICT training needs were. Interpretation of the results revealed a low level of ICT knowledge and skill amongst subject librarians and a general lack of formal training for ICTs amongst the subject librarians. The findings of the study showed that subject librarians generally do not have the knowledge to explore and take advantage of the opportunities technology creates, nor did they have the skill or ability to perform the applications functions and operations described above effectively. By identifying the problems that subject librarians face in the use of ICT, it is evident from the findings that the majority of these problems were as a result of a lack of understanding, knowledge, skill, and a lack of training. The author suggests that Library schools should provide a curriculum that is balanced so that it provides for an education in traditional librarianship as well as ICT knowledge.

Oak and et.al (2005) have discussed the implementation of 'e-Granthalaya' software (s/w) in the State/City/ District Central Libraries (SCL/CCL/DCL), in the State of Karnataka, by the National Informatics Centre (NIC), Bangalore. This package is developed in co-ordination with the Director of Public Libraries, Karnataka. The s/w package has also been implemented in other States -- Gujarat, Delhi, Lakshadweep, Chandigarh, West Bengal, Orissa, etc. The Package provides bilingual (one Indian language and English) and also multilingual (two or more Indian languages and English) support for data storage and retrieval.

Rai N.Kumar S. (2011) has discussed the progress of library management software and to trace out the characteristics and trends of software with special reference to packages that provide either web interface for some of their modules or total web-based solutions for all management modules. The paper also seeks to compare services and facilities and technologies incorporated in library automation packages. The paper reports on a survey of software vendors in Delhi, India, aimed at knowing about the different features of the six software packages selected for this study. Data were collected by means of a questionnaire that was circulated among the software vendors.
Ramesh Babu, Vinayagamoorthy and Gopalakishnan (2007) in their study report made through a survey of the ICT skills among librarians in engineering educational institutions in Tamil Nadu. The main objective of the study was to identify the types of ICT skills possessed by the librarians; assess the level/extent of different types of ICT skills, the means of acquiring ICT skills, and identify the constraints in acquiring ICT skills by the librarians. The knowledge in ICT relates to operating systems, packages and programming languages, library automation software, web awareness, "knowledge of online facilities/services, and also technical skills and managerial skills. The results show that the librarians of these institutions are acquiring considerable basic skills in ICT. However, they need to concentrate more on network-based services and digital library services.

Sonker and et.al (2003) have discussed the explosion of computer and communication technologies have affected nearly all aspects of human life, including libraries. In the information era, library professionals are applying advanced technologies and automating their services to enable user communities to get the right information at the right time. Several commercial library automation packages are now available, but their cost is often beyond the reach of most libraries, especially school and college libraries. The study suggests KOHA, the first open-source library automation package, which can be downloaded freely and also discussed different features supported by KOHA.

Venkatramana (2003) conducted a survey to evaluate the hardware, software, network facilities and status of library automation in central university libraries of India. The study concluded that IT has been deeply embedded in these libraries and the trend will continue in future.

Zhang (2004) used a questionnaire to assess and identify areas of training and development of library support staff in selected academic libraries in Oklahoma and Kansas. Questions include opinions on the importance of training topics on computer skills, interpersonal skills, and supervision/management skills that they perceive as important to their job and the importance of library/organizational supports that encourage them to participate in training and development. It is seen that support staff highly rated computer skills like web browsers, MS Office Suites (e.g., word processing, spreadsheet, etc.), e-mail
management etc that help their job and oral/written communication, working with difficult people, managing priorities etc as important training topics on interpersonal skills.

Gulati (2004)\textsuperscript{98} Studied the Indian scenario on the use of ICT infrastructure in libraries and information centers depicts that special libraries are better equipped and are involved in consortia and digitization programmes in the country.

Ambati et. al (2005)\textsuperscript{99} Explains to find out the digitized content returned from the contractors and approves for uploading and hosting on the web. They perform the check for duplicates, improper scans, damaged pages, missing pages, file formats and a few other parameters to ensure that the quality standards defined in the DLI are met. Administrative issues regarding the decision making of the undefined errors found in the digitized books and content is also made by this team. The team also ensures the process is carried out in the defined manner and performs process audits for applying the improvement strategies.

Bradley (2007)\textsuperscript{100} indicated that it is not possible to preserve digital information without a sustainable organizational, economic, social, structural, and technical infrastructure, nor is it sensible to preserve material without sustained value.

Varathan and Chandrashekara (2007)\textsuperscript{101} Discussed about how the digitisation plays an important role in preserving and disseminating knowledge in art and culture, education, science and technology, literature and humanities, media and entertainment, cultural heritage, and history. In India, a substantial number of libraries and information centres have initiated digital library activities.

Kowal (2010)\textsuperscript{102} highlights the creating access to cartographic images via digitisation, and maintaining the integrity and authenticity of the digital objects and associated metadata, is a current preoccupation of map curators. Format specific information about the complete digitisation process can aid in planning for scanning projects to ensure reliable access, active management and long term preservation. The outcome is a unique application of existing library standards and systems and
illustrates an alternative to project specific software programs or web pages for managing and providing access to digitised collection materials.

Amberg (2010)\textsuperscript{103} explains that the digitisation is viewed as "reproduction" according to copyright terminology, because digitisation is nothing but transforming analogue works into digital ones, by copying as necessary. Library digitization serves a dual aim of preservation and document provision availability.

Breeding (2010)\textsuperscript{104} shares his opinion that how the digitisation initiatives are proliferating all around the world. Most libraries are now trying to digitise and preserve their collections including photographs, manuscripts, and other unique content. Digitisation projects are also being launched in academic, research, and public libraries. Trusted digital repositories implement the best practices available to ensure that print documents are transformed into digital content. The Open Archival Information Systems (OAIS) is a classic example of how best practices help to ensure the long term digital preservation of cultural heritage materials.

Ramesh Babu (2011)\textsuperscript{105} expresses that hundreds of libraries, museums and archives have recently launched projects designed to digitize their collections. The potential of digital projects to present information in new and important ways seems limitless. Further he pointed out that digitization remains plagued by confusing standards, changing technologies, and doubts about the long - term viability of digital files.

Jayawardana et. Al (2001)\textsuperscript{106} pointed out that the active learning of individual users can be supported in the personalised information environment of a digital library. With respect to digital materials, three main facilities are required when active learning tools are designed and developed, namely, active consuming, information gathering and information seeking. The architecture of a personalized information environment is divided into two schemas called collection personalisation and material personalisation. Those tools are designed, developed and used to access digital text, audio and video materials.

Nagatsuka and Kando (2006)\textsuperscript{107} explained the digitalisation of information sources such as books or audio/visual media of the library holdings is an activity undertaken by many developers of digital library. Many of the digital content created by the developers are made available as part of the Web. The
volume and types of digital content are rapidly increasing now. The development of
information technology such as Internet and Web is affecting the activities of
traditional library.

McCracken (2007)\textsuperscript{108} identifies the traditional description and access of
library materials has undergone a transition for over a decade, librarians as well as
information and computer scientists have worked with the challenges to identify and
provide access to various types of digital resources such as electronic journals;
electronic books and reference resources; electronic government publications, Web
sites and databases; and geospatial maps and digitised special collections. Along
with the provision of measures to internationalise and accommodate the nature of
electronic resources (ER). The goal is to continue to identify, manage, and preserve
digital materials today and into the future in order to provide the best access to
information for library users.

Breeding (2010)\textsuperscript{109} tells that more and more libraries are resorting to
electronic collections, with the degree of shift that has already taken place varying
from one type of library to another. While the proportions of formats that will
constitute public libraries in the future are not easy to predict, the growing shift
toward electronic content is expected to continue well into the future even as printed
materials remain a significant offering of libraries. This transition toward more
digital collections has important implications for the technologies needed to support
libraries. Libraries are advised to avoid technologies that will cast their electronic
offerings with the mold of today's assumptions, and instead adopt those that are
versatile.

Witten et.al (2001)\textsuperscript{110} discuss highlights the Greenstone digital library
software is an open source system for the construction and presentation of
information collections. It builds collections with effective full text searching and
metadata based browsing facilities that are attractive and easy to use. Moreover, they
are easily maintained and can be augmented and rebuilt entirely automatically.
Greenstone incorporates an interface that makes it easy for people to create their
own library collections. End users can easily build new collections styled after
existing ones from material on the Web or from their local files (or both), and
collections can be updated and new ones brought online at any time.
Witten (2003)\textsuperscript{111} Pointing out the building and distributing digital library collections, opening up new possibilities for organising information and making it available over the Internet or on CD-ROM. Greenstone digital library software is intended to lower the bar for construction of practical digital libraries, yet at the same time leave a great deal of flexibility in the hands of the user.

Witten and Bainbridge (2005)\textsuperscript{112} describes that the greenstone digital library software is a comprehensive system for building and distributing digital library collections. It provides a way of organising information based on metadata and publishing it on the Internet or on removable media such as CD-ROM/DVD. First time users can easily and quickly create their own digital library collections. Advanced users can design and customise new collection structures, create new collections whose structure mirrors existing ones, and build collections and put them in place for users to view.

Hafezi and Karimi (2008)\textsuperscript{113} This paper explains the process of designing a digital library begins with system analysis, and continues with architectural design and programming. It then ends up with examination and installation and support of the final product as a new born digital library. Development of architectures of software begins with the plain architecture of the server, which is of the primitive generations of software design, and continues, with complex 3-layer client/server kind of architecture.

Pilsk et.al (2010)\textsuperscript{114} discuss about the open access digital library of taxonomic literature, forming a single point of access to this collection for use by a worldwide audience of professional taxonomists, as well as "citizen scientists." A successful mass scanning digitisation program, one that creates functional and findable digital objects, requires thoughtful metadata workflow that parallels the workflow of the physical items from shelf to scanner.

Smith (2003)\textsuperscript{115} explained the issues and challenges dealt with long-term digital preservation of manuscripts particularly that associated with “born digital” materials. He is of the view that digital information is easily created, quickly accessed, cheaply disseminated and provides significant benefits to users, but this versatility brings with it a new level of volatility and fragility. The rapid changes in hardware and software make digital records are formidable and raise social and
technical challenges of a fundamentally new form. It is vitally important to understand that digital format is extremely fragile media for preserving the cultural heritage of the world. Traditionally preserving things meant keeping them unchanged, however if digital information is held without modification, accessing the information over time becomes increasingly more difficult and eventually impossible. Digital information is highly susceptible to technical obsolescence and physical deterioration and requires continues conversion, refreshing and migration to new formats.

Cornish and Merrill (2010)\textsuperscript{116} deals with the efforts made on large-scale book digitisation projects, research libraries will increasingly be distinguished by their special and unique collections. In this paper, the authors analyze three software solutions that enable Encoded Archival Description finding aid documents and digital objects (derived from photographs, manuscripts, and other special collection items) to be published online. While several significant market and technological challenges exist, there are available solutions, both commercial and open-source, that enable libraries to publish selected digital collections and items online.

Ashling (2008)\textsuperscript{117} stated that the Organisation of American States (OAS) agreed to join and to contribute material to the World Digital Library during September. The project, planned by the library of Congress, has more than partners who have made a commitment to add material to the Internet, free of charge, including manuscripts, maps, rare books, musical scores, recordings, films, prints, photos, architectural drawings, and other significant cultural materials. The OAS’s Columbus Memorial Library, which holds content from the 35 member states, will be the contributing partner. The library houses the world’s most complete collection of unique photos, maps, commemorative stamps, archives, and records documenting the history of the organisation and its predecessor agencies dating from 1889. The Wellcome library in London holds the world’s leading collection of books, manuscripts, archives, films, and pictures on the history of medicine from the earliest times to the present day.

Appleton (2006)\textsuperscript{118} stated that Electronic resources are invaluable tools which complement print-based resources in any traditional libraries. Electronic resources provide easy and immediate access to information that might be restricted
to the users due to geographical location/ financial positions. They also provide access to current information as these are often updated frequently. Through their various search techniques, e-resources provide.

Bharat Kumar (2006)\textsuperscript{119} studied on “Use of UGC-INFONET consortium by the faculty members and research scholars of department of Chemistry, Karnataka University, Dharwad: A study” found that maximum number of the respondents (87.5\%) have got awareness about the UGC-INFONET programme. E-journals are the most widely used electronic resources over Internet (85\%) by the respondents. All the respondents (100\%) expect more number of E-journals to be included in the UGC-INFONET programme. There are 95\% of the respondents who recommend for print journals in addition to e-journals. Majority of the respondents (82.5\%) feel that they are in need of regular training programme to make effective use of INFONET programme. Maximum number of the respondents (95\%) has recommended for high speed computers to access information over internet. 65\% of the respondents strongly agreed that the present UGC-INFONET consortium programme is a good resource for research. The data reveal that the majority of the respondents (i.e. 47.5\%) have enough knowledge in using the web, including search of different databases.

Chakravarty and Singh (2005)\textsuperscript{120} referred that the Library consortium usually refers to co-operation, co-ordination and collaboration among the libraries for the purpose of sharing information. Consortia are basically, evolving a form of co-operation among the libraries which come together to share resources electronically. It has gained momentum in developing countries like India.

Dermody and Majekodunmi (2011)\textsuperscript{121} studied “On-line databases and the research experience for university students with print disabilities” and concluded that the digital collection of articles, books and resources provided greater access to resources 24/7 for our students. Various sectors are benefitting from digital access like distance education students and to a certain extent, students with print disabilities. While the print collection of a library is usually inaccessible to students with print disabilities, a database that can offer accessible features like simplified search screens will mean instant access to resources. As the digital information world continues to grow and offer more and more features for its users, it must also
evolve to take into consideration the needs of these students. The Academic library and database vendors must work together, in consultation with students with print disabilities, to ensure that technology opens up doors and tears down walls. To allow barriers to exist in this technologically advanced age would prove to be the greatest failure of the 21st century library.

Gummerus (2010)\textsuperscript{122} studied “E-services as resources in customer value creation: a service logic approach”. The present study has shown that service content, service process, and service configurations should all be considered as input resources in the production of value by customers of websites. In particular, the study has identified service content and service configurations as being especially important in the perceptions of value of customers of an information-based healthcare web site.

Haridasan and Khan (2009)\textsuperscript{123} in their study explained “Impact and use of e-resources by social scientists in National Social Science Documentation Centre (NASSDOC), India” focus on the impact and use of e-resources by social scientists pursuing research in the NASSDOC library. The data were collected from the entire population of social scientists at NASSDOC through a questionnaire accompanied by a personal interview. This was further analysed using statistical techniques and percentages to arrive at qualitative and quantitative results. The major findings of the study indicate that respondents are aware of the e-resources (such as e-books, e-journals, e-encyclopedia, e-theses, CD-ROM databases, e-mail, internet and the OPAC). Large numbers of research scholars and faculty members are using e-resources for research work. Most of the faculty members strongly agreed with the necessity for computer and internet literacy to access information. A majority of users were satisfied with the e-resources available at the NASSDOC library. Faculty members and research scholars were using library databases, OPACs, and bibliographies, for locating e-information. Faculty members and research scholars were facing the problems of internet access while searching/accessing online databases both the research scholars and faculty members. The retrieval performance of the OPAC among both the research scholars and faculty members was good. Research scholars were using Google, Google Scholar and Yahoo for literature queries while scientists were using Google, Google Scholar, Ask.com and
Khoj.com. Most of the faculty members strongly agreed the need for computer/internet literacy. Majority of the users are satisfied with the availability and use of e-resources at NASSDOC.

Hawkins and Sorgi (1993) survey also leads to user needs, define user interests, opinions, attitudes, and characteristics/ demographics as well as user priorities in finding information. Library research is usually performed as user studies to know the characteristics, information seeking for user strategies and behaviours, and information skills to discover.

In their study “Impact and use of e-resources by social scientists in National Social Science Documentation Centre (NASSDOC), India” focus on the impact and use of e-resources by social scientists pursuing research in the NASSDOC library. The data were collected from the entire population of social scientists at NASSDOC through a questionnaire accompanied by a personal interview. This was further analysed using statistical techniques and percentages to arrive at qualitative and quantitative results. The major findings of the study indicate that respondents are aware of the e-resources (such as e-books, e-journals, e-encyclopedias, e-theses, CD-ROM databases, e-mail, internet and the OPAC). Large numbers of research scholars and faculty members are using e-resources for research work. Most of the faculty members strongly agreed with the necessity for computer and internet literacy to access information. A majority of users were satisfied with the e-resources available at the NASSDOC library. Faculty members and research scholars were using library databases, OPACs, and bibliographies, for locating e-information. Faculty members and research scholars were facing the problems of internet access while searching/ accessing online databases both the research scholars and faculty members’ s. The retrieval performance of the OPAC among both the research scholars and faculty members was good. Research scholars were using Google, Google Scholar and Yahoo for literature queries while scientists were using Google, Google Scholar, Ask.com and Khoj.com. Most of the faculty members strongly agreed the need for computer/internet literacy. Majority of the users are satisfied with the availability and use of e-resources at NASSDOC.
Kaliyaperumal et al. (2010)\textsuperscript{125} It is evident that most of the libraries in developing nations like India are yet to be automated. And only the minimum numbers of libraries are either fully or partially automated, and a countable number of libraries in the country are able to provide e-resources to their patrons. To maximize the e-resources' use in these libraries, the attitudes of the users are to be measured to maximize the usage.

Kothari (2004)\textsuperscript{126} Survey method was used to measure research scholars' background, experience, and awareness about electronic information. The data have been obtained using questionnaires; the data have also been standardized for comparison. The questionnaire was designed, keeping in view the objectives of the study, and hypothesis framed.

Krishan Kumar (1992)\textsuperscript{127} explained that the data collection was made by administering questionnaires to the users in the selected institutes. Mailed questionnaire has been the most popular form of data collection used in Library and Information Science studies. However, the "directly-administered" questionnaire method which is more effective, accordingly the researcher had administered and collected the completed questionnaires from the sample respondents.

Liu (2006)\textsuperscript{128} in his study "Print vs. electronic resources: A study of user perceptions, preferences, and use" shows that the arrival and proliferation of electronic resources and digital libraries have a number of significant impacts on the use of print resources and traditional libraries. This study explores the extent to which graduate students in a metropolitan university setting use print and electronic resources. Reading preferences and use of print and electronic resources vary among different disciplines. Graduate students seem to expect a hybrid of print and electronic resources. They desire to meet their information needs through a mix of print and online resources, even though reasons for supplementing another type of resource differ.

Moret (1997)\textsuperscript{129} describes that networked product can provide multiple points of access at different times and to various kinds of users. e-resources will allow the users to approach the publications to analyze their content in new ways to get a vast amount of information and the material can consist of mixed media i.e. images, video, audio animation which could not be replaced by any printed
documents. Apart from the above said advantages of e-resources, it may include international reach, unlimited capabilities, reduced cost, convenience, search ability and linking.

Mulla and Chandrashekara (2006)\textsuperscript{130} carried out a study on "E-resources and services in Engineering College Libraries: A case study" found that collection of books and service infrastructure of the libraries in the some regions are not up to the mark in engineering college libraries. Libraries are given less importance and they struggle to get digital collection and disseminating electronic information, due to the following. 1) Lack of ICT infrastructure, 2) Lack of IT trained manpower with the awareness of users, 3) Awareness of use of the digital resources, 4) lack of user's demand, 5) Lack of financial support, 6) Lack of access like computer facilities, 7) Lack of knowledge about the digital preservation method and 8) lack of training for the digital access, etc. A concrete effort must be taken on the part of individual institutions with the support from the INFLIBNET which would be a better digital resource. An establishment of ICT task force for individual institutions composed of IT experts and department needs would result in effective way

Paul Pandian et.al (2002)\textsuperscript{131} describes IIM (Indian Institute of Management) Library consortia is a Digital Library network system based on internet technology to provide the IIM community (the faculty, students and staff) web enabled access to the information resources available in all the IIMs without any barriers of time and distance. It will be a simple, efficient and cost-effective system. The basic operating principle of this system is to decentralize acquisition, processing and centralized utilization.

Pricilla Rani and Geetha (2007)\textsuperscript{132} indicates that the electronic resources become inevitable collections in the libraries. Print media are being digitized, and it increases the availability of books and journals in the electronic formats. The electronic books are helpful due to their portability and its feature of incorporating more than one book in a single hand held device. The published materials are also available on open access. This also helps the students to get the required information free of cost. The government undertakes various steps to introduce this facility in academic institutions for the benefit of research scholars. The university avails this facility and gains access to e-resources at large.
Resnick et.al (2008)\textsuperscript{133} observed that ARL (Association of Research Libraries) statistics states that the top ten libraries ranked by them, spend 15-47 percent of their library budget on electronic resources which was three fourths of budget. With such high budget allocated in purchasing electronic resources, libraries can concentrate on supporting the users as a whole. Virtual desk top reference service responds to any user question about access to electronic resources which further should be evaluated to meet the challenges in the digital age.

Sampath Kumar (2008)\textsuperscript{134} carried out his research on “Use of search engines by research scholars and faculty members of physics departments in the universities of Karnataka State” which studies the use of various search engines, frequency of use of search engines, factors that influence search strategy by Physics research scholars and faculty members in the universities of Karnataka. The result shows that majority of the respondents (84.33%) used search engines to retrieve information on the internet and the most frequently used search engines are Google (72.85%) and Yahoo (53.57%) while AltaVista, Lycos and Hotbot search engines are used less frequently.
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