Chapter 1

Introduction
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INTRODUCTION

1.1. PREAMBLE

Advent of Information and communication technologies and their capabilities such as high-resolution capture devices, dramatic increase of digital storage media, explosive growth of internet and World Wide Web, have resulted in establishment of digital libraries. Sophisticated search engines, fast-processing power and reducing cost of computer, high bandwidth networks and increasing number of electronic publications make it possible for the implementation of digital libraries. Advanced countries like USA and UK have already established several digital libraries. In USA digital libraries came into existence due to the research projects, whereas in UK they were developed due to the efforts made by the library and information professionals. In addition, a growing number of universities, national libraries, professional associations etc. are also making efforts in developing their own digital libraries. Digital libraries have attracted almost all the developed and developing countries due to its features and the opportunities it extended to the information providers and information seekers.

The digital library has the information in electronic form and the electronic media facilitates the access to information available in digital form at different places. In other words, digital libraries are the logical extensions and augmentations of physical libraries in the electronic information society. Extensions amplify existing resources and services, and augmentations enable new kinds of human problem solving and expression. As such, digital libraries offer new levels of access to broader audiences of users and new opportunities for the library and information science field to advance both theory and practice. In a digital library, electronic publications have some limitations regarding management when compared to printed documents. They include infrastructure, acceptability, access restrictions, readability, standardization, authentication, preservation, copyright, user interface, etc. But still the advantages are more and therefore, the importance of digital libraries has been recognized by all nations of the world.
1.2. DIGITAL LIBRARY: AN OVERVIEW

The term digital library has been used to characterize a large storehouse of digital information accessible through computers. Like a traditional library a digital library serves as an archive of knowledge that spans many topics. Like a newsstand, a digital library provides information that changes quickly. Like a telephone or television, a digital library provides access² to events as they occur. Because information can be stored in many forms, a digital library can contain text, sound, graphic images, still and moving pictures, and conversations. In addition, a digital library can access information live as it occurs; the information need not be recorded. For example, a digital library can provide access to services that show the changes in users face, sample the current weather at a given geographic location, measure current traffic on a highway, or find the recent delay at an airport. Digital library occupies less space, need less manpower to manage and therefore are cost-effective.

1.2.1. Origin of Digital Library

The term ‘Library’ is derived from the Latin word liber, meaning book. The history of the library is linked with the story of the system of writing; in the form of books and documents; methods and systems of preserving these and most importantly, making these available and easily accessible for use. Earlier forms of books were clay-tables and papyrus, leather and parchments rolls. The advent of printing technology³ and use of papers during the sixteenth century accelerated the rate of book production. Since the beginning of the nineteenth century and more so during the twentieth century, there has been a phenomenal rise in production of books and documents. And the present is virtually an era of literature-boom of all kinds-macro and micro, generated in varied forms and contents. The primary function of library is to collect, organize, preserve and disseminate information to the end-users. With the passage of time, several techniques and technologies have emerged for handling the information more speedily and effectively. Invention of printing in second half of the 15\textsuperscript{th} century started a revolution in spreading thoughts and scholarships. Later on microfilm (1839), video-tape and TV (1908), sound recording discs (1877), audio tapes (1899), micro computers (1980) CD-
ROM (1985), optical (1998) etc., were introduced in commercial market which had an everlasting impact on publishing. Slowly all these recording media, used for storing information were introduced in the libraries. All these forms were acquired and stored separately because the information retrieval methods used different techniques for each form of media. As a result, combining information from different forms became difficult. In 1940s efforts were made by Dr. Vannevar Bush to integrate all these forms by designing a mechanical device called 'Memex' for storing, organizing and retrieving information received in various physical forms. During late 1980s Computer specialists succeeded in integrating the text, graphics and animation, audio and video information that were converted from different formats into a uniform digital media and could be retrieved through computer or computer networks. The transformation from Museum to Digital Library is summarized in Figure 1.1.

![Library Transformation Diagram]

**Figure 1.1. Library Transformation**

In 1990s there has been a revolution in digital library systems. Institutions, libraries and end users were all effected by these developments in libraries. At the same time general population became increasingly aware of the usefulness and capabilities of computer technology for education, research and recreation. Users have been demanding broader variety of information services, tailored to their requirements. They are also...
demanding for better quality of such services, single point of access and minimum training.

According to Jeffrey Pomerantz et al. (2006), A Digital Library$^7$ is an assemblage of digital computing, storage and communications machinery together with the content and software needed to reproduce, emulate, and extend the services provided by conventional libraries based on paper and other material means of collecting, cataloguing, finding, and disseminating information. A full service digital library must accomplish all essential services of traditional libraries and exploit the well-known advantages of digital storage, searching, and communication.

1.2.2. Definitions of Digital Library

The Digital Library in a broad sense is a computerized system that allows users to obtain a coherent means of access to an organized, electronically stored repository of information and data. The term Digital Library$^8$ may be used to describe any of the following:

- Collection of electronic journals and books
- On-line educational portal
- Repository of multimedia files
- Archives of information created from local knowledge
- The entire Internet

It is surprising yet true, that there is no single universally accepted definition of the term “Digital Library”. Different persons have defined the term digital library differently as stated below:

Tedd and Large (2005)$^9$ states that the phrases ‘Virtual Library’, ‘library without walls,’ ‘electronic library’ and ‘cyber library’ all used by some authors to describe the digital library.
Borgman (2003) defines, “a digital library is (i) a service, (ii) an architecture; (iii) information resources, databases, text, numbers, graphics, sound, video etc., and (iv) a set of tools and capabilities to locate, retrieve and utilize the information resources available”.

Ioannidis, (2005) defined digital library as the meeting point of many disciplines and fields, including data management, information retrieval, library sciences, document management, information systems, the web, image processing, artificial intelligence, human-computer interaction, and digital curation.

Drabenstott (2003) has identified the following common elements from various definitions of digital libraries.

- The digital library is not a single entity;
- Digital Library resources technology to link the resources of many;
- The Linkages between many digital libraries and information services are transparent to the end users;
- Universal access to digital libraries and information services is the goal;
- Digital library collections are not limited to document surrogates; the extent to digital artifacts that cannot be represented or distributed in printed forms.

The Digital Library Federation (DLF) defines digital libraries as:

“Organizations that provide the resources, including the specialized staff, to select structure, offer intellectual access to interpret, distribute, preserve the integrity of, and to ensure the persistence over time of collection of digital works so that they are readily available for use by a defined community or set of communities”. (Shiri 2003)

The DELOS (2004) Digital Library Reference Model defines a digital library as:

“An organization which might be virtual, that comprehensively collects, manages and preserves for the long-term rich digital content and offers to its user communities
specialized functionality on that content, of measurable quality and according to codified policies”.

With the assumption that digital libraries are libraries first and foremost, we can list some characteristics. These characteristics have been gleaned from various discussions about digital libraries, both online and in print (Chepesuik, 1997):

i. Digital libraries are the digital face of traditional libraries that include both digital collections and traditional, fixed media collections. So they encompass both electronic and paper materials.

ii. Digital libraries will also include digital materials that exist outside the physical and administrative bounds of any one digital library.

iii. Digital libraries will include all the processes and services that are the backbone and nervous system of libraries. However, such traditional processes, though forming the basic of digital library work, will have to be revised and enhanced to accommodate the differences between new digital media and traditional fixed media.

iv. Digital libraries ideally provide a coherent view of all the information contained within a library, no matter it is a form or a format.

v. Digital libraries will serve particular communities or constituencies, as traditional libraries do now, though those communities may be widely dispersed throughout the network.

vi. Digital libraries will require both the skills of librarians as well as those of computer scientists to be viable.

Based on the view of different persons, a Digital Library may be referred to as combination of library system with computer network technologies or computerized network system where all the library information is stored in an electronic format, which can be accessed and transmitted through networks enabling retrieval of required information by a large number of users. Users may access to desired information using a computer terminal at their pace of work.
1.2.3. Components of Digital Library

Digital library framework permits different computer systems to coexist. The key components run on a variety of computer systems connected by a computer network, such as the Internet. The following are the key components of digital library (S.K.Pandey 2010)\(^\text{16}\) and are illustrated in Figure1.2.

![Diagram of Digital Library Components]

**Figure 1.2. Components of Digital Library**

1. **IT Infrastructure**: It requires a library system with adequate number of computers with LAN / Internet and requisite software.

2. **Digital Collections**: It contains digitized information in different media such as CD-ROM, Disks etc.

3. **System Function**: A variety of systems functions to coordinate and manage the data existing and retrieval of data.

4. **Telecommunication facility**: It provides communication between one host to another. It is required to access the databases local or remote, access to network of networks and provision to provide e-mail services.

5. **Human Resources**: Trained manpower is required.
1.3. NEED FOR THE STUDY

Modern libraries are moving towards smaller, but with rich potential of information. The impact is seen in the form of the digital library, the electronic library, the virtual library, the hybrid library etc. In all these libraries, the information is stored in digital formats and accessible over a network. Many benefits of these libraries are well-known. The digital libraries are based on digitized data of information, which has gradually replaced paper-based records. Since the visual information systems are getting more popular these days in comparison to text-based information systems, digital libraries, are becoming more and more popular and extra graphical in nature at existing scenario. Digital libraries have the ability to view for several persons at the same time.

On review of the literature, it is observed that only a limited attempt have been made in the Indian context to study the digital library activities and these studies concentrate on design, development and establishment aspect. An initiative of digital library on case study method in Indian scenario has been observed in the literature. However, attempts on evaluating either the status or initiatives on digital library of educational institutions have not been noticed in the literature. This paved the way for examining the digital library initiatives especially in engineering educational institutions in Rayalaseema Region of Andhra Pradesh. Hence, the proposed study.

1.4. STATEMENT OF THE RESEARCH TITLE

“Digital Library Initiatives in Engineering Educational Institutions in Rayalaseema Region of Andhra Pradesh: A study”.

1.4.1. Explanation of the Concepts

1.4.1.1. Digital Library Initiatives

Digital library initiative is a starting of digital library or a move towards digital library. Merriam Webster Collegiate Dictionary (1993), defined initiative as an “Initial step or a starting move”. In India substantial number of library and information centers has initiated the digital library projects to establish it by procuring digital resources in the form of CD-ROM based databases, online data bases, online e-journals, online
bibliographical databases, and online indexes or by digitizing their own rare and valuable collection\textsuperscript{19} of archival importance.

In this study, the digital library initiatives includes provision of computer facilities in the libraries, digital library development, information technology based services such as CD-ROM search, database support services, electronic document delivery services etc., Information and Communication Technology (ICT) skills of library staff, efforts in digitization, constraints in the digital libraries, digital library network and consortia. The availability of these initiatives have been surveyed and examined among the engineering educational institutions in Rayalaseema Region of Andhra Pradesh.

1.4.1.2 Engineering Educational Institutions in Rayalaseema Region

In this study the concept of engineering educational institutions include Universities engineering institutions, private minority and private engineering institutions respectively offering courses in the subject of engineering science and technology and allied subjects. In Rayalaseema Region at present there are about 99 engineering educational institutions which are listed below:

- Universities and Government Engineering Institutions – 06
- Private Minority Engineering Institutions – 03
- Private Engineering Institutions – 90

This study covers only 92 engineering educational institutions in Rayalaseema Region (EAMCET-2010)\textsuperscript{22}.

1.4.1.3 Andhra Pradesh

Andhra Pradesh\textsuperscript{20} is one of the 28 states of India, situated on the southeastern coast of India. Andhra Pradesh lies between 12°41' and 22°N latitude and 77° and 84°40'E longitude, and is bordered by Maharashtra, Chhattisgarh and Orissa in the north, the Bay of Bengal in the East, Tamil Nadu to the south and Karnataka to the west. The state comprises of 23 Revenue Districts.
1.4.1.3.1 Rayalaseema Region

Rayalaseema (Telugu: రాయలాసీమ) is a geographic region in the state of Andhra Pradesh in India: It includes the districts of Anantapur, Chittoor, Kadapa, and Kurnool.

1.5. OBJECTIVES

The objectives of the study are:

i. To survey the engineering educational institutions that are opting for digital library initiatives in Rayalaseema Region of Andhra Pradesh.

ii. To examine information and communication technology (ICT) infrastructure facilities in the selected engineering institutions under study.

iii. To survey the digital collection development in the selected engineering institutions in Rayalaseema Region.

iv. To assess and identify the constraints in acquiring ICT skills among librarians.

v. To identify the facilities and constraints in the digital library initiatives in selected engineering institution libraries.

vi. To offer suggestions towards the implementation / improvements of digital library initiatives in engineering institutions.

vii. To propose for developing a prototype design for networking of engineering institutions based on the study.
1.6. HYPOTHESES

The following are the hypotheses formulated for this study:

i. Most of the educational institutions in Rayalaseema Region are opting for digital library initiatives.

ii. All the engineering educational institutions in Rayalaseema area have Information and Communication Technology infrastructure facilities.

iii. There exists heterogeneity in the motives for gaining ICT skills, among library professionals in engineering educational institutions at Rayalaseema Region.

iv. Managerial skills, subject skills and technical skills are at satisfactory level among the library professionals.

v. Librarians adopt varied means and methods to acquire ICT skills and face a few obstacles in acquiring ICT skills.

vi. There exists consensus among engineering educational institutions in Rayalaseema Region in developing a policy for establishing a digital library.

vii. There exist some constraints in establishing a digital library among engineering educational institutions in Rayalaseema Region.

1.7. LIMITATIONS

i. The study covers the attempts of digital library initiatives by the engineering educational institutions established up to July 2010 only.

ii. The survey has covered only the librarians of the respective institutions and the semi professionals not covered (assistant librarian, library assistant and others).
1.8. METHODOLOGY

The investigator has adopted the following methods in this study:

Step 1: Review of literature

The literature on digital library initiatives have been studied and reviewed, which facilitated the construction of the questionnaire.

Step 2: Questionnaire Construction

Based on the review of literature, a structured questionnaire (Appendix A) has been designed to collect data from the Engineering Educational Institutions in Rayalaseema region. The questionnaire elicits information on the following aspects:

- General information about the institutions
- Library collections
- Library manpower and skills
- Library services
- ICT facilities
- Library automation
- Digital library initiatives
- Constraints in digital library initiatives
- Suggestions to overcome digital library issues

Step 3: Questionnaire Survey

3.1. Pilot Study

A Pilot study was conducted with a sample of 20 respondents from different engineering educational institutions. Based on the study and results, the questionnaire was further modified and developed to suit the stated objectives. Accordingly, the revised questionnaire was finally administered.
Step 4: Administration of the Questionnaire

The revised questionnaire was administered among 92 engineering educational institutions all over Rayalaseema Region which were established up to July 2010. A total of 81 have responded and the response rate is 88.04%.

Table 3.1. Sample Frame

<table>
<thead>
<tr>
<th>S.No</th>
<th>Institutions</th>
<th>No of Questionnaire Distributed</th>
<th>No of Questionnaire Received</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Government Engineering Institutions</td>
<td>6</td>
<td>6</td>
<td>7.40</td>
</tr>
<tr>
<td>2</td>
<td>Private Minority Engineering Institutions</td>
<td>3</td>
<td>3</td>
<td>3.71</td>
</tr>
<tr>
<td>3</td>
<td>Private Engineering Institutions</td>
<td>83</td>
<td>72</td>
<td>88.89</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>92</td>
<td>81</td>
<td>100</td>
</tr>
</tbody>
</table>

Step 5: Data Analysis

The data collected from the questionnaire has been analysed to test the hypotheses framed and to fulfill the stated objectives. For this purpose, Statistical Package for the Social Science (SPSS) software packages has been used for the analysis of data. Statistical analysis techniques such as Frequency Distribution, Percentage Analysis, Weighted Arithmetic Mean, Linkert-type Scale Analysis, Cluster Analysis, ANOVA (Analysis of Variance), Discriminant Analysis, Chi-square test etc., have been employed depending on the nature of the data collected from the respondents.
1.9. CONSPECTUS

The thesis has been presented in seven chapters.

Chapter 1  Introduction on digital library, need for study, objectives, hypotheses, limitations and methodology of the study.

Chapter 2  Deals with the review of related literature.

Chapter 3  Brief account of source of digital information, digitization, digital library initiatives at International level and at National level.

Chapter 4  Present engineering colleges in India and State-of-The-Art Report of the engineering institutions in Rayalaseema Region.

Chapter 5  Analysis and interpretation of the data collected from the selected engineering institutions.

Chapter 6  Provides a summary of finding and suggestions.

Chapter 7  Presents a prototype design of digital library for engineering education and directions for the further research.

The thesis concludes with a list of bibliographic references and appendices.
REFERENCES


22. EAMCET (2010). Admission into Engineering & Pharmacy colleges information and instructions booklet, Andhra Pradesh.