Chapter 2

Literature Review
CHAPTER 2
LITERATURE REVIEW

“A researcher cannot perform significant research without first understanding the literature in the field.”
- Boote & Beile

2.1 Introduction

Literature survey takes stock of the background work done by researchers by going through the various published resources drawn from different databases. The main goal of literature survey is to gather the basis for presenting the research work and to establish the fact that the researcher is familiar with the published literature in the field. Research work of other scholars who have probed similar topics & issues, guides a great deal. This study builds on such research works in the hope of developing a clear understanding of the need for children’s science digital library in India and the dynamics and concerns regarding the location, organization and providing access to the user community with the objective of developing scientific tempo in children and aiding teachers with pedagogic tools to enrich their teaching, learning process.

Digital libraries are complex systems that not only stretch institutional resources and the capabilities but also offer unparalleled opportunities for new and improved user services. The review of the related literature in this context, reveal the challenges and the potentials. The vast amount of literature contains white papers, conference reports, journal articles, research reports and a great deal of experience sharing activities as well as the reports of the experience gained from many individuals and
institutionally supported endeavours. Consequently the collective understanding of what makes digital libraries work well is increasing as the number of digital libraries and the inventory of useful technology tools. Digital libraries of one kind or another are now implemented in academic institutions, public libraries, local and national government agencies, international organizations, national libraries, corporations, publishers and professional associations. They range from specialised collections focusing on one type of subject to complex aggregations of multiple subjects.

Libraries all over the world are undergoing transformation due to the induction of ICT which is enhancing the access to information, some of the school libraries in India are technology rich spaces. In context of the present study, the literature review has covered the selected articles/papers abstracted in LISA (Library and Information Science Abstracts) and LISTA (Library and Information Technology Abstracts). Articles/papers that are very specific to the topic of research are considered for reviewing.

The selected literature is conveniently grouped under the following four facets;

1. Growth & development of digital libraries
2. Digital library initiatives
3. Children’s digital libraries
4. Emerging trends in digital libraries
The review of papers, articles, research reports and books coming under each group is presented. Though there is enormous literature published, only those materials which are having the focus on the topic of research and related aspects are covered for the review. In India, digital library literature could see the light of the day after 1990’s. One of the earliest primary articles was published in 1997 (Rajashekar, 1997). Fox and others (1993) opine that digital libraries are becoming the main repository of mankind’s knowledge. This has resulted in the design of user-friendly interfaces to access, understand, and manage digital library content which has become an active and challenging field of study.

Wallace, Krajck and Soloway (1996) are exploring the ways in which digital libraries can support inquiry learning. Digital libraries offer a unique and unprecedented resource through which teachers can facilitate student inquiry. In the recent National Research Council publication quoted above, National Science Education Standards, emphasis on inquiry is pervasive. Yet when it comes to textbooks and curricula as they exist today, the clear emphasis is on learning science content, disconnected from experience. Although digital libraries can’t change pedagogy or textbooks, they can make it possible for students to have access to scientific information and data which interests them, a fundamental requirement for authentic inquiry. Digital libraries can provide teachers with a feasible way to let students pursue their own interests within the bounds of the curriculum and without creating an enormous amount of extra work in providing students with materials to support their investigations.
Conventional library and information activities have undergone major transformation due to the induction of ICT. Recent developments in Internet and WWW have brought significant change in the way the generation, distribution and the accessing of enormous amount of information published through various modes and means. Today digital libraries have overtaken managing the information world using both commercial and open source software. Origin of the digital library can be traced in the basic ideas propagated by Paul Otlet and his associates in 1930 and few years later, the concept of Memex advocated by Vannavar Bush in 1945.

Initially conferences and seminars have given inputs to the publication of primary articles on digital libraries. Particularly International Conference of Asian Digital Library (ICADL, 2001) and the series of International Conferences on Digital Libraries (ICDL) have been responsible for creating awareness on digital libraries in India.

2.2 Growth and development of digital libraries

In earlier times, the role of a library was easily defined. Its functions could be summed up in three words: Acquisition, Preservation and Access. For centuries this meant getting hold of books, looking after books, and placing books in the hands of the readers. At the end of the 20th century the three principal tasks of acquisition, preservation and access remain fundamentally unaltered but their scope is expanding and methods of fulfilling them are multiplying. The book edited by Carpenter, Shaw and Prescott (1998) describes the ways in which The British Library was
aiming to carry out its traditional tasks in a world profoundly modified by information technology. Here the authors of the individual chapters have been very successful in communicating a lively feeling of what it was like to be involved, hands-on, in these pioneering projects. The authors detailed descriptions of technical devices and projects, especially their candid accounts of mistaken and blind alleys, will make this book valuable to the experts in other institutions and other countries working in similar fields.

NALANDA (Network of Automated Libraries AND Archives) is the proposed digital library project of Calicut Regional Engineering College library. This project aims at fulfilling the virtual library concept and establishing open communication with other similar systems in the world (Mathew, 2000). Rajendran and Vengan (2000) discuss the nature and collections of Archives library, arrangement of collection, methods adopted in preservation and conservation of rare materials including old collection. It also highlights the impact of information technology and suggests for digitization of selected archival collections using the available current technology.

Giving brief introduction to the issues which are to be considered while developing the digital library, Yogendra Singh and Robert Allen (2000) are raising the issues concerning content selection, acquisition, storage, organization, dissemination and use of the resources. They also present the report of the results of pilot project undertaken in the College of Library and Information Services (CLIS), Maryland University, USA to develop a prototype digital library of the collection available in the archives Central
Library of the University of Roorkee, India. Vengan (2000) presents an account of the role of the library in the light of the ever-growing of digital library and Internet. The author says that the end-users will become powerful when they directly interact with digital libraries via Internet. In his opinion digital libraries offer new challenges to an emerging breed of digital librarians or new opportunities with rapidly evolving technological developments to create information products and services.

Presenting the overview of the digital libraries, Schwartz (2000) opines that digital libraries are complex systems that stretch institutional resources and capabilities, but also offer unparalleled opportunities for new and improved user services. The purpose of this article is to provide context through an overview of the components of the digital library works, and also to point to resources for further explanation. Shalini and Indira (2000) present the efforts made in Mysore University to develop the prototype user interface to augment Boolean Query formulation with the help of the Venn diagram type visualization. This prototype basically aims to help users in visualizing result of their ‘AND’ and the inclusive ‘OR’ of the Boolean languages. Users are then cued to modify their query if needed. The whole process is interactive and enables the users to fine tune their query.

Sun Micro Systems (2000) has brought out a white paper which addresses some of the leading questions that academic institutions, public libraries, government agencies and museums face in trying to develop, manage and
distributes digital content. The evolution of Java programming, digital object standards, Internet access, e-commerce and digital media management models is causing educators, CIO's and librarians to rethink many of their traditional goals and modes of operation. It is in general a comprehensive introduction to digital libraries. Lee Stuart (2001) has designed a practical handbook which provides the guidance for anyone who is about to embark on a digitization project or is interested in this growth area. In particular those charged with initiating digitization projects such as senior librarians and managers, will find that the book adopts a practical approach to decision making following the life-cycle of the digitization projects from inception to completion. It follows the process of digitising, from initial inception through the capture, delivering and archiving stages, outlining workflows and discussing relevant issues along the way. This handbook also outlines the reasons why digitisation is so popular at the moment and what advantages and disadvantages it presents.

Manduca and her team (2001) has derived and assembled the information from the contributions of the participants of various NSDL grantee meetings. The brief review of the background of the NSDL is provided. This paper focuses the attention in those areas where there is broad consensus, namely the vision, scope, goals and principles guiding the development of the NSDL. Necessary components to support the collaborative efforts, the governing structure and the core integration
system are discussed. The action plan outlining the set of activities that need to be undertaken for this collaborative effort is presented.

A N Zainab, A Abrizah and W K Ng (2002) describe the proposed digital library for historical resources that support the development of digital content collaboratively. A prototype biographical portal that could handle information on Malaysian personalities is chosen as the domain for the test-bed. The biographical portal incorporates five basic features:

(a) Uploading, indexing, searching and retrieval modules supports the creation, capturing and sharing of historical data from distributed sites and user groups

(b) Supporting multi-format digital resources (text, images, audio and video clips)

(c) Providing facility for searching the contents of the digital libraries from simple keyword searches, specific occurrences of words in specific fields and a combination of terms using Boolean Operators

(d) Providing user controlled display

(e) Ensuring basic security features. Other information provided includes brief introduction about the system, frequently asked question (FAQ), terms and conditions for those interested in participating, help and edutainment features and linkages to other related resources.

William Arms and others (2003) describe the use of the Open Archives Initiative protocol for metadata harvesting in the National Science Foundation's National Science Digital Library. They give details of the use
of the protocol both as a method to ingest metadata into a central Metadata Repository and as a means by which the repository exports metadata to service providers. They cover the analysis of pertinent topics and relevant issues and also the implications on library technology.

Creating and managing a digital repository is similar to starting a new physical collection. Just as the value of a library is in how it collects, organizes and presents materials and quality of a digital repository is measured in the same way. On a basic level, a digital repository is simply a collection of digital resources. Building a digital repository requires a significant and ongoing commitment of staff and financial resources. In this sense digital repositories are a logical outgrowth of traditional library services in response to changes brought about by network technology. The overall effect of the digital library is to allow a library to provide a greater level of access to more diverse collection than it can with exclusively physical resources. Reese and Banerjee (Reese & Banerjee, 2004) have compiled a very useful handbook to educate the team of digital library professionals.

In the current information environment, libraries need to leverage on the latest digital technologies as well as the traditional paper technologies towards building practical digital libraries and electronic information systems. Digital libraries built exclusively out of nascent electronic publications such as e-journals, e-books, e-reference works (Web-based training programs, computer-based training programs, etc.), digital
scholarly works (monographs, etc.) in the public domain) and digitized documents conforming to standard digital formats are proving to be an uphill and unfinished task. Perhaps this could be the major reason why the start-success-finish ratio of most of the digital library initiatives, particularly initiated by isolated/individual libraries, is still left at alarmingly low numbers. Seamless aggregation and meticulous integration of diverse data streams, embracing the print as well as the electronic information, is the most appropriate strategy to be adopted and applied. Sreekumar & Sunita (2005) shares 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 the significant features of IIM(K)’s digital information system- the content aggregation and the content integration strategies they adopted for designing a scholarship Web portal and developing a digital library using the ‘Greenstone’ open source digital library software. He 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. Sreekumar concludes that the digital libraries enable the seamless integration of the scholarly electronic information, help in creating and maintaining local digital content and strengthen the
mechanism including the capacity of library’s information systems and services.

Bawden and Vilar (2006) have made an attempt to present the expectation of digital library users and managing the same. Authors state that one must observe change in the information environment to realise that a new breed of users are evolving. This new breed of self-sufficient users does not see the library as the centre of their information environment. They rely on the Internet and WWW. The competition faced by libraries from other information providers such as Google or even Amazon has been recognised and discussed but very few libraries have taken the challenge seriously and taken steps to actively formulate strategies to encounter the developments. The availability of digital resources is not enough if not complimented by additional services to support activities that occur during the information seeking process.

Saylor and Minton-Morris (2006) briefly describe the mission, history and status of the National Science Digital Library (NSDL) and focus on future work of the NSDL Core Integration (CI) service, including the NSDL Collection Development activity, phase two of the architecture and data model, and two new services—On Ramp and Expert Voices—that leverage acquisition and management of user-contributed contextual information about educational resources, and the ability to express complex relationships between them made possible by the new architecture.
A practical guide book designed and compiled by Jordan (2006) is aiming at the working professionals who are contemplating developing a collection of digital documents and at library staff who are already doing this type of work but require guidance on dealing with specific aspects of the projects. This is a general book to help the libraries make informed decisions in creating online content and organize it into collections. This book differs from other books as it provides broad view of all the activities involved in creating digital content of all types and presenting it online.

Miller (2007) is highlighting some of the issues that are critical to success in building digital libraries and initiate thinking in the future directions. This paper also explores the issues of selection and purchase of digital content, both from vendors and creating in-house and degree to which standard collection management principles apply.

David McArthur (2008) describes the National Science Digital Library (NSDL) as the digital database which is available on the Web site www.nsdl.org, giving access to over 2.5 million digital education resources on topics from science to mathematics from the pre-kindergarten to postgraduate levels. He gives details of the NSDL being a research program which the National Science Foundation (NSF) may be changing due to it having accomplished its primary goal and being more of an operational center which the NSF does not support. He opines that if the NSF continues support of the NSDL it can act as a storage place which
provides knowledge management for the digital products of NSF's education programs.

Mahesh and Rekha Mittal (2008) have conducted a research to identify and evaluate the collections within digital libraries and repositories in India available in the public domain. The digital libraries and repositories were identified through a study of the literature as well as Internet searching and browsing. The findings of the study reveal that major 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. This research is first of its kind to evaluate and identify the digital libraries and repositories in India. It also gives a comprehensive listing of digital libraries in India in the public domain. G Mahesh and Rekha Mittal (2008) in their article ‘Digital libraries in India: A Review’ have reviewed 63 published studies in scholarly journals on digital libraries in India and have presented an overview of the growth, development and current status of digital libraries in India. They have analysed that most of the articles concentrate on developing digital libraries and digital collections and few of them make an effort to touch on the copyright issues and management of digital libraries. According to them, issues like digital rights management, security and digital library policies are not dealt with in any of the studies. This once again draws attention to the fact that along with digitization, also need to seriously consider formulating the policy guidelines for digital libraries and digitization in general.
The advancement and widespread adoption of the information and communication technology has expanded the access to information. Alternatively, deluge of digital data and the rate at which the information repositories increasing are not affable because one needs to track these individually. Usha Munshi (2009) addresses these apprehensions and focus on interoperability of these digital repositories so that the subject gateways could be generated using these repositories to facilitate one stop shop and easy access to galore of resources contained in these digital repositories, thereby enhancing access to scholarly communications. Changing user expectations have changed many libraries to move toward digital content. This provides an access to resources from anywhere, anytime with efficient on demand information. Accordingly librarians are presented with challenges and opportunities to build, manage and implement outreach strategies that promote their digital library collection. Zhu and Guevara (2009) have experienced these challenges and opportunities. They conclude that by working through the various processes of digital content and collection one can be better equipped to work with library’s content. 

Scholars in library and information science are pressed to seek funding for research. The National Science Foundation (NSF), which is one of the source of such funding, considers proposed projects based on the criteria of 'Intellectual Merit' and 'Broader Impacts.' But these merit review criteria have been criticized as being insufficiently specific and not appropriate for all types of scientific research. In order to examine the extent to which
funded projects represented Broader Impacts, Marcia Mardis and others (2012) performed a content analysis of the abstracts from projects in the National Science Digital Library, an NSF project that crossed many disciplines and applications, but is of particular relevance to information scientists. The results of these analyses when placed in the context of the controversy surrounding the Broader Impacts merit review criterion, it became clear that this criterion is interpreted broadly and that even successful proposals often include aspirational claims of impact. According to them, current proposed revisions to the merit review criteria include emphases on demonstrable innovation and economic benefits will only complicate proposers' abilities to describe their projects' potentials. Ricky Erway (2013) defined the born digital resources as the items created and managed in digital form. The purpose here is to explain the various types of born digital materials. Main intention here is to improve community discourse by encouraging caretakers of born digital resources to specify what they mean when they use the term. Butdisuwan (2013) has made a modest attempt to describe the digital libraries, organization structure, components, services and sociological issues involved in it. A significant amount of digital repository research and development activity is taking place worldwide which calls for the investigation of issues identified as critical to the development, management and sustainability of these repositories. Fatemeh and Abdullah (2013) are presenting the research framework to find out critical success factors for digital libraries by collecting the ideas from literature published in the subject field. They have taken the feedback from ten experts who had experience in digital library
research and development as well as implementation, through email interviews. Six dimensions in the enterprise architecture (namely, motivation, resource, people, process, location & time) needed to create the environment in which digital delivery can be effective and sustained, are mapped. The results revealed the six dimensions of critical factors and thirty six potential success factor statements contributed by the study participants. Both researchers and practitioners in the field of digital libraries may value the novelty and results of this study.

2.3 Digital library initiatives
The swift proliferating scattered and shared scholarly Knowledge Management is being reined in by the academic and research libraries the world over by harnessing technology. The recent trend and dynamics witnessed in the academic and corporate arena is that of Knowledge Management slanting on Information Science (IS) and Information Technology (IT). Digital libraries, due to their multifaceted features and the opportunities have caught the fancy of all information seekers both in the developed and developing countries. Access to wider group of users and opportunities to advance library and information science theory and practice is the distinct feature of a digital library. Collection development, infrastructure, acceptability, access restrictions, readability, standardization, authentication, preservation, copyright, policy and strategic issues, user interface, funding, etc. Are posing as serious challenges while creating effective digital libraries. In spite of these major hurdles, the positive aspects of digital libraries outshine them and thus
digital libraries are gaining importance by all the countries. India too has identified the power of digital libraries and many initiatives are rolling for creating state-of-art digital libraries.

Edward Fox (1999), presents the reports of the projects of Digital Libraries Initiatives (DLI) from 1994 to 1999 in United States. Various aspects role of National Science Foundation in DLI; funds in DLI; Expansion of DLI phase 2 to different disciplines working in digital libraries; assessment of progress of the DLI are discussed.

Bhattacharya (2004) in his paper ‘Advances in digital library initiatives: a developing country perspective’ focuses on the digital library initiatives in India with examples, the initiatives of the government of India and state governments towards digital library activities, and the policy of the Government of India towards digital library development. The current initiatives, such as INDEST consortia, are described in detail. The challenges facing digital libraries, the problems of the digital divide facing the country are mentioned.

The focus is on building world class digital libraries which can handle the precise issues put forth by the technology push as well as the demand pull. Open Digital Library (ODL) initiatives are gaining momentum both institutional and professional group attention due to a number of unique features offered by the digital libraries, particularly in India. Now that more than 70% of scholarly literature of the world is born digital and is obvious
that libraries procure them for their users in the digital form and that could well be the reason that India is adopting this trend in a optimistic and proactive manner. Sreekumar & Sreejaya (2005) discusses the problems, challenges and issues concerning the design and development of world standard digital libraries, focussing on the Indian context. He also takes into consideration the initiatives taken by various Indian libraries and organizations towards the development of digital libraries.

Dasgupta, Kalpana (2005) describes some major digital library initiatives in India in different LIS sectors. The digital divide within the LIS scenario due to diverse situations are highlighted by her. She has reported that most of the present initiatives are in the area of science and technology, in the government sector, and in institutions of advanced research and are project based. Also the need for trained personnel, lack of holistic policy regarding digital content generation, management of digital libraries, standards and services are discussed. She points out the lack of focus on preservation of digital data. She concludes that sustainability of digital libraries in India will need continuous technical and economic support along with the political will of the government, sustained well informed interest of the decision makers and the library professionals.

Dr. A. P. J. Kalam (2006) in the guest article titled ‘Digital Library Initiatives in India’ has reviewed the Digital Library Web Portal from Ministry of Communication and Information Technology (MCIT). P K Jain (2006) opines that the success of a digital library depends upon the computers,
communication skills and knowledge of library professionals in connection with modern technology. According to him, the technology based idea is to provide universal access to digital content available only in a digital library environment. The emergence of digital technology and computer networks has provided a means whereby information can be stored, retrieved, disseminated and duplicated in a fast and efficient manner. He further states that digital libraries have made considerable advances both in technology and its application at the global level but only sporadic and partial attempts have been made towards digital library initiatives in India. All projects aimed at creating digital libraries concentrate only on specialized collections but he concludes that the nation is serious about digital library implementation.

Ramalakshmi (2012) presents the attempts made in all types of libraries to convert the existing print library materials in a library to digital format and also acquiring the digital materials. She also discusses the digital library initiatives undertaken by the select engineering college libraries in Chittoor district of Andhra Pradesh in India. Subrata Deb (2006) describes the setting up of The Energy and Resources Institute (TERI) digital library, which provides better single window access for researchers to access the structured information from their desktop. The purpose of the integrated library is to provide a single window to researchers through which they can access born digital resources and digitized documents. This initiative is useful for small and medium special and research libraries who do not have enough funds to start with commercially available digital library
software. It also shows the way to start using Open Source Software, which is easy to use and has been used by the libraries with little effort. In his study S. N. Singh (2006) discusses the various aspects of the conversion of in-house library materials into electronic format, which leads towards the creation of digital library. Also describes the digitization initiatives that have taken place in India. Objectives of digitization have been correlated with the mission of university libraries. Further the study deals with various image capturing and processing technologies and its suitability for the university library. An attempt is also made to identify the areas to be covered under digital conversion programme in the first phase. Forster (2007) focuses on the digital libraries initiative as part of the i2010 European Commission strategy. He discusses the move of the Heads of state and government for the European Commission to take steps to make Europe’s cultural and scientific heritage accessible online and to work towards a European digital library. He also mentions Europe’s effort to make cultural content more accessible. Varatharajan and Chandrashekara (2007) focus on the importance of digital library at the higher education and research institutions in India. According to them, the impact of the new technology has contributed to the transmission of knowledge in all fields and disciplines in the academy. Also it considered a way of making educational and research data and information available to the faculties, researchers, students at the institutions and played a vital role in acquiring and disseminating information for academic and research activities. They also state that the central and state government of the country funded the technology to preserve the culture and heritage for the next generations.
In India majority of libraries in metropolitan cities are involved in preparing themselves for the 21st century. They are getting converted into digital libraries which can be more suitably help to fulfil their basic objectives of preserving the national heritage and culture and making it globally accessible by passing all constraints of time and space. Digitization has helped to change the entire concept of R & D activities and the ways the scholars, students and a common user access and use scholarly information. S P Singh (2008) introduces the concept of digitization, emphasis the need for digitization. She also highlights the policy and criteria for selecting the documents for digitization etc. and briefly covered the selected initiatives being made in this direction in India in different sectors. Sujata (2008) describes the role of Distance Education Council (DEC) as an apex body in coordinating distance education research and technology transfer in India. One of the strong points of open distance learning is its ability to harness the latest communication technologies to reach the unreached and to reduce inequalities and respond to socio, cultural and economic contexts of the learners and promote excellence. Its approach and framework stand on three pillars – relevance, equality and excellence. The author has strongly pleaded for the digital system for open universities in India.

Bansode and Pujar (2008) are stating that the emergence of digital technology and computer networking have provided a means whereby information can be stored, retrieved, disseminated and duplicated in a very
Digital libraries have considerable advances both in technology and its applications. They have made an attempt to present briefly the digital library initiatives in India. In their view just like the initiative ‘Million Book Project’ promoted by Carnegie Mellon University, the culture of digital libraries has also made a beginning in India. Toomey (2010) focuses in his article on the National Science Digital Library (NSDL), a central online network for teaching and learning science, technology, engineering and mathematics (STEM) from the National Science Foundation (NSF). In his article he explains that the NSDL website shows the pathways, subject areas and collaborators such as Chemical Education Pathway, Biological Science Pathway, and Engineering Pathway. Furthermore, the NSDL offers several components including Literacy Maps, Science Refreshers and Brown Bag.

Masaki’s (2012) article focuses on the current situation of construction of the National Diet Library (NDL)’s digital archive and the direction of activities for ‘creating and reproducing new knowledge’ which ‘knowledge sharing’ aims at. It is explained that NDL as a deposit library has a responsibility to acquire and preserve not only paper materials but also digital contents, and needs to make them accessible anytime and anywhere. The NDL acquires and preserves digital contents to a maximum extent to build the NDL digital archive. But it also cautioned that since it is not possible to collect all of them, NDL plans to accumulate all knowledge in co-operation with other institutions to build distributed digital archives. The NDL plays a data provider role to navigate all the distributed digital
archival information and make it available as semantically-related knowledge to build ‘NDL Search’. Visva-Bharati University Library, Shantiniketan has endured much to digitize the resources of long standing value available in their library. Subodh Nandi and Ram Prasad Mazumder (2012) have made an attempt to explain the practical approach to the process of developing the Digital Resources at Visva-Bharati (DRVB). The open source software is used for creation, maintenance, browsing, and usage pattern of the digital resources through WINISIS, GENISIS Web and Apache Web server. Their paper argues that this procedure is practically viable. Its working process is well tested and it claims that it is user friendly. The authors conclude that it would be helpful to all libraries trying to create their digital resources. An interesting case study of use of digital resources made available in the private engineering education and research college library in Nashik (Maharashtra). Its a survey conducted by through the questionnaire method and the data of use of digital resources by the faculty and the students. It is found that there is a considerable increase in the productivity of the research output as well as the performance of the students in the college. The authors (Bodke & Sane, 2012) have very systematically analysed the data using all possible statistical methods with graphical presentation.

2.4 Children's digital libraries

21st century school children are blessed to be born digital natives. They are experiencing the thrill of technology and at the same time are extremely comfortable with the nature of its user friendliness. Being the
Net generation students they are connected on a global level and hence emerging as;

- Action oriented problem solvers as they use technology as a primary tool
- Collaborators on various projects by sharing their interests and experiences
- Creative thinkers, empowered decision makers and thus act as key players in the knowledge society
- Act as a proactive community by expressing their feelings & emotions.

With the collective desire to work together, to learn together and to socialize, the Net generation children use digital technologies as a medium to get the required information. The world of technology will continue to move swiftly and the information landscape will become more complicated, overloaded and dense. In this context, it is essential for developing the foundation for getting connected to a centrally accessible digital storage where in the teachers and children are able to access freely the organized digital information for their teaching and learning. The following reviews make an effort to put together the works done in establishing the digital libraries and also the experiments that are ongoing in this direction.

Masullo and Mack (1996) examine the question of what roles digital libraries may appropriately play in K-12 education. In context of digital libraries, how to transform atoms into bits is a technical problem being addressed by much research and development coming from both industry
and academia. The problem of how to tap into the kind of knowledge teachers possess and how to gather content of the kind useful in learning is much more delicate. That problem is best addressed by means of dedicated demonstration projects that specifically target the educational issues and the educational settings.

The flexibility of a digital library and the richness of the tools now being developed to exploit those invites exploration of content. Exploration in education is generally rewarded by discovery, enabling inquiry-based, and constructivist approaches to learning. However, digital libraries represent a functional departure from our existing technology supported educational environments.

Druin (2003) deals with the description of the first version of International Children’s Digital Library (ICDL). The mission of the research work is to establish an access and facilitate to read the collection through the development of new interface technologies. It also describes the need for the research and the work in the context of other digital libraries for children. This also gives the analysis of initial seven weeks of ICDL’s public use on the web. Druin (2005) again gives the draft presentation of the work of the interdisciplinary team at Maryland University. Team consisting of information science, computer science, education psychology worked together with children (aged 7-13) which led to new approach to collection development, cataloguing (meta data standards) and the criteria of new technologies for information access and use. This paper presents a
case study on the development of the ICDL. It also discusses the implications from this research as they relate to new technology design methods with children and new directions for future digital libraries.

Anne C Week’s (2003) paper, presents outcome of five year research on the project of designing and developing the ICDL. Interdisciplinary researchers from computer science, education, library science, art and psychology are working together with children to create new interface technologies that will enable them to browse, search, access and read books electronically. This paper is describing project and presents the initial findings of the research. Edzan and Abrizah (2004) describe the conceptualization of a model for a collaborative digital library specially designed for Malaysian Secondary Schools, which support classroom teaching and learning. Stating that the move towards collaboratively building the contents of a digital library as a fairly recent trend and that it stimulates an environment where partners are empowered to participate in building and up keeping the knowledge contents of the system. They explain that the conceptualization of a Malaysian digital library is in line with the government’s efforts in establishing SMART schools. They caution that many issues such as identifying local resources, ascertaining the needs of its users, and establishing a framework to meet these needs must be addressed before the digital library can be implemented. They suggest that it must be approached through the establishment of test beds in a particular learning institution, before nationwide implementation.

Druin (2003) describes the differences in children’s collaborative behaviour and dialogue when using two different software conditions to search in the
digital library. In this study half the children had to confirm their collaborative activities. The other half used an ‘independent’ collaborative technique. The results of the study show distinct differences between conditions in how children discussed their shared goals, collaborative tasks and what outcome they had in successfully finding multimedia information in the digital library. Massey, Weeks and Druin (2005) have discussed the children's responses to self-selected books in a digital library and identified patterns in those responses. The study presents an analysis of 241 book response forms submitted by 12 children from 4 countries: Germany, Honduras, New Zealand, and the United States. The children described most of the books they read as being funny or happy and generally rated them with four or five stars (out of five stars). The most commonly identified types of responses were those expressing like or dislike, summarizing the text, or explaining how the book made the child feel. Two factors were identified that influenced response patterns from the study sites: the data collection instrument and adult mediation. This research has implications for library program development related to recreational reading and for changes in the procedures for data collection in this area of research.

In the article titled ‘International Children’s Digital Library’ (ICDL, 2005) information is presented about ICDL and its the first digital library to provide free access in nine languages. It is funded by the US National Science Foundation and the Institute for Museum and Library Services. It is mentioned that the materials included in the collection reflect similarities and differences in cultures, societies, interests, lifestyles, and priorities of
people around the world. It is further described that the collection’s focus is on identifying materials that help children to understand the world around them and the global society in which they live. It is mentioned that this library is one of the few online libraries for children with books reviewed by child readers around the world. Hutchinson and others (2005) have presented a case study and covered the challenges encountered in building the ICDL which include selecting and processing books from different countries, handling and presenting multiple languages simultaneously, and addressing cultural differences. They opine that ICDL must serve as a multilingual, multicultural, multigenerational audience. The authors have addressed the design criteria; current solutions and plans for future work.

Children of the age group 5-11 are among the largest user groups of computers and the internet. So it is important to design searching and browsing tools to support them. However many such tools do not consider their skills and preferences. Hutchinson and others (2006) in their paper present the design rationale and process for creating the searching and browsing tool for the International Children’s Digital Library (ICDL). Dania Bilal & Imad Bachir (2007) in their paper ‘Children’s interaction with cross-cultural and multilingual digital libraries’ present the outcome that studied the Arabic-speaking children’s interaction with the International Children’s Digital Library (ICDL) to locate Arabic books on four tasks. HyperCam software was used for capturing children’s information seeking activities. A measure that the researchers developed is used for assessing children’s
success. Group interviews were used for collecting children’s perceptions of and affective experience in using the ICDL. Children’s information-seeking behaviour was marked by browsing using a single function from simple interface pull-down menu as per the findings. Compared to assigned and semi-assigned tasks, children achieved fully self-generated, open-ended tasks. In order to improve the Arabic collection and the design of the ICDL, children had offered suggestions. Overall the findings have affected the practitioners, researchers and system designers.

Druin (2007) presents the case study of 12 children who use the International Children’s Digital Library (ICDL) over four years and live in one of the four countries – Germany, Honduras, New Zealand, and the United States. By conducting interviews and classroom observations along with collecting drawings, book reviews and work samples, this study describes how these children were interested in books, libraries, technology and the world around them. Findings from this study include these young people increased the variety of books they read online, still preferred physical interactions with books for reading, but appreciated the searching tools online, still valued their physical libraries as spaces for social interaction and reading, showed increased reading motivation and showed interest in exploring different cultures. Marcia Mardis and Robert Payo (2007) discuss how teacher-librarians could use Strategic Implementation Content Knowledge (STICK) tool to enable teachers, students, administrators and the community to recognize the importance of a vital school library program, which is indispensable in achieving
organizational and educational guidelines. The authors conclude that digital libraries may be an ideal part of a strategy to make the school library sticky for teachers and students.

Abdullah and Zainab (2008) examine the affordances that a collaborative digital library (CDL) can bring to bear on supporting information literacy practices in the digital information environment. They suggest that the digital library can contribute to student empowerment in information literacy practices while searching, using and collaboratively building the digital library resources. To illustrate this, the authors have been experimenting with the implementation of an integrated information literacy model based on Eisenberg and Berkowitz’ Big 6 Model and describes the CDL features in association with the information literacy dimensions in this model. The CDL focuses on the project-based learning approach to conduct students' project, which supports specific information behaviors that underpin research and learning such as information seeking, browsing, encountering, foraging, sharing, gathering, filtering, and using. Findings regarding teachers' reception of the digital library are encouraging as they feel the relevance of the digital library to the current requirement of the students' project and its potential to entrench information and resource study skills through project-based learning.

Despite their decade of deployment, educational digital libraries have not achieved sustained use in elementary and secondary schools in the United States. Barriers to accessing the Internet and computers have been widely targeted by myriad initiatives, but efforts aimed at bridging this first level 'Digital Divide' have not led to increased use of the Internet and
digital library resources in US classrooms. In fact, such programs have revealed additional divides that affect educator's use. Mardis, Hoffman and Marshall (2008) examine the additional digital divide levels and proposes a new framework for understanding technology innovation in schools that can improve development and outreach approaches by digital library developers.

Kiran Kaur and Diljit Singh (2008) have conducted a descriptive study states how university students perceive digital library services, or the integration of digital library elements within the traditional or hybrid library services in academic libraries. These services were identified through a preliminary study and evaluated the digital services offered by 20 university libraries. The top 5 libraries with most services offered were selected. Qualitative method of data collection using 10 focus groups consisting of 81 P.G. students was employed. Overall the focus group discussions reveal the digital services are very well received by users. The most popular being access to online databases, e-journals and e-books. Users almost unanimously request for more online help to assist in search for information and improve their information seeking skills. The results have implications for academic libraries providing digital services in a networked environment and recommendation made include providing better guidance to users and solicit feedback to make evidence based decisions on digital library service delivery.
Michelle Dubroy (2010) discusses the use of digital branches of libraries by children and the concept of creating children's digital library branches. It explains the concept of the digital branch, which contains access to staff, community, library collections, and a physical building, as well as a web site that provides users with access to the library's electronic collection. The article presents a review of research on the web design for children's web sites and presents several examples of successful children's web portals created and managed by libraries. Other topics include public library web sites, personalization in digital technology, and children's perspectives on web site design.

Abrizah and Zainab (2011) present the findings of a case study investigating secondary school teacher's understanding of the term digital libraries and their relationship with learning. The study addressed two research questions namely 'How do teachers conceptualize digital libraries, their relevance and issues relating to their integration into the curriculum?' and 'What are the teachers' perceptions of the initiative to develop a collaborative digital library for school projects?' they carried out a series of interviews on six history subject teachers which provided a detailed and succinct information on their understanding of digital libraries, their knowledge and use of the Internet and digital resources, their perception of the possible impact of digital resources on teaching and learning, the benefits teachers seen in digital resources and the problems they have in using them. It also offers important insights on history subject teachers' perceptions of the initiative to develop a collaborative digital
library for historical projects, perception of its potential use, pointing out the conditions that facilitate its use in the class rooms. The paper also points out the relevance of digital libraries to the history curriculum which will make readers understanding that using the technology is relevant to the teaching of all subjects.

Martens (2012) presents state of the art review of articles published between 1989 and 2010. Author states that the children have underdeveloped motor skills, difficulties with spelling and trouble in understanding the hierarchies, classification schemes and metadata. This creates some problem in finding information. The literature indicates that research in designing for children’s library is valuable not only because it seeks to improve children’s experience with digital resources but also because such research translates to other marginalized users and special needs populations.

Xinyu, Yu (2012) explores children’s interaction with picture books which shows relationship with visual perception. The author says this has an impact on children’s categorization and narratives and illustrations of picture books are works of art that can provide sources for children to appreciate art and enhance their visual perception. Physically as children grow, they constantly acquire knowledge and improve visual information by correcting previous perceptual errors.
Hourcade’s & others (2003) study highlights that reading books play an important role in children’s cognitive and social development. However many children do not have access to diverse collections of books due to the limited process of their community libraries. This research study addresses this issue by creating a large scale digital archive of children’s books, the International Children’s Digital Library. Authors are focusing on building the ICDL concentrating on informal evaluation of innovative digital book reader. Sedighi, Gilvari and Nooshinfard (2013) investigate the user interfaces of the most important world’s children digital libraries and consider their conformity with the expert’s opinions with the aim of proposing a set of unique and applicable criteria for Iranian children digital libraries that was not provided by the previous studies. They have collected data for this study by a check list for each of six world’s most famous children digital libraries. Based on the outcome of their study they have proposed a set of criteria for children digital library user interfaces. This set of criteria can only be used to evaluate the user interfaces of children digital libraries. They conclude that applying a unique set of criteria in designing children’s digital library interfaces could increase the amount of children’s use of such libraries.

2.5 Emerging trends in Digital Libraries
The trends in digital libraries are clearly visible from the growing number of publications. The periodical reviews conducted reveal that there is a rapid proliferation of articles, papers and reviews from 1990 to 2010. It was estimated by Nguyen and Chowdhury (2011) that there are over 8000
publications on digital libraries. The digital library knowledge map includes about 21 core topics and 1015 sub topics. Apart from these, new research topics such as ontology and semantic retrieval, virtual technologies, mobile technology, semantic web and social networking are coming up. Further in the years to come new and emerging technologies and standards, cloud computing technologies, reforms of the intellectual property laws and associated developments are going to emerge in the field of digital libraries.

Nagatsuka and Kando (2006) present the development of digital library activities within Asia Pacific and state that it has been increasing definitely. The eight International Conference on Asian Digital Libraries (ICADL 2005) which is one of the major conferences on digital library in the world held in December 2005 in Bangkok, Thailand. Digital library research in Asia Pacific is uniquely positioned in the world to help the development of cultural heritage, cross-cultural and cross-lingual digital library research. Through the presentations in the conference and also the publications, the recent trend of digital library research and development in Asia Pacific were discussed from the two aspects of technical and social.

Digital library research and practice is still in the nascent stage in developing countries like India. Huge investments are being made in information technologies by these countries on the lines of advanced countries and have developed national information infrastructure programmes and related research and development support strategies.
This calls for basic and applied research and digital libraries are fast becoming enabling technologies for other applications. Resources published electronically are located, collected, organized, preserved and disseminated electronically and these become contributing materials to digital libraries. Digital libraries are an important asset as distance independent learning expects that content should be accompanied with instructions. One of the problems of digital libraries is how to include ways to manage the related work products that need to be included in the software that supports computer supported cooperative work.

Digital libraries need more digital librarians. Both library and information educators and digital library practitioners are responding to this workforce shortage with training programmes. Consensus is elusive on the nature of digital libraries, so these training programmes differ significantly in their content and objectives. Competency based training is proposed as a method to help both groups reach greater shared understanding of digital librarianship and build more consistent digital librarian training programmes. The paper by Thomas and Patel (2008) suggests some abilities and competencies required for digital librarianship but it suggests multi tiered framework to help to define the digital librarians' job.

The paper by Doghe and Moreels (2009) presents the results of analysis of current practices and guidelines. From the existing myriad approaches found in the field the paper formulates a set of common criteria for selection by way of a sector independent long list. It also illustrate the
complex nature of selection, which may be seen to depend upon significantly greater number of criteria than have so far been put forward in any single guiding document, but also proposes a base technology that can be used in any institutional setting. Dr Kumbhar's (2012) review is based on the literature published during 2010. LISA database is used for collecting the E-resources analysed and reviewed under various broad categories. E-books are one of the latest technological evolutions in the development of communication technology. Number of agencies are related with the e-book media. Writers, publishers, aggregators, libraries and users are the agencies directly related with the e-book media. This review in nutshell gives the glimpse of growing interest in e-books.

Digital libraries have matured over fifteen years since the term came in vogue. Yet, the term 'digital libraries' has never come into general use outside the select group of conferences and journals. This research perspective is a collection of papers dealing with digital libraries, information access and data services. Chowdhary & Foo (2012) are providing the necessary historical context to understand current issues. The chapters covered here, range in style from analytical to the tutorial. Some describe individual research projects and case studies, others synthesize the literature in specific areas. Collectively the papers span the scope current research themes, user interfaces, architecture, equity, technology, organization, curation and social policy. Increasing trend of publications of explicit knowledge in digital forms along with digitization of manuscripts, print collections and other forms of human expression, have
created a ocean of digital information. The digital information has posed new challenges of preservation, copyright issues, digital divide, quality filtering, systematization and organization of information, etc. Digital information environment has helped to truly realize the goal of universal availability of publications and just in time access to information on desktops, notepads and smart phones.

Malban’s (2012) paper discusses the latest trends and publications of digital documents and emergence of new generation of information products and knowledge management tools to improve accessibility of digital information resources and improve their accessibility. It requires the convergence of efforts to organize such resources, synergy among ongoing projects, sharing of thoughts and culmination of actions for more effective action. In the 21st century several surveys have been done to ascertain the types and number of skills that the LIS professionals should master to handle digital libraries in future. Kaul (2012) describes the impact of ICT on the management of information and knowledge resources and the skills necessary to undertake this job. Classification of skills is presented and changes taking place in the universe of knowledge are described. Essential skills needed for selecting quality content, managing online content, accessing information available locally; at the national level and that available internationally are listed. Further he describes classification, cataloguing and metadata creating skills, ICT and database creation skills; skills to transform traditional library into online, skills to serve the users, generic and personal skills. He also suggests that
the LIS education in India needs to consider these new skills and techniques to be incorporated in the curriculum.

Advanced as well as advancing countries are focusing their attention on digital library research. Some DL initiatives or projects are carried out collaboratively or individually by certain research organizations and academic institutions and libraries but most of them are funded by government agencies and professional bodies. Some have winded up successfully but a good number of them are currently being carried out in many countries. Chowdhury and Chowdhury (1999) present an overview of a few major digital library projects that are completed or under progress along with the definitions and characteristics of digital libraries as given by a number of researchers. LISA CD-ROM database, Dialog search on library and information science databases coupled with scan of various issues of D-Lib Magazine and Ariadne, along with browsing of websites of various institutions engaged in digital library research have yielded the literature for review which has been presented under sixteen major headings. The study comes to the conclusion that a number of issues are yet to be resolved though a lot of learning has taken place in a short time concerning digital library research. These issues are compiled with the intention that they need to be addressed and resolved as a priority so that the digital library services can be practical in day to day life of the users.

Important U.S. libraries and their clients are moving towards a much greater demand for metadata and content that is nimble, agile, that can be combined with other items locally, and that can be integrated with
courseware systems, desktop scholars’ toolkits and local archives. Aggregations dictated by publishers and libraries are valuable but increasingly they are not sufficient to our needs if that is the only context in which that content can be accessed. The realities of the local service needs and the growing ambitions of users mean that there is a need for more of streamlined, flexible, time-saving, and interactive access. Advances in local institutional repositories, growing ambitions for digital curation, and the developing dialogue between libraries and their users concerning open access scholarship, all argue for richer aggregation integration of bulk of digital library holdings. In this paper David Seaman (2004) presents his observations of his decade experience in the university of Virgina’s digital library project. Dinesh Rathi and Ali Shiri and Shannon Lucky (2012) are reporting the work done in their research project on how two national and two public digital libraries selected from four different countries (Canada, United States, Britain, Australia) have made use of metadata elements and social media features such as social tags and recommendations to support the searching, browsing and navigation of digital information.

2.6 Conclusion

The literature review reveals that the digital libraries evolved over the past twenty years. They represent different subjects and disciplines. Different types of content have been created and deposited in the digital repositories covering the photographs, music and film to more scholarly scientific and social data. Research activities in the area of digital libraries
in the first decade covered metadata, indexing and information retrieval. The concentration in the 21st century is more on social, cultural, legal, ethical, organizational and use dimensions of the digital libraries. There is a growing concern in recent years for the designing the curriculum models and integrating them at different levels of education and training to bring out the suitable manpower to handle the digital library environment.

There is an increasing growth of digital libraries all over the world. Numerous challenges and issues are evolving as the team of researchers are involved in resolving the issues. Huge budget is earmarked by the various governments, institutions and corporate sectors. Apart from this, number of conferences and seminars on digital libraries are being organized at different levels. As a consequence of this, recent publication covering the different aspects and types of digital libraries are published.

REFERENCES


In Paper presented in NAACLIN 2012 held at The Maharaja Sayajirao University of Baroda (pp. 104–119). Vadodara.


