3.1 Introduction

The traditional academic libraries have undergone sea changes over the past few decades due to rapid development of information communication technology and its impact on libraries. Due to continue growth and impact ICT, the libraries are going to digital day by day. Library and information professionals today need to acquired knowledge and skills in information communication technology. In this age of globalization, the importance of ICT to people generally an information professional in particular cannot be over emphasized. In fact, is now difficult to imagine a world without information technology.

3.2 Role of Information Communication Technology in Academic Libraries

The use of ICT users can get more and more information and also they can solve their problems with help of ICT. We can distribute information and storage of information in CD, pen drive, computer. You can become able to handle amount of data or information. The development of ICT we are participating in networking and resource sharing. We can get immediately information. The role of IT in collection development, storage and dissemination of information is widely recognized all over the world through internet. Thus we can see the IT has an impact on every facet of in house-operation in academic libraries for example Accession, circulation, cataloguing, and serial control. Now a day academic libraries goes on changing from simple to complex organization because of IT. With the help of IT users can get more information and in this way they can increase their knowledge and get nascent information for their educational curriculum or research purpose. (Bachhav, 2012)

3.3 Components of ICT in Academic Libraries

It is very important for implementation of information technology in any academic college library to understand all major components of information communication technology that are impact on quality and strength information services of academic libraries, are as follows.

Library Automation

Barcode/RFID technology

Network technologies & Internet

Web 2.0 and Library 2.0
3.3.1 Library Automation

Application of modern information technology in the library management functions are known as library automation. Library management functions includes all types of housekeeping operations such as acquisition, cataloguing, circulation, serial control, budget management etc. it includes use computers and other semi-automatic devices. Although computers have major role to play in library automation, telecommunication and reprographic technology have an equally important role because of the extend of support they offer. (Prabha, 2004)⁰⁰

Characteristics of Academic Library Automation

- The main characteristics of Library Automated system are:
- To operate/process are carried out automatically.
- To avoid or reduced human action and thus save time and labor.
- To accelerates efficiency and speed in operations.
- To expends the range and raises the quality of existing services.

Need of Library Automation

A computerization is better than manual work where one avoid duplication. A library whether public, national, academic or special main objectives and functions are to
collect, disseminates information to its users effectively and efficiently. Applications of information technology in the organization and services of the libraries have brought about sea changes in the functioning of libraries in the last two decades throughout the world.

**Area of Automation of Libraries**

Computers can be used practically to all library operations. Lot of research is going on to develop knowledge based expert system for classification. The other operations can be focus as follows.

Library house-keeping operations.

Information storage, retrieval and dissemination.

Management support activates.

**Requirements for Library Automation**

- Adequate collection
- Financial assistance
- Hardware
- Software
- Trained staff
- Users training
- Maintenance & development

**Hardware**

Main components of hardware are computers, printer, scanner with latest version and operation system.

**Library Software**

Automation of any college library involve three basic factors the hardware, software and skilled staff. Software is an essential element of library automation process college library may develop in house software tailored to the specific requirements of
the institute, known as tailor-made software. Alternatively, the library may select from commercially available software packages. There are many library automation softwares in the market. A library may choose any of the software considering their specific requirements.

**Availability of Library Softwares**

There are two types of software available in the market. One is developed by government-aided research institutions and the second is commercial softwares which are developed by private software companies or firms.

Softwares developed and provided by Government-funded Institutions:

- E-Granthalay provided by National Information Centre, New Delhi.
- Sanjay provide by DESIDOC, New Delhi.
- SOUL 2.0 by INFLIBNET, Gandhinager.
- Suchika by DESIDOC, New Delhi.
- DELIS, DELDOS, by DELNET, New Delhi.

These are few examples of Softwares developed and provided by Government-funded research institutions for academic libraries, information centers, and institutions at lowest cost or reasonable price and also providing training to the library staff and support.

Softwares developed by private software companies or firms:

- Libsys by Libsys ltd, Gudgaon.
- Liberator by CMS, Coimbatore.
- Libsoft by ET & T, New Delhi.
- Librarian by Growth Com Ltd., Ahmedabad.
- LIBMAN, Data-Pro Consultancy Service, Pune.
These are some examples of commercial library management softwares in India. At present more 40 -50 library software provider in India.

3.3.2 Barcode technology

Almost every type of industry is using barcode technology to replace keyboard data entry because bar coding is much faster and more accurate than keyboard data entry. We can give input of data at three times the speed of manual entry. Combination of barcode technology with computer and application software improves performance, efficiency and speed of various library operations. Barcode technology play vital role in automating the various functions of the library operations. That includes all types of housekeeping operations such as acquisition, circulation serial control and stock verification.

What is barcode?

It is an automatic identification technology. Barcode is predefined format of dark bars and white spaces. Barcode is a machine-readable representation of information in a visual format on a surface. Originally barcode store data in width and spacing of printed parallel lines. In other words we can say that barcode are series of black and white bars arranged in pre-defined form to represent known coded information. A liner barcode is a binary code 0-1. The lines and space are various thickness and printed in different combinations. A device known as barcode scanner reads this code. The most common is laser barcode scanner. Bars are darker and non-reflective element of barcode. The gaps are white and known as inter character gaps. The space is known as reflective element of barcode. (Aswal 2006)101

Requirements of equipments for Barcoding

- Barcode scanner to read barcode labels
- The decoder to translate this information into binary code data.
- Computer
- Barcode Printer
- Barcode labels.
- Manpower to stick barcode labels
RFID Technology

We have discussed barcode technology earlier. RFID is the next stage of advanced technology after barcode with security and other features. RFID’s full-form Radio Frequency Identification is the latest technology to be used in library theft detection system. The Auto ID centre as successor to the barcode technology developed RFID. The aim of using RFID technology is to increase the efficiency, reduce data entry errors, and free up staff to perform more value-added functions. RFID technology is a labor saving technology so it is likely that some staff will free up. The most common applications are tracking goods in the supply chain, re-usable container, high value tools and other assets, and parts moving to a manufacturing production line. (Kumar 2000)\textsuperscript{102}

Radio Frequency Identification is a generic term for technologies that use radio waves to automatically identify people or objects. There are several methods of identification, but the most common is to store a serial member that identifies a person or object and, perhaps other information, on a microchip that is attached to an antenna. The antenna enables the chip to transmit the identification information to a reader. The reader converts the radio waves reflects back from the RFID tag into digital information that can then be passed on to computers that can make use of it.

Components of RFID System

- RFID tags that are electronically programmed with unique information.
- Sensor or Readers to interrogate the tags
- Antenna
- A server or docking station on which the software that interface with the automated library system is loaded.
- Although the RFID technology is useful but till it is a very costly technology. Prices of RFID tags till higher. Small colleges or institutions cannot afford expenditure of this technology. But in future when prices will come down libraries can afford RFID technology.

3.3.3 Network technologies and Internet

Networking
Library network may be defined as “a distribution system composed of two or more libraries and other organizations engaged in common pattern of information exchange, through communication for some functional purpose.”

The literature growth in various disciplines is being noticed at an alarming rate and the rising prices of publication. Even with increased financial resources, libraries have not been able to meet all the information needs of the readers. Efforts can be made to achieve this by creating viable library networks for better and economical use of library resources. (Dhiman 2003)

**Types on Networks**

- Local Area Network (LAN)
- Metropolitan Area Network (MAN)
- Wide Area Network (WAN)
- **Local Area Network (LAN)**

In a local area network two or more computers directly linked within a small well defined area within a small well defined area such as room, building, or a campus. The main benefit of a LAN is the reduction of hardware and software costs because users can share several computers, peripheral devices such as laser printers, color-printers, scanners, scanners, software. Another benefit is that the users can share the same data.

A LAN could be said to be a set of data processing devices interconnected through cable. It sends and receives data transmitted over relatively short distances. The types of data transmitted are LAN may include mail, manuscripts, reports, computer files and software.

Any LAN network that exists within a single building or even group of adjacent buildings is considered as LAN. A LAN is a geographical small network of computers and supporting components used by a group or department to share related software and hardware resources. Some LANs specifically required all the computers to be of a certain brand, while other allows variety of brands to be connected. The numbers of computers in LAN varies widely from small LANs that connected two to twenty five computers, to large LANs those more than 10,000 computers.
**Some Highlights of LAN**

- Two or more computers.
- Software to control the operation of the computers.
- Peripheral devices such as modems, printers, plotters.
- Coaxial or fiber optic cable is usually used to connect the computer and other devices.
- Ports and hubs for connecting computer.

**Use Of LAN in Academic Library**

- Sharing expensive peripherals such as printers, etc.
- Sharing expensive software
- Exchange of massages between users connected to LAN
- Sharing files between users.

**Metropolitan Area Network (MAN)**

A Metropolitan Area Network (MAN) is a network that is larger than a LAN. It is called metropolitan since it normally covers the area of a city. Different hardware and transmission media are often used in MANs because they must efficiently cover these distance or because they don’t require complete access to location between the network sites.

**Wide Area Network (WAN)**

A Wide Area Network (WAN) is two or more geographically dispersed computers, lined by communication facilities such as telecommunication or microwave relay. In other words, one of the most important aspects of a wide area network while comparing with the freedom of a local-area network is the involvement of a public telecommunications authority. WAN is usually limited to use by the large organization and government agencies due to high costs involved in building and maintaining them. A special designation has also been given to two specific WAN categories.
Components of Computer Network

- Server
- Nodes
- LAN Cables
- Network Operating System Software
- Network Interface Card

Server

Servers are the faster computer to run various software stores and process information and to provide a human interface for the user to be able to use the networked computers.

Nodes

Nodes are the computer on the network which is provided to the user carry out their tasks using the network. A node which is more powerful and can handle local information processing or graphics processing is called a workstation.

LAN Cables

The workstation works only for the person sitting in front of it, whereas a server all the people on the network to share its resources. A workstation usually has an inexpensive, small hard diskless workstation, have no disk drive of their own. Such workstation also called dumb terminals; rely completely on the LAN for their access. The network operating system lets the nodes work as if all the resources at the server belong to the node itself.

This is medium over which the information travels from computer to computer from the computer onto the medium (cable) and to take up the information from the medium and make it available to them in the form, it can read.

Network operating System Software

To control the movement of information on the network, network which are more complex require components like Hubs, Switches and Router to carry out different network functions. On the network, each computer is called a node or a workstation, unless there are certain computers designed as servers. Each computer contains a
network interface card. LAN cables connect all the nodes and serves together to from
the network. In addition to its local disk operating system, each node requires network
software that enables the nodes to communication with the node.

Network Interface Card

This is card used to connect the cables to the computers. These cards help the
computer to transfer the data at a speedy rate and in the form of packets. These cards
are generally called as earthen card.

Internet and Academic Libraries.

Internet

The internet is massive network of network, networking infrastructure. It connects
millions of computers together globally, forming a network in which any computer
can communicate with any other computer as long as they are both connected to
internet. Internet is worldwide communication system which links together a verity of
computers with distinctive software and hardware. These computers are connected to
allow them to communicate by translating massages in to a mutually understanding
language refer to as communication protocols. Protocol used by the internet is called
TCP/IP. The protocol is a set of rules that two computers are required to follow when
they communication.

Services provided by Internet

Lot of services are available on the net which can be use for information storage and
retrieval purposes in the academic library. These include:

- Email
- Information Search
- Internet relay chat
- E- Learning
- News groups/Usenet
- Download and Uploads
Information Searching with Internet

To search for and retrieve the maximum information on the net, retrieving information from net requires a lot of patience and devotion as the numbers of sites or web pages retrieved on any particular query are immense. So search engine is required.

Search Engines

The function of a search engine is a locator of information available on the Internet via the World Wide Web. It contains references to thousands of web documents. It provides an interface between a user and the related database. To provide information to users is composed of two parts, available information with data and methods of indexing of information. The interface presents the user with a place to type in a search string, which may be a word, a phrase, a data, or some other standard, and a way to submit the request. Search engines are software which searches pages or website on the internet. [www.google.co.in](http://www.google.co.in) is the main example of search engine which is famous in the world. Other popular examples of search engine as follows:-

- Yahoo
- Infoseek
- Hotbot
- Altavista

Benefit of Internet to Academic Libraries.

Internet has become an effective tool for teaching and learning. It is significantly affected the efficiency and effectiveness of process of creation, accumulation and transfer of knowledge. Its role appears to be of paramount importance especially in the field of knowledge generation. Internet not only offer interesting files to acquire information, but also provides with tools for actually doing research.

The vast interconnection of computer provides an ideal infrastructure for sharing resources. The internet allow users to transfer files between computable computer and send message across the globe and login to databases, thousands of kilometers away with the blink of an eyes. It offers a variety of services to create browser, access,
search, view and communicate information on various topics. (Trivedi 2009)¹⁰⁴

The services of information available on Internet are electronics journal, technical reports, Library catalogue, email based information services, reference service, content page of journal, etc. All these sources provide a great wealth of information which can be utilized by the libraries in providing information to the user.

3.3.4 Web 2.0 & Library 2.0

Web 2.0

The term Web 2.0 refers to the development of online services that encourage collaboration, communication and information sharing. It represents a shift from the passive experience of static read only web pages to the participatory experience of dynamic and interactive web pages. In other word, Web 2.0 reflects changes in how we use the web rather than describing any technical or structural change. Many librarians and integrated library system use these exciting tolls to bridge the gap between the user and the information. The old days or old age reference services are now being enhanced using Web 2.0 tools to have instant messaging services. (Harinarayana 2010)¹⁰⁵

Web 2.0

Web 2.0 is a unifying term that represents several kinds of new technologies evolved Web environment appear in the form of social professional networks, blog, wiki, free encyclopedia, RSS feeds, podcasting, Skype, instant messaging, YouTube, list server and discussion forums etc., a few detail as follows :-

Instant Massaging

Instant massaging is a real time text/video/audio communication between more than one individual early part of this country saw the advent of web based catalogue which have made use of this utility to communicate with user in much more innovative and useful way currently most of the integrated library system come with a suite called reference librarian or reference desk which is more interactive the users get interactive helps on many issues.
Streaming Media

Streaming media is another important web 2.0 enhancement which has influenced on the library services streaming media is a sequential delivery of multimedia over the content mostly on request providing requested media instantaneously.

Wikis

Wiki is a piece of sever software that allows users to freely create and edit web page content using any web browser wiki supports hyperlinks and has simple text syntax for creaming new web pages and cross links between internal pages on the fly wiki is unusual among group communication mechanisms where it allow the organization of contribute to be edited in addition to the content itself several libraries have used the wiki tool in the provision of different services.

News Feeds

The advancement of web has brought news feeds directly into our desktop the advent of news feed which are called as RSS (Relatively Simple Syndication) has been that the news services come to the user. The emerging library services seem to have captured this novel idea into the development of library services and have imbedded them in the library services.

Blogs

The weblogs which are the innovations of web 2.0 concept make another form of information source in modern libraries interesting many libraries treat blogs as another form of publication with so many blogosphere available most of the OPACS now try to sort them in subject order for the readers and avail them to use it Blogs are considered to be an information source of information library catalogue try to use this utility in their catalogues.

Tagging

Another web 2.0 feature which is becoming common in library community is called tagging. Tagging is describe as the process by which the resources in a collection are assigned tags in the form of words phrases codes or other strings of characters this
allows users to add and change the data and metadata the advantage of user tags is that it helps the data to be more easily searchable.

**Social Networking**

Social networking involves a software based networking of communities which have common interest forums are prime examples of social networking where discussion groups with common interest join together to share common ideas most of the social networking facilities are web based interfaces where users make use of the above mentioned web 2.0 tools such as chat messaging email video blog etc. Living examples of the social networking groups are My space, Facebook, Delicious, Flicker the social networking spaces are considered to be potential meeting place of one mind people. The majority of social networking sites present freedom of expression by offering the ability to upload photos music and video each site also offers customized profile pages using varying themes making homepage design a quick and simple process. Another shared quality is the ability to search for existing friends by simple entering their name or email address.

**Library 2.0**

Library 2.0 is multidimensional it is a hybrid of blogs, wikis, streaming media, content, aggregators, instant messaging and social network library 2.0 remembers a use when they log in. it allows the user to edit OPAC data and metadata saves the users tags IM conversation with librarians wiki entries with other user and user is able to make all or part of their profile public user can see what other users have similar items checked out borrow and lend tags and a giant users can see what other users have similar items checked out borrow and lend tags and a giant user driven catalogue is created and mashed with the traditional catalog.

**3.3.5 Reprographic Technology in Academic Libraries**

When users come to the library they require copy of the document in various forms. It can be possible through reprographic technology. It’s includes photo copy, print out, image coping, digital imaging, microfilming etc.
Many types equipments require for reprographic services in academic libraries like printers, fax, photo coping machine, CD/DVD writers, cameras, pen drives, external hard disk, Scanners, etc.

Academic libraries make some rules and regulation for users to use reprographic services. Especially research scholars and faculties always require this type facility. Librarian has to follow regulations copy right act whenever he/she provide reprographic services to the users. Information technology made easy to provide reprographic services. (Balakrishanan 2001)\textsuperscript{106}

Sometimes reprographic services provide self-service subject to restrictions. Training to users must be provided to handle the equipments available in the library.

### 3.3.6 E-Resources

The development of information technology has made great changes in all types of libraries. Academic libraries being the reservoir of knowledge are no exception to the development. Users seek information for their research, education, reference and guidance from libraries. The media of communication is developing and the format of information delivery and exchange is also undergoing rapid change. People require most up-to-date information from libraries and it is possible only through e-resources.

The electronic resources are systems in which information is stored electronically and made accessible through electronic systems and computer networks. Electronic resources are e-books, e-journals, e-newspapers etc. Due to growth of information communication technology most of the document are available in electronic format. This has increased the responsibilities of the academic library to provide up-to-date and latest information to the users. Now the development of e-books, e-journals has changed the academic library from traditional book collection developer to owner of electronics resources. The role of library professionals in collection development and management has become restricted. In fact, they are now playing the new role of access manager of e-resources rather than acquisition manager and custodian of scholarly resources in print form. (Arikrishnan R. 2010)\textsuperscript{107}

### Types of E-Resources

In this era of information technology, there are numbers of e-resources available for users. It can be described as follows:
**E-Books**

An electronics book is the content of the book made available to the in electronic form. E-books are books in computer file format and read on all types of computers, including handheld devices, designed specifically for reading e-books. E-book offer advantages like portability, 24 hours access, text search, annotation, linking, and multimedia and self-publishing possibilities. Development of e-books is still in the early life stage and issues like compatibility, e-book readers, availability and intellectual property rights are to be addressed before it can be implemented on large scale. There are some libraries and organization like British library and INFLIBNET where e-books are available for users or member.

**E-Journals**

Libraries have been exploring easy to handle with problems of ever increasing prices of the journals, space requirement and decreasing level of usage as the journals get older. Nerveless, academic libraries are to maintain back issues of the journals, usually in bound form. Electronics journal helps the library professionals in addressing these problems to a great extent without considerably affecting the service levels. Electronics journals can be accessed via internet from any web enabled computer or device. Depending on the type of subscription, one or more users can access the services sententiously, either directly from an independent web enabled computer or in a local area network through proxy server (IP addresses based access). Electronic journals also offer benefit of full text searching and downloading of articles. Many publishers of electronic journals offer their journals through consortia of libraries at much lower rates. INFLIBNET and INDEST are such consortia operating in India.

**CD-ROMs Database**

CD-Rom Databases are increasing day by day in almost all fields due to their many advantages in information storage and retrieval. Majority of publications of books and journals, on line vendors and various learned societies are bringing out new titles in CD format with powerful retrieval software. Electronic information resources in CD format include abstracting and indexing services, encyclopedia, dictionaries, yearbook, back volumes, standards, patents and many other reference works.
E-Reference Sources

Reference sources like dictionaries, almanacs, encyclopedias, are now available online in full text.

Image Database

Users can assess images online.

Web –OPAC

It is an online catalogue of any library. Users can access it through web or internet.

E-Reports

Scientist, research scholars’ etc. now a say consider as an important electronic resources of library, which contains reports, publish e-reports. These reports are scanned and converted to searchable PDF document.

E-clippings

E-clippings are retrospectives search and comprehensive analysis of new items. It facilitates the users to retrieve the news clips by simple clicks.

Selection of E-resources

The selection process should be done in relevant with the demands of the users, committee, focus group, users recommendation etc. apart from this, it should taken into consideration the following step:

- To identify library needs;
- To identify content and scope of the e-resources
- To evaluate quality of that particular resource and search capabilities
- To estimate the cost
- To check either subscription based or web based when acquiring
- To evaluate the systems and technical support
- To review licensing agreements
- To check the facilities for educational support and training
Advantages of E-Resources

- The advantages of e-resources as follows:
- Space saving in library.
- Available to access all time.
- Maintenance of e-resources is economical.
- It can be join together with altering services.
- It provides timely access to documents.
- Many users can use simultaneously.
- It can be solve the problems of missing issues of journal.

Problem of E-Resources

- High speed of communication is required.
- Need special equipment to access
- Trained manpower is required.
- Barriers of copyright.
- Knowledge of computer is require to access.
- Software and hardware compatibility issues between publishers and users.
- Users can’t read seat in front of computer screen more than specific limit.
- Electricity is always requiring for e-resources.

Internet as a tool for E-Resource

The internet is World Wide Web has given a model to information management. The information available on net is increasing rapidly and the task of providing relevant information to patrons is gaining paramount importance in all types of libraries. Most of the reputed publishers, learned and commercial societies are hosting their products on net and also all libraries are sharing their internal and external information resources by means of web pages and web-OPACs. Due to impact of internet there is swift migration from offline to online, as web is becoming popular user interface for providing access to mote and continuously updated resources.
Role of Academic Library professional towards E-Resources

Librarian or library professionals are professionally trained in library and information science. Typically, librarians work in a college library is traditional but now it is changing. Due to information communication technology libraries are changing. UGC has also taken some steps through INFIBNET to change the situation. Library professional has take active part in implementation of e-resources in the academic library for selective and current awareness services. He has suggested specific infrastructure to higher authorities for implementation of e-resources. Librarian has to arrange e-literacy training for library staff as well as users and also subscribe different e-resources available on the net. He has to keep balance in collection development traditional and traditional resources, focus must be change traditional means printed book, journals, newspapers to e-books, e-journals, e-newspapers. Librarian is representative of paperless society of tomorrow.

3.3.7 Library Consortia

The limited financial assistance to the academic libraries and increase in the cost of the information sources has made it very difficulties to procure all the information sources needed by their users. The solution to the above problem is library consortia especially in relation to electronic resources. Many initiatives have been taken place in India for the formation of library consortia. Many library consortia in India are doing well and many libraries are benefited.

Library consortium is a community (a cooperative) of two or more information agencies which have formally agreed to coordinate, cooperate, or consolidate certain function to achieve mutually objective the joint benefit. It provides a way for it s member to conduct business in a comparative manner. (Muzamil 2008)

Feature of Library consortia

- It provide each organization and institutions with the capacity to share the resources without sacrificing the individual 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 consortia. As a result, end users can take benefits of more resources than would be available through one library.

To expanding inter library searching at less cost is possible.

**Benefit of Library Consortia**

- Consortia-based subscription to electric resources provides access to wider number of electronic resources at substantial low cost.
- Proper utilization of funds
- Facilities to built-up digital library
- Helpful to provide better library services like SDI and CAS.
- Cost sharing for technical and training support
- Electronic journals demand neither library space nor shelling costs nor can they be stolen from the library.
- The consortium have been offered better terms of licenses for use, archival access and preservation of subscribed electronic resources, which would not have been possible for any single institution and available any time.

**Disadvantages of Library consortia**

- Absence of printed copy of journals
- Require training to the staff for handle electronic documents
- Consortia require high initial investments in licensees and information and communication technology.
- Problems of copyright issues.
- Barriers in telecommunication links and insufficient bandwidth.
- Lack of archiving and back files availability.
- Internet access ID necessary.
- Users are not accepting e-journals as per with the printed journals
3.3.8 Institutional Repositories

The emergence of internet has brought vast opportunity to bring the research output of academicians, scientists and research scholars through ICT at one place. The open access initiatives have been seen all over the world to promote the research activities among the scholars. The increased demand for scholarly information, especially in science and technology demands scholarly societies and universities for centralized access to institutional rich resources revealing the scientific output. Digital publishing, global networking, more research, and increased communication among communities of scholar are driving the demand for broader access.

An Institutional Repositories (IR) is a digital archive where a college community’s intellectual work is made accessible and preserved for posterity. The concept of IR suggests the tantalizing possibility of greater library influence over the scholarly communication on campus, from research through publication, collection and preservation. Libraries are performing lead role in shaping institutional digital repositories all over the world.

In other word an institutional repository is an online locus for collecting and preserving in digital form intellectual output of institution, particularly a research a research institute. It also includes other digital assets such as administrative document, course notes or learning object. (Bansod 2012)109

The main objectives for having an institutional repository are as follows.

- To create global visibility for an institution’s scholarly research.
- To provide access to institutional research output by self archiving it.
- To collect content in a single location
- To store and preserve others institutional digital assets, including unpublished or grey literature.

Importance of Institutional Repository

Research Scholars, Students and faculty members increasingly recognize the need to store their intellectual output in the form of personal collections and make available within and outside the institution. Institutions can develop the repositories of intellectual output for long term archival purpose.
Advantages of Institutional Repository

- Digital archive of own(institutional) research publications accessible anywhere through internet.
- Improved citation of research publications.
- Preservation and control of one’s own publications
- Increases the accessibility and impact of research among the students in the colleges.
- More timely access to research publications of faculty members and research scholars.

Limitations of Institutional Repository

- Technically trained staff not available in colleges for IR.
- Absence of proper development policy.
- Copyright issues.
- Technical difficulties in long term digital file preservation in small institution.
- Ongoing operation cost to maintain IR.
- Lack of proper development policy for IR.

3.3.9 Digital library

We are in the era of a network society where information technology in addition to its use in all subject of human perception has been used extensively to record, store and disseminate the information in the digital form. IT has almost converted the world into a global village.

The revolution in IT sector is influencing the information industry also. Libraries are changing to meet the demand put on them. The new generation whose demand for information is never meet always demanding that traditional libraries should be developed as a equipped and interconnected as digital libraries. If we consider that the information is for use and for all means libraries for all and libraries should become universal open for all those who seek for information.

The term digital has a variety of potential meanings, ranging from a digitized collection of material that one might find in a traditional library through to the collection of all digital information along with services that make that information useful to possible users. As there are many definition of a digital library such as
electronic library and virtual library are often used synonymously. Digital library nothing but a large database for the people who are working on hypertext environment. It is an environment, which supports the full life cycle of creation. Storage, preservation, dissemination, use of data, information and knowledge. (Ansari 2003)

**Requirement for Digital Library**

The internet and World Wide Web provide the force and technology environment for the development and operation of a digital library. The internet provides the TCI/IP and or its associated protocol for accessing the information and web provide tools and technique for publishing the information over internet. In the digital environment it is reasonable to say that a central back up or archive should be created at national level, which will store information output of the region as well as information from outside the country. Some of the requirements for digital libraries are as follows:-

- Computer: P.C. with multimedia, Server, UPS etc.
- Network: LAN, MAN, WAN, Internet etc.
- Printer: Laser printer, Dot matrix, Barcode printer, Digital graphic printer etc.
- Scanner: H.P. Scanner, Digital camera, Barcode scanner etc.
- Storage devices: optical storage device, CD-ROM, Jukebox etc.
- Software: Any suitable software, which is interconnected and suitable for LAN and WAN connection.
- E-Resources: different type e-resources to upload.

**Advantages of the Digital Library**

A digital liberty is not confined to a particular location or so called building it is virtually distributed all over the world. The users can get her/his information on his own computer screen by using the internet. Actually it is a network of multimedia system, which provides finger strip access. In the new environment owing a document will not be problem for the library because the user will pay for its uses.

**All time availability**

Digital libraries can be accessed at any time, 24 hours a day and 365 days of the year.

**No physical boundary**
It is not necessary for users to go physically in the library, they can seat anywhere with laptop and internet connection. Now a day people can access information tab or Smartphone.

**Multiple accesses**
The same resources can be used at the same time by a number of users.

**Structured approach**
Digital library provides access to much richer content in a more structured

**Information retrieval**
The user is able to use any search term following to the word or phrase of the entire collection. Digital library will give user friendly interfaces, giving click back access to its resources.

**Space for collection**
Whereas traditional libraries are limited by storage space, digital libraries have the potential to store much more information, simply because digital information requires very little physical space to contain them. When the library had no space for extension digitization is the only solution.

**Networking**
A particular digital library can provide the link to any other resources sharing can be achieved.

**Cost effectiveness**
The cost of maintaining digital library is much lower than that of a traditional library.
A traditional library is spending large amount on staff, books maintains, rent, etc.
Digital libraries do away with these fees.

**Disadvantage of Digital libraries**
- **Copyright**: Digitization violates the copy right law as the thought content of one author can be freely transfer by other without his acknowledge.
- **Speed of access**: if number of computer attached to internet connection speed of access is come down.
- **Initial cost is high:** The infrastructure cost of digital library, the cost of hardware, software, internet bill is very high.

- **Efficiency:** with the larger volume of information, finding the right information for a specific task difficult.

- **Environment:** Digital libraries can make environment of traditional library and although the information available in digital form people take print than read it.

- **Preservation:** Due to technological developments, a digital library can rapidly become out-of-date and its data may become inaccessible.

### 3.3.10 Cloud Computing and Libraries

Clouds are particular commercial interest with growing tendency to outsource IT so as to reduce management overhead and to extend existing, limited IT infrastructure. “Cloud” also reduces the entrance barrier for new service providers to offer their respective capabilities to a wide market with a minimum of entry cost and infrastructure requirements.

Cloud computing is an emerging IT service model paving its way into the business world. It is a way different from Grid computing, utility computing or automatic computing. Anyone connected to the internet is probably using some type of cloud computing on regular basis. Using Google’s Gmail, organizing photos on Flicker, Yahoo mail, or searching the web with Bing are examples of engaged in cloud computing.

Cloud computing is different from traditional computing. In traditional approach the organization need to setup large servers, storage devices and lot of other equipments to support the business. This not only need large capital expenditure but also lot of efforts in terms of maintenance and up gradation of technology. Uninterrupted power supply, cooling mechanism, expert technical team, big server rooms, were undoubtedly other requirement. Now due to cloud computing all such requirements are eliminated. (Kulkarni 2013)

**Advantages of Cloud Computing**
Cloud computing reduce energy consumption.
It engages merging the computing resources on the internet or the cloud and making these accessible to individuals who need it, when needed.

The organizations that used cloud computing services were freed of worrying about the technological issue related to IT installations.

Cloud computing resources were available immediately as soon as the agreement with the service provider is executed.

Users were charged only for what they used.

University and colleges can open their technology infrastructure to businesses and industries for research advancement.

**Disadvantages of Cloud Computing**

Steady connectivity required.

Additional cost of data transfer fees.

We do not have control over remote servers, their software or security.

Our data is at the mercy of a third-party company.

It may be difficult to migrate massive amount of data from the provider.

**Cloud Computing in Libraries**

In today’s situation libraries are adopting advanced technology in their day to activity. Libraries have seen using some cloud computing services for over a decade. Online database are accessed as cloud applications. Large union catalogues are also defined as cloud applications. Moving to cloud based services means, the library housekeeping operations, digital libraries etc are hosted on cloud based network.

The library community can apply the concept of cloud computing to amplify the power of cooperation and to build a major, combined presence on the web. This approach to cloud computing can help libraries to save time and money while simplifying workflows. With above following are some benefits of cloud computing for library.

- Servers can be decommissioned and no longer require replace every five years.
- Staff no need to maintain the complex software stack.
- No need to worry about compatibility to the stack during upgrades.
- The data stored in cloud can be shared among services and users easily.
- There is no need for local storage, maintenance and backup.
- Cloud computing changes traditional job roles in libraries.
3.3.11 Mobile-Learning (M-Learning)

M-learning is the new sensation in the field if education. E-learning is an old term replaced into new technologies terms. M-learning anyone learn, anytime, anywhere. In the rapidly shifting framework of library & information systems a fresh group of people of information will be essential with a multiplicity of fresh abilities and acquaintance learning also can promise good educational chances for student. Mobile learning aspires vat making the learning process more elastic. Mobile learning get better access to information, that community can bring up to date their knowledge constantly to make happy the demands, which want to improve literary experiences of life. Mobile learning offers the potential to give the proper information to correct people at the anytime, any locations using portable learning devices. (Dresselhaus 2012)\textsuperscript{112}

Types of Mobile learning

The major categories of mobile devices for m-learning used in education process are as follows.

**Notebook Computers/Laptops**

It is easy to any person to take this type of devices in hand or keep in travel bag. Users can use laptop devices anywhere and anytime with use of wireless internet, they can connect to the information world.

**Tablet PC**

These are one of the most recent mobile devices. They too have complete variety of capability as personal computers a few of them have not keyboard but have software to recognize hand written text. It is expensive.

**PDA (Personal Digital Assistance)**

PDA have little sizes and considerable processor power. The major operating system used are palm and Microsoft pocket PC.

**Cellular Phone**

The low class devices mainly can be used for voice communication, sending & receiving of text massages (famous as SMS). Some of other disadvantages are low
memory capacity. Some costly phones have lot of memory, GPRS, WAP and 3G compatibility. These devices are useful to M-learning.

**Smart Phones**

Smart Phones are hybrid devices which join the capabilities of cellular phones and PDA with big screen. The screens are touch-screen and size of screen is 7 to 10 inches. User can use these types of phone for reading of e-resources also.

**Advantage of M-Learning**

- One can access lesson, video clips, audio libraries from anywhere including public place and moving buses & trains.
- Light weight, received & enter all types of data directly.
- Student can access the system any time from any location.
- Students can interact with each other.
- A number of mobile devices in a classroom than several desktops, as per request for a smaller amount room.
- Can draw maps, diagrams, and sketches directly into a tablet using normal. Short massages can be used to get information to learners and staff more without difficulty and faster than telephone calls or e-mails.

**Disadvantage**

- Cost - Technology changes & advances very quickly. You need upgrade mobile frequently
- Size of device – Main first disadvantage is a size of device very small, it can be easily stolen & lost. Secondly display size is to small and can result in eye nervous tension for people using them for long period time.
- In the m-learning incapable of printing.
- Devices may become outdated quickly and students have to keep combating obsolescence.
- Life of Battery –life of mobile battery ranges from about 2 to 4 hrs of use. One the batter runs out, you must plug in to electric power.

**The role of libraries in M-learning**
Despite some disadvantages it will be more useful in assignments and work in a as option to desktop computer or books where pupils are extensively dispersed engage with where pupils who in the history have field excluded. It will be more useful in assignments and fieldwork substitute to desktop computer or books. Easy access at all time, anytime and anyplace students to participate in learning activities with no the restrictions of place and time.

3.3.12 Information Literacy

The information people are set apart by a continuously rising amount of information, improvements in formation and ICT. The usual concept of bibliographic description organization and distribution of information are to be modifying to the fresh environment by the library and information professionals. As a result list of professional functioning in the surroundings have to face challenges. It becomes vital for clients also to increase ability in information literacy so that they can recognize, weigh up and use the pertinent information efficiently. Information literacy programme is the require for maximum utilization of these resources in research coaching and learning. (Thanuskodi 2011)\textsuperscript{113}

**Definition of Information Literacy**

The American Library Association is defined “to be information literacy, a person must be able to recognize when information is needed and have the ability to locate evaluate and use effectively the needed information.”

**Need of Information Literacy**

In present, age of information, information literacy is most important factor because everyone is trying to acquire all kind of information which his need is having an appropriate from and in minimum time. In present day information becomes a basic need like food, air and water.

Following factors create need of information literacy.

- Current age is an information revolution era.
- Every second new and lots variety of information sources coming up.
- Traditional libraries change into a digital & virtual library.
- Extension or board dispersion of information.
- Number of users’ increase who want to know information and its sources.
Need of Information Literacy for Academic College Libraries

- The users of college libraries are most of the students and researchers. They need their information but they were unknown about how to use library to bring out their proper information, how to locate proper information, recognition of information related to their need, how to evaluate that information and success.
- The students were always guided by their senior about the use of book. That mean they use only that book which were following by their senior. The result gets very small use of library material. So we can bring them towards 100% person use of collection.
- It will help to develop problem solving skill and information identification and evaluation skill among student and researchers.
- Students are always managing themselves with traditional information material or get confused by web based information. Information literacy helps them to identify with surrounding current material and useful information.
- Students will become familiar with library activity.

Role of Library Professionals in Information Literacy

Information communication technologies have changed the complete scenario in library. Now day, library has become point of resource-base learning the role of library professionals is changing radically with skill of education paradigms. The impact of moving from text based learning to resource based learning will involved heavier use of library material and a demand for more media resources, including print and not print. The library professionals are responsible for locating, acquiring, disseminating and tracking information resources of main types. It might include database searching, interlibrary loan, monitoring internet newsgroups or maintenance of a computerized library information system. Libraries and library professionals play an important role in education of people for effective and efficient information use by teaching them information skills at all levels of education to enable to be informed citizens of the country.
3.3.13 Information Communication Technology Skill & Training for Academic Librarians or Library Professionals

In the new age of IT use of technology is increasing speedily. Everybody knows that we were using window-dos in 1990 and now MS offices 10. It is a long journey of IT in academic libraries. In the pattern traditional library, once taken training was useful for long time. Even person was fluent with his work or services.

Now a day time is changing today’s training and skill will be outdated tomorrow. If library professionals have to provide nascent services to the users, they must have knowledge of latest information communication technology. All library staff must be information literate and they have skill of use of use computer and handing of e-resources. The role of library professionals or total library staff has changed rapidly in recent years. It is changed in response to new forms of information and new methods of teaching and learning. (Devi Rama 2005)\textsuperscript{114}

It is need of time that attitude of management of academic institutions, library professionals and subordinate library staff must be positive and creative of environment of information technology in academic libraries.

**Challenges Faces Academic Library Today**

- Quality of Professional manpower
- Library Automation
- Team spirit of Library Staff
- Attitudinal Skills
- Technical Support
- User Perception and Consciousness
- IT Infrastructure

**Types of Information Technology Training and Skill require for the Academic Library Professionals**

- Computer means operating system training.
- Network technologies & Internet training
- Library software training
- RFID and Webcam use training for library collection security.
- Reprographic technology training
- Use of E-Resources training
- Institutional Repositories software maintenance training
- Digital Library training
- Mobile-Learning or use of mobile in library services training
• E-literary awareness training.

**Information Communication Technology Training for Academic Library Professionals in India.**

• Leading universities providing ICT in curriculum of Library and Information Science.
• Short term training in INFLIBNET Centre, Gandhinagar with SOUL training.
• Refresher Courses in Staff Academic Colleges in all Indian universities.
• Short term ICT courses Staff Academic College, Hyderabad.
• Short term and Long term ICT courses in DRTC, Bangalore.
• Short term and Long term ICT courses in NISCAIR, New Delhi.
• Short term and Long term ICT courses in TISS, Mumbai.
• Short term ICT courses in DELNET, New Delhi.
• Conferences/Seminars/Workshop conducted by professional bodies & association like IASLIC, ICDI, ILA, KSCLA etc. every year.
• E-Granthalaya training by YASHADA, Pune.

**3.4 Conclusion**

Automation, Barcode/RFID technology, Network technologies & Internet, Library 2.0 and Web 2.0, Reprographic technology, Electronics Resources, Library consortia, Institutional Repositories, Digital Library, Mobile-Learning, Cloud Computing and libraries, E-Literary, ICT Training etc; are major components of information communication technology to application in academic library activities to provide proper and current information to user. Success of use of information technology in academic library is depended on the quality, strength and coordination of all these major components.