CHAPTER - I
INTRODUCTION

1.1 Preamble

With the advent of the internet and the World Wide Web (WWW), the Digital Library (DL) field has emerged as an important application area. Distinct from traditional libraries, digital libraries process large collections of digital objects and provide on-line information services. They are very important for archiving and utilizing human knowledge records in the new networked world.

Today, we are living in the age of electronic information. Information is a dynamic and unending resource that affects all disciplines and walks of life. Over the last decade, electronic contents have become increasingly substantial components of collections in different kinds of libraries. This is due to the growing development of information technology and its impact on collection development policies. Changing trend of users need for the pinpointed and exhaustive information within a short time has forced library professionals to assert electronic products.

Information Communication Technology (ICT) in libraries has provided enough opportunities for building e-contents and disseminated them in the manner which suits the needs of digital libraries. Among e-resources, e-journals and e-books are mostly preferred by the users Arun Kumar (2009)\textsuperscript{1}.

ICT has brought a revolutionary change in the information scenario, giving rise to a number of options to handle varied information sources. As a result of which e-content resources have become the most sought after modern library, reserves in satisfying varied needs of students, teachers and researchers with minimum risk and time. The electronic information resources have acquired a major portion of library collections and the value of information resources, particularly E-contents have increased with the time and therefore there is a necessity to make a study on the different aspects of e-resources and issues related to the faculty members of academic institutions Sunil Kumar Satpathy et.al (2010)\textsuperscript{2}.

The recent developments in Information Technology (IT), the Internet, WWW, coupled with increase funding for research on creation, access and management of E-content resources, have led to the development of the new era of electronic and digital libraries. These technological innovations have improved the
new breed of information professionals to select, organize, retrieve and transfer
digital contents effectively and efficiently to their target audience Shemeent (2002)³

The importance and challenges of digital libraries have attracted many
researchers. We need to be able to model a generic digital library properly before we
are able to make the building process easy. The multidisciplinary nature of digital
libraries makes the generic modeling of a digital library very difficult Baeza-Yates
(1999)⁴.

Internet and online resources provide access to a variety of information
ranging from basic to specific sources. However, the authenticity and value of the
online information mainly remain interrogative. Therefore, the awareness among the
users is necessary for the value-added information and research. Moreover,
accessibility, format, style and arrangement of the online information resources are
different from the conventional sources. Hence, users are expected to adopt different
approaches to access and use the electronic content resources Parashuram Kattimani
(2010)⁵.

1.2 Digital Libraries: Meaning and Nature

The term electronic library, digital library and virtual library have been used
interchangeably and now widely accepted as description of the use of digital
technology by libraries to acquire, store, conserve and make available their content
to remote users.

In abroad sense, digital library may be defined as an organized and managed
collection of highly quality information contents in a variety of media (text, still
image, moving image, sound or combination thereof), but all in digital forms
accessible over different electronic networks. Such a digital library includes a
number of search or navigation aids that both operates library and allow access to
other collection of information connected by network world wide.

The term digital library best defined by Christine Borgman (1996)⁶ is a set of
electronic resources and associated technological capabilities for creating searching
and using information. They are an extension and enhancement of information
storage and retrieval system that manipulate data in any medium.
The concept of digital library is rooted in the age-old dream of creating a virtual library. But digital library is different from virtual library because of its physical identification. James J, O’ and Donnel (1995) differentiate digital library from virtual library as it can still maintain a physical presence, whereas virtual library is a vast, ideally universal collection of information and instantaneous access to that information wherever it physically resides.

1.3 Types of Digital Library
Digital libraries can be grouped in the following ways:

1. Digital libraries developed in USA as part of DLI1 and DLI2 (Digital Library Initiatives)
2. Digital libraries developed in the course of eLib (electronic Libraries) programme in UK
3. Digital libraries built by individual institutions
4. Digital libraries that are part of National Libraries
5. Digital libraries that are part of universities, or by period, or by country of their origin

1.4 Objectives and Functions of Digital Libraries
The primary objectives of Digital Libraries are:

- To collect, store, organize and access information in digital form via communication channels
- To meet the requirements of patrons by providing better services
- To provide personalised and retrospective services in efficient way
- To have large digitized databases
- To save time of library staff by avoiding routine jobs
- To provide coherent view of all information within a library in any format
- To serve widely dispersed communities throughout the network
- To minimize massive storage and space problem of large libraries
- To reduce cost involved in various library activities
1.5 Digital E-Content Resources

Digital resources may be defined broadly as any electronic journals, magazine, e-zine, webzine, newsletter or type of e-serials publications, which is available over the internet and can be accessed using different technologies such as www, gopher, FTP, telnet, e-mail or list server etc. E-Journals are the periodicals, regular or irregular moderate unit made available in an e-format either on a static medium or via computer networks Ranganathan’s Five Laws to the digital resources applied in this study are

1. Digital resources are for use
2. Every use his or her digital resources
3. Every digital resources its user
4. Save the time of the user
5. The digital resource is a growing organism

1.5.1 E-Content Resource Access Types

The access to e-content resources through internet is prominent because of the inherent advantages of the net over other media such as CD-ROMs and advancement in web technology. The most significant advantage is of wide access and currency of information on the net. However, the types of access are in itself not uniform. The publishers provide the following different types of access mechanism:

a) Free Access: On subscribing to the print version of the books, journals, reports, reference proceedings etc., some publishers provide free access to the electronic version of the e-content resources.

b) Fee-based Access: This is one of the most preferred access mechanisms by both the subscriber and publisher. On the payment of an access fee, which is a certain percentage of the cost of the printed e-content resource being subscribed, the publisher provides access to its complete e-holdings. The subscriber will have to maintain the print level subscription throughout the period of agreement. The access fee percentage in such cases depends on the quantum of print level subscription.
e) **Exclusive subscription:** Institutions can obtain complete access to all the e-journals brought out by the publisher without subscribing to the print counter parts. However, the subscription charges in this case are very high i.e., approximately 90 percent of the print subscription.

d) **Selective Access:** The subscribers choose a maximum number of e-content resources from the publisher and pays for them as per agreed terms and conditions. The publishers because of the difficulties in their administration do not favour this type of access.

e) **Institution Vs Consortium Access:** Institutional access of e-journals is expensive and not many institutions and organizations can afford to subscribe to e-journals, particularly in developing countries. In consortia access, a few institutions that have common interests and requirements can form consortia for e-journal access. This would be an economic model for wider accessibility and develop a strong information base.

### 1.6 Benefits and Impact of E-Content Resources

The tremendous growth of knowledge and information explosion has posed challenge in procuring, organizing and disseminating information for librarians and actual users. With the help of modern information technology and communication technology, libraries and information centers can render their services and also respond to the needs of the readers. Several factors like training of library professional, funds, information policies, modern information technologies also have been taken care of. The following are the expected benefits:

- Immediate accesses to high demand and frequently used items
- Easier access to individual components within items (e.g. articles of journals)
- Access at multiple points in time (24 hours a day. 7 days a week) and to multiple simultaneous users
- The ability to reinstate out of print materials
- The potential to display materials that are on in-accessible formats, for instance large volumes or maps
✓ Virtual reunification allowing dispersed together
✓ Ability to enhance digital image in terms of size, sharpness, color, contrast, etc
✓ The potential for integration into teaching materials
✓ Enhanced search ability, abstract and full text
✓ Integration of different media (sound, video etc)
✓ Reducing the burden or cost of delivery

1.7 Content Management System

A Content Management System (CMS) is a collection of procedures used to manage work flow in a collaborative environment. These procedures can be manual or computer-based. The procedures are designed to:

✓ Allow for a large number of people to contribute to and share stored data
✓ Control access to data, based on user roles which define the information each user can view or edit
✓ Aid in easy storage and retrieval of data
✓ Reduce repetitive duplicate input
✓ Improve the ease of report writing
✓ Improve communication between users

Figure 1.1 Basic Content Management System [Bob Boiko (2005)]
CMSs are frequently used for storing, controlling, revising, semantically enriching and publishing documentation. A CMS is responsible for the collection, management and publishing of chunks of information known as content components. A management system, which is a sort of database, stores these components. The publication system draws components out of the management system and turns them into publications.

A CMS as shown in Figure 1.1 is effectively collecting, managing, and making information available in targeted publications. According to Bob Boiko (2005)⁸ "Content Management is a combination of well defined roles, formal processes, and supporting systems architecture that helps organizations contribute, collaborate on and control page element such as text, graphics, multimedia, and applets". CMS involves the three parts of large physical overlaps as shown in Figure 1.2.

Figure 1.2 Parts of the CMS

It is a discipline that involves the collection, management and publication of content with clearly defined rules, methods, documented workflows and applicable tools and techniques with effective publishing system.

1.7.1 The Collection System

A CMS collection system is responsible for all the processes that happen before a piece of content is ready for publication. It turns raw information into a well-organized set of content components. An overview of the collection process, showing authoring, acquiring, converting and aggregating is shown in Figure 1.3.
1.7.2 The Management System

The management system in a CMS is responsible for the long-term storage of content components and a range of other resources. The management system contains the repository, workflow, and administration facilities.

1.7.3 The Publishing System

The publishing system is responsible for pulling content components and other resources out of the repository and automatically creating publications out of them as shown in Figure 1.4.
1.8 Digital Library Contents

The most important components of digital library, however is its digital collection. Viability and extent of usefulness of a digital library would depend upon the critical mass of its digital contents. The information contents of a digital library includes virtually any kind of electronic media (text, image, graphics, video, etc.), licensed databases of journals, articles, abstracts and description of physical collection.

Theoretically any object from a text fragment to an animal in zoo may be rendered digitally and thus, there is no limit to the types of contents that may be held by a library. But in practice, digital contents may be of three types:

✓ Contents created and existing primarily in machine readable format
✓ Contents converted from the traditional format into digital (e.g., print text, pamphlets, manuscripts, motion pictures and recorded sound)
✓ Access to external contents, not held in-house, by providing pointers to web sites, publisher’s services, password to consortium or other collaboration from commercial organizations

1.8.1 Management of Digital Library Contents

Contents in digital library are organized and managed for the purpose of immediate access to the target audience. How contents are developed and managed, is a critical issue to the long-term success of digital library services, especially when technical resources are limited. Content management includes the following key functions:

✓ Selection and acquisition
✓ Indexing
✓ Storage
✓ Retrieval
✓ Maintenance
✓ Rights management
1.9 E-Content Resources: An Overview

In the fast-emerging and ever-growing information explosion, it is very difficult to retrieve particular information within a short time. The advances in the field of information technology contribute significantly to improve the services of libraries. Now-a-days libraries are not only seen with printed documents and non-print documents but also with computers. The impact of technologies such as CD-ROMs, multimedia, computer networks, internet, etc, have led to a paperless society. With the availability of computers, capable of computing at very high speed and having large disc storage space, it is possible to digitize and store information in the form of high quality graphics, colour images, voice signal and video clips at a relatively affordable cost Baljinder Kaur et. al (2006)\(^9\). The comparison of a library with paper content and electronic control is shown in Table 1.1.

There are several forms and types of E-content resources which are available in the internet, some of the popular ones which gain ground are the electronic journals, standards, technical specifications, reports, patents, full text articles, trade reports and hosts of other document sources. The printed versions of scholarly journals are also available on the web. The publishers of journals provide services like E-contents, abstracts of articles, full text, before the actual printed version is put on the stands. Majority of this kind of service providers are those who publish several journals such as Elsevier, Academic Press, Springer, Oxford University Press, Taylor and Franc's Blackwell Science and others.

The above services are available to anyone who wants to publish research papers free of cost. Some of the journals are only available on commercial basis for which library has to subscribe and for these journals, users have to pay for viewing if needed. E-journals are known as various names such as electronic journals, internet based serials, online journals, e-serials and electronic serials. But the term ‘E-journal’ has become a standard as these are available electronically via a computer or a network. These may or may not be published in the other (physical) medium but these are not available on CD-ROMs or diskettes Jones (1998)\(^10\). The advantage of the electronic resources is that many users can simultaneously access to a single electronic copy from different locations.
Digital storage also permits libraries to expand the range of material, they can provide to their users since audio cassette tapes and records cannot stand a large number of playing without deterioration. Their digital representation (digital audio) can produce a format which is much safer and of better quality. Digital materials can also permit access to video tapes and new kinds of multimedia materials that are created only on computers and have no equivalent in any traditional formats. Table 1.1 gives the comparison of paper content and electronic content features.

Table 1.1 A Comparisons of Paper Content and Electronic Content Features

<table>
<thead>
<tr>
<th>Features</th>
<th>Paper Content</th>
<th>Electronic Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tactile</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Portable</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Access Without Devices</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Easy Random Access</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Multiple Access At One Time</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Customizable( Font Size, Annotations etc)</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Hyperlinks</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Text</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pictures</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Audio</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Animation /Video</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Instant Search Facility</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Easily And Conveniently Read</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Easily Damaged (I.E. Tear)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Content Updated Easily</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Go Out Of Print</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Highly Interactive</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Good Legibility</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Easily Reproduced Same Quality</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
The digital information can be copied without any error. As a result, preservation of a digital world does not depend on having a permanent object guard but it has the ability to make multiple copies Lesk Michael (2006).11

1.10 E-Content Resources in Academic Environment

E-content resources have brought new possibilities into teaching, learning and research, but at the same time they have created more demands on academics and researchers. E-content resources have been the biggest and most precious gift of the 21st century within a short span of time, it has revolutionized the whole philosophy of teaching and learning process especially the scholarly communication through blackboards, chalks and dusters which have started giving way to the projects and white screen in the classrooms. E-content resources are valuable especially for identifying and accessing the published work of scholars.

Information to improve the quality of study, particularly teaching and research, internet, e-mails, e-journals, e-books, CD-ROMs is considered as some of the important e-products. Internet and its most used component has turned into the greatest source of information with wide coverage and fast accessibility Mathew and Sheeja (2005).12 It is the most powerful tool for global communication and exchange of information. The amount of available information on the web is increasing consistently at an unbelievable rate. It has emerged the way the people can access information, and has opened up new avenues such as digital libraries, information dissemination and retrieval, education, e-commerce, entertainment, government and health care.

The new technology has given the libraries the facility to concentrate on different types of information sources, including virtuality, increasing and thus allowing an easy access to information among user communities. Widespread use of E-content information systems and more flexible access to further higher education have lead many people to use the libraries. The online and electronic publishing will help the users to access the information without any delay. Technology has brought an easier way of accessing information both for the faculties and researchers. The E-content resources are easily searchable like viz: specific terms, definitions, chapters, often by just clicking on a key word within the text.
E-journals are being able to evolve quickly as they are not tied to a format, printer or distribution network Moret (1997)\textsuperscript{13}. A 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.

1.11 Types of E-Content -Resources

The E-content resources are basically divided into two major types:

1. Online e-resources which include
   - E-journal (Full text and bibliography)
   - E-books
   - On-line databases
   - Web sites

2. Other E-content resources which include
   - CD – ROM
   - Diskettes
   - Other portable computer databases

1.12 Use of E-Content Resources in Libraries

The E-content 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-content resources at large Pricilla Rani and Geetha (2007)\(^\text{14}\).

1.13 Impact of E-books

E-books are preferred by the users for their features like portability, upgradability, note making, citation, changeable font, references, links to other relevant sites and searching etc., Libraries purchase e-books and provide facility to view them on monitor or with some specific e-book readers. E-books can also be circulated like printed books. They can be transferred from library catalogue to users. E-book readers avail it for a fixed loan period and after that it is automatically taken back. In this regard, libraries can limit the access by giving a specific period.

E-books help the readers by giving more possibility of access and media of learning. They can be accessed from anywhere at anytime and free from time lag. E-books will not go out-of-print by any chance. They can also create a personal book library from the collections which they hold. The content, however, needs to be compatible to all hardware devices. They need to support any format to make them easy to transfer and read. The features of e-book include the following:

- Their portability gives a new chance of learning, e.g., Distance learning
- Can be carried and transferred anywhere
- Changeable font size makes it easy for usage
- Searchable and navigable through links Snowhill (2001)\(^\text{15}\)

1.14 Impact of E-journals

E-journals have now become a major source of information delivery for faculty and researchers. Their timely production, delivery, incorporation of multimedia, hyper links and searching facility has attracted the large group of people. E-journals facilitate documentation in many ways so as to get the recent publications even before they get published as hard copy. The libraries incorporate
this facility to access the subscribed journals online through login mode and upload them on a local server. The users of library can browse the journals which further provide closer link with a wider variety of supplementary information to formal and peer-reviewed materials.

The libraries can assist the users by
- Creating a subject wise list and linking to all resources. [subject gate ways]
- Creating search for journal title and locating the sites
- Maintaining the list of websites that provided e-journals and checking to access at frequent intervals. The users may feel convenient of online searching, browsing, scanning, retrieval and even submission of articles as it saves the time and makes them more productive in academics

1.15 E-Content Factors Related to Publication

There has been evidence about the potential for electronic publication for the past five years. However, much of the research about electronic publications has been driven by technology rather than demand. A significant proportion of the recent literature about E-content resources has focused on the views of authors and the scholarly community in general and it has emphasized the scholar’s role as author. Librarians’ concerns have naturally insisted on the difficulties of providing access to e-content resources for users and archiving them for future access. Commercial publishers are concerned about protecting both their role in the scholarly communication process and profit. The views of e-resources users' themselves have been accorded comparatively a little attention.

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 Resnick et. al (2008)\textsuperscript{16}.

1.16 Current Scenario on Usage Pattern of E-Content Resources

Spending large amount on e-content resources may not create an impact on the services until proper human resource is deployed to serve the end users. The assumption and facts are to be analyzed to study and find out the need of the users so as to support and provide an effective access to e-content resources. Libraries have to redesign the flow of works and staffing in order to provide dynamic help desk reference service for making access pattern easy. Providing help desk services needs improvement, response time, problem solution, systematic information capture, service expectations and policies. Co-operative efforts of library and information technology professionals are necessary to ensure reliability.

E-content resources have been an emerging area in the activities of the Library. In developed countries, many academicians do have networked PCs on their own desk and some personal control of the software mounted on its hard disk Woodward et. al (1997)\textsuperscript{17}. However, students are mostly accessible to public PCs or their institute computer laboratories only. Removable storage devices are to be used by the students, as basically they cannot store anything on the hard disks of these terminals. Moreover, they are not entitled to install any software on to these shared machines. Even though the viewers Personal Digital Assistant [PDA] are freely available, the disk space to mount them on a local server is not free, and there will be a competition from other software packages in underdeveloped countries. Even after an institute provides PCs with network facilities, problems like power supply and wide access to information are very common to the students.

1.17 Access to E-Content resources

In the day to day activity, users are bundled with heavy work and hence they rely on ready information access. But many barriers are thrown to access the ready information on network commonly with network delay: source of e-content resources being hosted in a different place through service provider has to pass through various networks to reach a particular reader. There are five screens from
which the user must select an option to view either the abstract or the full text of an individual article. If each of this access is slow, the overall time to reach a required document may be quite long. As not all potential readers have their own machine anyway, at peak hours the network traffic is very high and hence the access speed would be less.

1.18 User’s Interests Read by Publishers

Since e-content resources are rapidly occupying a significant place in this digital age, the publishers are making a successful business out of the needs of the users. Many commercial publishers come forward to provide their resources on the internet. Basically, publishers’ web sites list some sort of contents page, giving resources that they make available in electronic format from which users can link to the individual documents. At present, users need to access the internet sites of several publishers and input different passwords to obtain their required document. This is in contrast to the arrangement of a library, where all the resources on a particular subject are shelved together. The evolving internet resources system appears to suit the business interests of publishers, and sometimes it does not fit the interests of the users. Therefore, it may not help the publishers and no profits will be made from electronic resources. To overcome this problem, efforts are being taken up by those organizations.

1.19 E-content Page Viewing - User Friendly

PDF is one of the most commonly used formats by the publishers to view the documents. This requires users to have the acrobat viewer which is available free of charge and can be installed on PCs. The effect of using acrobat or other such viewer is that appearance of the printed page is preserved even though the text is searchable.

The document thus looks like the printed one and pagination which is important for bibliographic referencing in the printed format is maintained by publishers who tend to assume that this is desirable but scholarly opinion is divided. Some academicians argue that citation makes it clear and it is referred to either in the print or electronic version.
1.20 E-content Resources Lead to Superfluous Information

In the last five years the development of networked information resources has radically changed the way in which both academics and libraries operate. Mostly users do find it convenient to search information from their own desks. Libraries are doing a great deal to facilitate users' access to electronic information by means of CD-ROM networks. Internet pages provide links to national subject databases and datasets, and the development of web-based OPACs to experience a seamless method of information retrieval. Users find it an inconvenience to use different interfaces and software packages to look at information. If the library can make interfaces and search procedures more uniform for all the publishers, users will be luckier to use resources.

1.21 E-Content Resources towards Cost Benefit

When resources are published electronically, the publishers are likely to reduce their price compared to printed ones. Some publishers are more tentative: most of them are keeping the printed formats as the primary subscription and charging libraries additionally above the subscription if they wish to get the electronic version. Only a small number of publishers are offering electronic resources as separate, stand-alone subscriptions; those electronic products have been priced at the same level as, or higher than the printed documents.

Since the cost of memory storage continues to fall, it must be remembered that simultaneous access by multiple users to large number of documents should be provided with necessary hardware, network and software. Although the “free” internet documents make no charge to users for access, they are almost small.

As a recent study confirmed that the full texts of e-content resources mounted locally in each subscribing library, make quite substantial cost of disk storage for holding the full text. The addition of video clips and sound to e-information would slow down the network traffic. The delivery of full text and graphics over the internet are found to be slow at peak hours.
1.22 Indian E-Content Consortia Resources

Academic libraries in India are facing a lot of problems due to static budget and exponential price hike of library collections. The library environment is currently undergoing a rapid and dynamic revolution leading to new generation of libraries with the emphasis on e-content resources. A lot of efforts have been taken in the past few years to overcome this problem of financial crunch by resource sharing through consortia for libraries.

In India INFLIBNET, UGC-INFONET and INDEST-AICTE Consortium are the major initiatives for digital libraries. The revolutionary steps are providing scholarly resources including peer reviewed journals, databases, abstracts and proceedings, etc. These efforts must be a boon to library users and growth level of higher education system in India Bajpai et. al (2009)\textsuperscript{18}.

1.23 E-Content Consortium

A consortium is a set up of two or more libraries which agreed to co-operate with each other in order to share the e-content resources at discounted price. A consortium supports and provides services to users through programmes in co-operative acquisition, access to e-content resources such as e-books, e-journals, bibliographic databases access to physical collections, enhanced inter library loan and document delivery in an effective way.

The Dictionary.com provides the definition as “co-operative agreement among groups of institutions”. According to Oxford English Dictionary (1966, p.260), Library consortium is a community of two or more information agencies, which have formally agreed to co-ordinate, co-operate or consolidate certain functions “to achieve mutual objectives”.

According to Dong and Zou (2009)\textsuperscript{19} “A Library consortium is an association of libraries established by formal agreement, usually for the purpose of improving services through electronic resource sharing among its members”.

A consortium is an association of two or more individuals, companies, organizations or governments (or any combination of these entities) with the objective of participating in a common activity or pooling their resources for achieving a common goal. “Consortium” is a Latin word, meaning ‘partnership,
association or society' and derived from "consors" meaning 'partner', itself from "con"- 'together' and "sors" - 'fate', meaning owner or comrade.

1.24 Importance of E-content Library Consortium

The consortium facilitates the libraries to get the benefit of wider access to e-content resources at affordable cost and at the best terms of licenses. A consortium, with the collective strength of resources of various institutions available to it, is in a position to resolve the problems of managing, organizing and archiving the electronic collections Moghaddam and Talawar (2009)²⁰.

The phenomenon of information revolution has posed several problems and this has far reaching implications in the society. The nation or society which possesses more information will lead the world which is also true in case of individuals. This power of information has induced the nations and individuals to acquire and control more quantities of information. But in this aspect, the poor nations, societies, institutions or individuals will be back as compared to the others.

This has created a big gap in the availability and use of information and library consortium can be an ideal solution in this context. Perhaps the most important advantages of library consortia would be their enhanced ability to serve the society by giving better library services.

1.25 Features of Library E-content Consortia

- It provides each organizations and institutions with the capacity to share their E-content resources without sacrificing the individuality of each member library
- The collections of the consortium libraries enable each member library to support scholarly research for its users
- Cooperative research and development in application of information communication and technology enhances service and realizes cost effectiveness
- Staff development and interaction with quality of service
It is the cooperative task to reduce the cost of purchase of e-content collections. As a result, end users can take benefits of more resources available in a library

Library services are provided with an emphasis on access to e-content resources including databases and services offered through the internet and www

To expand the inter library searching at less cost

Uncertainties in legal issues are handled with more confidence

1.26 Advantages of E-content Consortia

Some of the important advantages of the library consortium are given below.

- Consortia-based subscription to E-content resources provides access to a wider number of E-content resources at substantially lower cost
- Optimum utilization of funds
- Facilities to build up digital libraries
- Helpful to provide better library services like CAS (Current Awareness Service) and SDI (Selective Dissemination of Information)
- Cost sharing for technical training support
- Electronic journals demand neither library space nor shelling cost
- The consortium has been offered better terms of licenses for use, archival access and preservation of subscribed E-content resources, which would not have been possible for any single institution
- Less economy expansion

1.27 Consortia Initiatives in India

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 Chakravarty and Singh (2005)\textsuperscript{21}.

Some of the successful library consortia setup so far in India is listed below.

1. University Grants Commission – Information Network (UGC-INFONET)
   http://www.ugc.ac.in/new_initiatives/infonet.html

2. Indian National Digital Library in Engineering Sciences and Technology (INDEST)
   http://www.paniit.iitd.ac.in/indest

3. Inter University Consortium for Department of Atomic Energy and Facilities (IUC-DAEF)
   http://brahma.iuc.res.in/-iuc_cc/iuc_loc.html

4. Health Science Library and Information Network (HELINET)
   http://www.rguhs.ac.in/hn/ne_whell.html

5. Forum for Resource Sharing in Astronomy and Astrophysics (FOSRA)
   http://www.iiap.res.in/library/forsa.html

6. Council of Scientific and Industrial Research (CSIR)
   http://www.niscair.res.in

Apart from the above mentioned consortia, there have been efforts to set
up similar kinds of consortia by ICAR, ICMR, ICSSR, ISRO, IIM and other
governmental agencies to provide an access to e-content resources. Among these
UGC-INFONET and INDEST–AICTE consortium are proving to be a boon for the
academic community.

These two major initiatives have come to assist the academic libraries so
that they can cater to the needs of academic users who depend upon them. These
revolutionary steps are providing scholarly resources including peer reviewed
journals, databases, abstracts, proceedings etc., The efforts will definitely boost the higher education system in India.

1.28 UGC-INFONET Consortium

UGC-INFONET e-journals consortium initiative was undertaken by the University Grants Commission (UGC) to facilitate free access to scholarly journals and databases in all fields and disciplines by the research and academic community in India Kumar et. al (2006)\textsuperscript{22}. All the universities who are under the purview of UGC have been provided with UGC-INFONET connectivity and access to scholarly e-journals and databases.

More than 2,000 scholarly journals and databases were made available during 2004 and this number has increased to 4,500 full text e-journals since January 2005. As of May 2006, 122 universities are accessing resources from the programme. The access is based on IP (Internet Protocol) range. This effort has had a noticeable impact on research and academics Suresh Chauhan and Prem Chand (2007)\textsuperscript{23}.

1.29 INDEST-AICTE Consortium

The "Indian National Digital Library in Engineering Sciences and Technology (INDEST) Consortium" was set-up by the Ministry of Human Resource Development (MHRD) on the recommendations of an expert group appointed by the Ministry under the chairmanship of Prof. N. Balakrishnan, IISc (Indian Institute of Science). 48 centrally-funded Government institutions including IITs, IISc Bangalore, NITs, IITs and IIMs are core members of the INDEST consortium.

The ministry provides funds for providing different access to electronic resources subscribed for the consortium to the core members through the consortium headquarters set-up at the IIT Delhi. The consortium has recently been renamed as INDEST-AICTE consortium which is the most ambitious initiative taken so far in India.

The benefit of consortia based subscription to E-content resources is not confined to 48 major technological institutions in the country but also extended to all educational institutions under its open-ended proposition. 60 Government /
Government-aided engineering colleges are provided with accessibility to select E-
content resources with financial support from the AICTE and 100 engineering colleges
and institutions have already joined the consortium. The total number of members in
the consortium has now grown to 948.

The INDEST-AICTE consortium, on the basis of sheer strength of
number of institutions has attracted the best possible price and terms of agreement
from the publishers. The consortium subscribes to over 6,500 electronic journals from a
number of publishers and aggregators. The INDEST’s web site hosts a search
interface to locate these journals and their URLs as well as their alphabetical list.

Change is the law of nature and as it is very apparent in the present
library environment. A few decades back, Lancaster (1982)\textsuperscript{24} talked about the
“paperless society”. However, libraries have stepped into a paperless society very
rapidly and most of the university libraries in general and special libraries in
particular have begun to collect funds exclusively for E-content resources.

The INDEST-AICTE consortium has framed the following objectives:

i. To subscribe to E-content resources for the members of the
consortium at highly discounted rates and at the best terms and
conditions

ii. To extend the benefit of consortia-based subscription beyond the
core members to other engineering and technological institutions

iii. To impart training to the users and librarians of the member
institutions on subscribed E-content resources with an aim to
optimize the usage of E-content resources

iv. To find out more avenues of co-operation and interaction amongst
member libraries

v. To increase the interactions amongst the members of institutions
and

vi. To increase scientific productivity of member institutions in terms
of quality and quantity of publications
1.29.1 Major Activities of INDEST-AICTE Consortium

The following is the list of major activities of the INDEST-AICTE consortium.

- Arranging subscription to E-content for member institutions
- Identification of new resources
- Interaction with member libraries to ensure optimal utilization of subscribed E-content resources
- Ensuring access to subscribe to E-content resources to member libraries as per their subscription
- Organizing training programmes for the member institutions on the use of E-content resources; Initiating additional activities to enhance the existing services of the consortium

1.29.2 Membership

The consortium has divided into the following category based on e-content resources allocated to them.

**Group 1:** IITs and IISc
**Group 2:** NITs, ISM, SLIET and NERIST
**Group 3:** IIITs

IIMs and NITIE

The ministry provides funds for providing various accesses to E-content resources to these institutions through the consortium which has headquarters set-up at the IIT, Delhi, India.

1.29.3 Members with Financial Support from AICTE

The INDEST-AICTE consortium has enrolled 60 members with financial support from the All India Council for Technical Education (AICTE), New Delhi, India.
1.29.4 Self-Supported Engineering Colleges and Institutions

The consortium, being an open-ended proposition, invites AICTE-accredited and UGC-affiliated institutions to join hands with the leading engineering and technological institutions in India and shares the benefits. It offers benefits in terms of lower subscription rates and better terms of agreement with the publishers. 453 engineering colleges and institutions have already joined the consortium under this proposition. The brochure and application form can be downloaded from the INDEST-AICTE consortium’s website at http://paniit.iitd.ac.in/indest/or http://indest.iitd.ac.in/. Recently, AICTE has announced a new scheme for AICTE affiliated institutions to join the INDEST-AICTE consortium for selected e-content resources at lower rates of subscription.

1.29.5 Governance

The consortium operates through its headquarters at IIT Delhi under a National Steering Committee consisting of members from beneficiary institutions. Prof. Surendra Prasad, Director, IIT Delhi and Prof. Damodar Acharya, Chairman, AICTE serve as Chairman and Co-chairman for the National Steering Committee respectively. A National Review Committee has also been set-up under the Chairmanship of Shri Ravi Mathur, Joint Secretary (Technical Education) with an overall responsibility for making policies, monitoring the progress, coordinating with UGC and AICTE for promoting the activities of the INDEST-AICTE consortium.

1.30 Electronic Resources Subscribed by the Consortium

Electronic resources subscribed by the INDEST-AICTE consortium can broadly be divided into the following two categories:

1.30.1 Full-Text Electronic Resources

Full-text E-content resources contain complete articles along with their bibliographic details. The INDEST-AICTE consortium subscribes to several full-text e-content resources like IEL Online, Science Direct, Springer Link, ACM
Digital Library etc. All full-text resources subscribed by the INDEST-AICTE consortium contain electronic journals. However IEL Online and ACM Digital Library also provide conference proceedings with standards.

1.30.2 Bibliographic Databases

Bibliographic databases contain references to articles published in journals, conference proceedings or chapters in books, etc. Most of the bibliographic databases contain abstracts of the articles along with links to their full-text and are subscribed for IITs and IISc only; however, JCCC (J Gate Custom Content Consortia) is available to all the core member institutions.

The consortium subscribes to 17 full-text e-content resources and 6 bibliographic databases. The member institutions are provided with different access to the resources based on their needs and profile. A brief description of these resources is available under "Compendium for INDEST Member Institutions" and seen on the website of the consortium.

1.31 Department of Atomic Energy (DAE) Library Consortia

DAE’s aim is to promote interaction amongst the scientists who are working in the research centres of the DAE and the faculty from the universities and other institutions of higher learning, and to enable young students to work on programmes of national importance under the joint guidance from DAE. To nurture an organic linkage between the university system and research centres of DAE, the UGC and Atomic Energy Commission have joined hands with Dr. Arun Nigavekar, Chairman, UGC and Dr. Anil Kakodkar, Chairman, Atomic Energy Commission who have signed a revised MoU on 10th December, 2003.

Earlier both the parties entered into a MoU on July 1989 with a view to provide facilities to the students and researchers of the university system and to involve them in the design and fabrication of systems and equipment for the setting up of new research facilities. Accordingly, the UGC created an Inter-University Consortium, with its headquarters at Indore for the utilization of the facilities established by the DAE. The Inter-University consortium has taken several
initiatives to foster the interaction between the University system and the DAE institutions over the years.

As per the present MoU, collaboration between the DAE and UGC will be expanded to cover the disciplines of physical sciences, chemical sciences, life sciences and engineering sciences. DAE will continue to make the major research facilities accessible to the researchers from the universities and institutions of higher learning through the consortium. Infrastructural and accessorial facilities such as laboratories, library, workshop etc. will be made available to carry out the research work.

The UGC, through its consortium, will continue to make the suitable financial provision for the salary of the core scientific, technical and administrative staff, and fellowship with research students, the travel and stay of the visiting faculty, and other recurring and non-recurring expenditure on the functioning of the consortium. It will also provide adequate grant for equipment and consumables.

The DAE institutions and the consortium will participate in each other’s training, education, research and developmental programmes. Mechanisms to arrange discussion meetings, refresher / orientation programmes, to ensure the free flow of ideas and researchers between the University system and the DAE institutions will be created at both ends (http://www.mysarkarinaukri.com/ugc-daee-consortium-scientific-research).

1.32 HELINET (Health Science Library and Information Network)

A HELNET is hosted by Rajiv Gandhi University of Health Sciences, Bangalore. HELINET is the first medical library consortium launched in India with an objective of networking the libraries affiliated to the University to promote resource sharing, especially with reference to international medical journals and databases. HELINET needs an e-journal access gateway to act as a common search and access interface for the e-journals which are subscribed with licensing and the libraries that might independently subscribe for the titles are not available through the consortium.
Further, HELINET developed a mechanism to maintain a common database of journal literature for all subscribed journals of 30 medical libraries which were largely available in print subscriptions. HELINET has adopted an indigenously developed and locally available e-journal gateway for its need. J-Gate enables online access to all the consortia members for the e-journals. It further enables shared access to printed journals through its customized database services as well Rao and Bhaskar (2008) 25.

1.33 FORSA (Forum for Resource Sharing in Astronomy and Astrophysics)

FORSA was established in 1980s, due to proliferation of information. Library professionals, who are working in the institutes where astronomy was one of the main thrust areas of research, felt the need to come together and to form an organization which can act as a springboard for sharing and exchange of information. The sheer necessity brought all likeminded astronomy librarians in India together and a first meeting was held on July 29, 1981 at Raman Research Institute, Bangalore and informally launched a forum for resource sharing in astronomy and astrophysics, FORSA with a vision and mission to share resources since 1989.

At present, there are eleven institute members, under this consortium.

1. Aryabhatta Research Institute for Observational Engineering Sciences (ARIES), Neonatal
2. Bose Institute (BI), Kolkata
3. Centre for Advanced Studies in Astronomy, Osmania University (CASA-OU), Hyderabad
4. Harish - Chandra Research Institute (HRI), Allahabad
5. Indian Institute of Astrophysics (IIA), Bangalore
6. Inter University Centre for Astronomy and Astrophysics (IUCAA), Pune
7. National Centre for Radio Astrophysics (NCRA), Pune
8. Physical Research Laboratory (PRL), Ahmedabad
9. Raman Research Institute (RRL), Bangalore
10. Saha Institute of Nuclear Physics (SINP), Kolkata
11. Tata Institute of Fundamental Research (TIFR), Bangalore.

1.34 CSIR Library Consortia (Council for Scientific and Industrial Research)

NISCAIR is the central organization for developing a “Consortium for CSIR Laboratories to access e-journals”. The activity shall vary from creating facility to access scientific periodicals published by leading international institutions. To start with, an agreement has been signed with, e-journal publisher, M/s Elsevier Science for a period of four years for 1200 journals. Under this scheme, CSIR scientists shall be able to access these journals and download. Such an access leads to strengthen research and development in CSIR laboratories, thus moving to knowledge generation for socio-economic development of the country Charton (2001)\textsuperscript{26}.

The objectives are

- To strengthen the pooling, sharing and electronically accessing the CSIR library resources
- To provide access to world S and T (Science and Technology) literature to CSIR labs
- To nucleate the culture of electronic access resulting in the evolution of digital libraries

1.35 IIM’s Library Consortia

IIM (Indian Institute of Management) Library consortia is a DL 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 Paul Pandian et. al (2002)\textsuperscript{27}. 
The following are the IIMs Library Consortia Members.

1. Indian Institute of Management Ahmadabad (IIMA),
   http://www.iimahd.ernet.in
2. Indian Institute of Management Bangalore (IIMB),
   http://www.iimb.ernet.in/
3. Indian Institute of Management Calcutta (IIMCAL),
   http://www.iimcal.ac.in
4. Indian Institute of Management Indore (IIMI),
   http://www.iimidr.ac.in
5. Indian Institute of Management Kozhikode (IIMK),
   http://www.iimk.ac.in
6. Indian Institute of Management Lucknow (IIML),
   http://www.iiml.ac.in

1.36 Need for the Study

Libraries are undergoing tremendous changes. On one side, they are facing three major challenges – shrinking budget, shortage of space and increasing cost of publications, and on the other side, we face the challenges posed by advances in the field of ICT. The remarkable growth of electronic information in the last few decades has changed the scenario and solved the problem of space.

In this electronic era, digitized information is available on CDs, audio and video cassettes etc., as well as on the internet. E-contents play a vital role in the field of science and engineering studies. Access to journals has become important and valuable tool for researchers, students and faculty.

The user community is becoming more familiar with these tools and now they have started using them very regularly. In India the Ministry of Human Resource Development (MHRD), has set-up the Indian National Digital Library in Engineering Sciences, and Technology (INDEST) consortium. The INDEST consortium has commenced its operation through its headquarters at the IIT, Delhi since December 2002. Access to E-contents resources is now considered more important than collection building, especially if the access is perpetual in nature.
The access to E-contents for the member institutions under the INDEST consortium has increased to a greater extent. These resources and its impact can be examined elaborately. Technical institutions have to initiate the use of the latest technologies and impact of E-content usage need for of the hour.

1.37 Objectives of the Study

The study has been carried out with the following objectives.

1. To describe properties of the digital library content such as encoding and language for textual material or particular forms of multimedia data
2. To specify organizational aspects of the digital library contents (e.g., structural /descriptive metadata, hypertexts, taxonomies, classification schemes)
3. To define logical and presentational views of several components.
4. To detail the behavior of the digital library content services
5. To define managers, responsible for running digital library services; actors, that use those services; and relationships

1.38 Statement of the Research Title

Building E-Content Management Systems for Digital Libraries

1.39 Explanation of the Concepts in the Research Title

The demand for new digital libraries is strong. Hundreds of digital libraries have been built around the world, and hundreds of digital library projects are ongoing. Different user communities need different digital libraries to satisfy their requirements.

The diagrammatic representation of statement of the study is shown in Figure 1.5. Figure 1.6 shows the proposed DLSS CADDITTIE model.
Many existing digital libraries are monolithic, tightly integrated, inflexible, and lack interoperability connections with each other. It usually takes a huge amount of effort and time to create a digital library that satisfies a specific need. Hence design and building up a pilot model in digital library E-content users is necessary.
The proposed DL 5S CADDTIE model 5S represents streams, structures, spaces, scenarios, and societies. All the 5S process streams model specifies the communication content between digital libraries and users. The structures model specifies how to organize information in usable ways. The model specifies how to present information in retrievable and usable ways. The scenarios model specifies available information services. Finally, the societies model specifies how the digital library satisfies users' demands for information.

1.40 Advantages of the Proposed System
✓ Content management provides a wide view of all content in one repository system
✓ Common and consistent storage and access for all
✓ The quality of content is increased
✓ Updates the content and reduces the error
✓ The "time to delivery" is shortened
✓ The access is faster and storage space is saved
✓ The separate storage of metadata offers better search capabilities
✓ The system increases re-usability of content for different target publications
✓ Easy updates can be achieved by exchanging layout or content
✓ Activities of team members across the organization can be coordinated

1.41 Hypothesis
✓ The proposed and developed tool is very easy to learn and use
✓ The developed model leads users to become highly familiar with the tool
✓ Users get much closer to expert performance level after they use the tool for the first time
✓ The participants are highly satisfied with the tool and consider this tool highly useful for building digital libraries based on the DL 5S CADDTIE model
✓ Statistical analysis shows that the mean value of post-understanding is greater than that of pre-understanding
✓ It is observed that the tool is helpful to increase the understanding of the DL 5S CADDTIE model

1.42 Limitations

✓ The designer must understand DL 5S CADDTIE model well enough to be able to write a DL 5S CADDTIE file and to correctly use it to express his/her ideal digital library

✓ The DL 5S CADDTIE file, which represents a digital library, consists of five sub-models (Stream model, Structural model, Spatial model, Scenarios model, and Societal model). Although all of the five sub-models are expressed in XML, they use different sets of concepts and have different semantics. These differences make a DL 5S CADDTIE model compatible and extensible, because many existing standard formats can be used in the DL 5S CADDTIE model. So to build one digital library, the designer needs to understand five or more different semantic specifications to express the system

✓ When large and complex digital libraries are to be built, it is very hard even for experts to manually write those XML files without any assistance from a tool

✓ It is very difficult to obtain the big picture of a digital library just from a huge set of XML files. This inconvenience may cause troubles for maintenance, upgrade, or even understanding of an existing system

✓ A number of semantic constraints exist between (inter-model constraints) and within (intra-model constraints) the sub-models. Designers need extra effort to ensure consistency in the DL 5S CADDTIE model

1.43 Significance of the Study

✓ Presented a domain specific visual modeling tool for DLs

✓ Evaluated the tool and proved efficiency, effectiveness and learn ability

✓ The average rating of user satisfaction is 91%

✓ The average rating of usefulness of the tool is 92%
Statistical analysis shows that the mean value of post-understanding of the DL 5S CADDTIE model is significantly greater than that of pre-understanding.

1.44 Methodology

Methodology refers to the processes, principles and procedures by which one approaches a problem to seek solutions. The proposed system adopts the analytical methodology for studying certain techniques and procedures for the research problem, which are enumerated in the following steps.

- Defining E-content
- Categorizing and organizing E-content
- Storing E-content
- Manipulating and maintaining E-content
- Surveying the e-content resources with respect to their format, types, publication, structure, linkages, evaluation and hosting
- Identifying the issues to integrate them into a unified set and building interfaces
- Finding the platform and mode to host them
- Identifying the pattern of hosting and building linkages
- Developing and implementing the proposed DL 5S CADDTIE model

1.45 Data Analysis

The data analysis have been analyzed and interpreted to test the hypotheses framed and to fulfill the stated objectives. The participants of this preliminary test include volunteers from Anna university graduate level, post graduate level and research levels. The participants chosen have basic knowledge of digital libraries and
have the motivation to create digital libraries. These types of people are also the
target users of the tool. Satisfaction is measured using a subjective rating scale.
After each participant finishes all three tasks, he/she is given a questionnaire in
which the participant is asked to rate the overall learn ability, effectiveness and
satisfaction based on his/her observation.

1.46 Chapterisation

The thesis has been presented in to six chapters:

Chapter 1 presents a detailed introduction to the proposed work and
presents the scenario of the digital libraries, E-content resource providers, E-content
management systems and evaluation of selected E-content management systems.

Chapter 2 presents a survey of the relevant literature in the field of digital
library operation, digital library modeling, digital library architectures, digital library
generation, and scenario based requirements analysis and design, and case tools.

Chapter 3 presents the proposed DL 5S CADDTI methodology of
generation of digital libraries, elaborates on the design and architecture of DL 5S
CADDTI model generation, covers the implementation of DL 5S CADDTI model
and provides a detailed explanation of the steps involved.

Chapter 4 presents an analysis of the services and digital libraries generated
using DL 5S CADDTI model followed by observation on the entire modeling and
generation process.

Chapter 5 presents a detailed description of the findings and conclusion. It
includes testing of hypothesis, suggestions for making and use of E-content services
efficient, scope for further study. At the end of the thesis references and appendices
have been given.
REFERENCES


22. Kumar B.D. Vatnal R.M. Gururaj Hadagali S. and Lata Patil (2006), ‘Use of UGC- INFONET consortium by the Faculty members and


