Chapter 4: Changing the Paradigms: Libraries and Technology

CHAPTER 4

CHANGING THE PARADIGMS: LIBRARIES AND TECHNOLOGY

4.1 Introduction:

Information and Communications Technology (ICT) is an umbrella that involves communication application or device, encompassing: computer hardware and software, satellite systems, television, radio, cellular phones and many more. Various services and applications associated with them, such as distance learning, e-learning, videoconferencing etc. are becoming more popular. ICT is used in every field including education, academics, schools, colleges, universities, libraries, different organizations, companies and industries, and business houses for effective communication as well as holding voluminous data.

Information and Communication Technology (ICT) is constantly upgrading and its utility in different sectors is also increasing due to its benefits. Applications of ICT made innovative performances in every field to serve the user community better. The applications of emerging technologies in libraries and information centers also made impact on library functions, activities and information services. This helped in providing qualitative services to users at economical and effective ways. It is observed that many libraries have been completed the automation process using computer and communication technology and ready to accept the advanced steps towards modernization.

Knowledge society and information society both are relying on the technology and looking for the acceptance of value added changes in their activities. Library and Information Centers are facing many changes and challenges due to emergence of technology and its effective use in the profession which is beneficial to everyone who are involved in knowledge generation and distribution sector. Academic i.e. education sector is changing from formal to e-learning due to applications of ICT and the users demands
are also changing due to maximum use of technology and digital contents. The infrastructure supporting to this activity is also changing like libraries, teaching methods, text, tutorials etc. Libraries are responsible for providing the information support to users and the emergent developments in education sectors also expects changes in LIS profession by providing required information based services, on demands of users. (Karambelkar et al 2012).

4.2 Trends in Education System in ICT:

Education is progressing, since ICT is effectively used for educational development. Emerging trends in education has completely changed the traditional practices. Different career options that were earlier not considered to be important have now emerged as the most popular education and career option base for the society. Online education is popular and becoming a major preferred mode of education among students and in education system. The changing practices in the education system forces other dependent systems to upgrade and change. Libraries in academic sector are facing challenges due to ICT applications in all fields. Higher education is becoming a dynamic, global enterprise, and becoming increasingly complex with multiple roles and provision for different information services (Campbell 2006, Karambelkar et al). Libraries have also to play an important role in satisfying the user needs by accepting modern techniques and practices to support current e-learning education systems.

4.3 Limitations of Traditional Libraries:

Traditional libraries no doubt have efficient library management system but due to information explosion, rising cost of publications, it is not possible for traditional library to provide instant access to users. Traditional libraries have many limitations in exploiting their library activities and services and major time of the library professionals is spent in repetitive and manual work. More manpower and capital investment is required for maintenance of collection than for providing information and reference services to users. Due to these drawbacks, traditional libraries are now started using ICT in libraries. The
practices followed in traditional libraries were undertaken in closed library system environment but revolutions like ICT has changed the face of libraries in the e-era.

4.4 Changing Systems in Libraries:

Libraries acts as powerhouse of information and have collection of books, journals, magazines, newspapers and other reading materials. A basic function of library is acquiring, accession, cataloguing, classifying documents, circulation, and reference service to users. Computerization of library activities such as acquisition, cataloguing, classification, circulation, serial control, OPAC etc. have changed the look of the libraries. Computers are used in libraries in all the activities and made the tasks simpler. Libraries have witnessed many transformations due to constant implementation of technologies e.g. in the mid of 20th century libraries began to use microfilms and microfiches for the purpose to save space, finance, and preserve the documents for the longer run. In 1952 concept of magnetic tape, a data storage system in digital format used and preserved huge data. The use of magnetic media to record and store numeric and textual information, sound, motion, and still images has presented librarians and archivists with opportunities and challenges. (John 1995). Later in the 1970s and 1980s, audio compact cassettes were used as an inexpensive data storage system. Compact disk (CD), is a laser disc technology and used in the mid-to-late 1970’s. Digital Video Disc / Digital Versatile Disc (DVD) developed in 1999 and offers higher storage capacity than previous media used. These magnetic and digital formats are used in libraries very commonly for storing and retrieving. Internet played the vital role in LIC’s and transformed the library system. Internet changes the functions of libraries especially information gathering, information searching etc.

4.5 Expectations of Users from Libraries:

In ICT era, librarians are facing significant challenges and to satisfy user expectations which are different than before. Users require different type of information resources and information services, advanced library services to fulfill needs pin pointedly. User expectations from the academic libraries are changing from text book monopoly to mega
information storage or knowledge base like wikis and from print media to digital media and reference services to virtual information services based on different information resources available online or offline. In addition, 24/7 services in digital form and deliverable at any suitable place, information delivery through mobile, I-phones, e-readers and real time archives of information is expected by users. The information services and dissemination of information covers active learning facilities supporting to current education system, with downloads and synchronization facilities, and information availability from distance or distributed learning centers based on user centric and customized services from libraries. For gathering resourceful information users are now using portals, search engines, information gateways, RSS and web 2.0 tools (Blogs, toolkits, flicker, twitter, face book, podcast, slideshow), webinars, might be effective for scholarly communication and access (Impactmax 2009). Thus the user’s expectations are more appropriate and their needs are now very specific and qualitative. Information explosion, availability of information in various formats, user needs have different approaches, search information from the huge information, retrieval of information, impact of information technology are the major issues faced in libraries.

To meet the expectations librarians have to perform activities differently. The traditional practices are not effective to satisfy user needs in the era of information growth and now technological support helps in assisting to provide advanced services using digital technology as well as other different technologies. The applications of emerging technologies and management practices in libraries are giving proper shape in consolidating information and generating information products suiting to needs of a specific user ICT and management issues are main factors in re-engineering academic libraries. Proper use of technology helps in developing the modern library practices and also supports to modern trends in education.

### 4.6 Performing Library Functions Using ICT:

The main purpose of the library is to serve users in getting the right Information. Library collects the information resources in different formats and stores it for use after processing. Basically, acquisition, processing, organizing, dissemination and library
services are the different functions carried out in libraries every day. Figures 4.1 and 4.2 are represents the different library services and functions carried out in the libraries, both traditional and advanced environment. Figure 4.1 describes basic functions and facilities of libraries.

![Diagram of Library Functions and Facilities]

**Figure 4.1 Traditional Library Functions and Facilities**

In the automated environment, libraries provide additional facilities in addition to basic as detailed in figure 4.2, due to use of technologies.
Figure 4.2 Library Functions and Facilitates using ICT

From above table concepts are very clear and ICT is like a boon to libraries.
4.6.1 Emerging Trends in Technologies:

Changes in libraries are visualized due to development of technologies and its practical applications to provide advance services to users. The technologies are emerging fast and techniques supporting to different activities in LIS might shift to:

- Mobile computing and mobile learning
- Cloud computing
- Distributed data processing
- Semantic web
- Networks based activities
- Web tool applications
- Virtual reality
- Internet and WWW resources
- Institutional repositories
- Visual data analysis (visual representation of data)

Using technologies and practices in libraries, which emerge to personalize learning, teacher generated open content, use of information commons, ICT based library systems, library 2.0, hyperlinked libraries, IR and knowledge base developments, visual data analysis and mining are considered on priority.

4.6.2 Benefits of Technologies in Developing Modern Libraries:

ICT made an impact over library collection, library services, library uses and library professionals. Benefits of ICT might visualize in all concepts in libraries and this made to change the face of libraries and the future libraries may act as:

1. Library as a place: for rethinking and integral part of university learning culture
2. College libraries may perform additional tasks in addition to present viz. Collaboration
3. A blend of formal and informal places
4. A home for services e.g. tutoring centers

5. Technology drives the bus for different functions and services

6. Library functions as a place of information and also act as
   - Writing centers
   - Group study rooms
   - Presentation rooms
   - Distance Learning rooms with Video Conferencing
   - Student and faculty lounges with Podcasting Facilities
   - Information gathering node based on Cafe class 24/7
   - Breaking the text book monopoly and depend on intellectual content resources in e-forms distributed globally.

Similarly few more common benefits achieved are:

   - Quick and pinpointed data searching and information gathering using different resources available globally
   - Improvement in quality of library services and integration within the library
   - Reduce workload of library profession
   - Easy to share the information resources and economical collection development
   - Better library network development

There are few issues which affect the implementation of ICT in Libraries

1. Insufficient funds and weak management support

2. Inadequate trained manpower in IT

3. Lack of necessary required infrastructure

4. Lack of standards

5. Networking of libraries have many administrative issues

6. Poor usage of free open source software’s and weak connectivity of internet
If these issues are set right then the functions of libraries might change in total.

The best practices to be followed in achieving ICT are:

1. Allocate some budget for information technology in addition to the library budget
2. Capacity building of the technical staff from libraries to undertake new tasks
3. Organize workshops and training programs for library staff to develop their knowledge and IT skills
4. Team working practices need to be adapted
5. AMC for the maintenance of IT instruments with battery backup

4.7 Impact of ICT in Library and Information Centers:

Susan (2011) in his article “Impact of Information Communication Technology (ICT) on Professional Development and Educational Needs of Library Professionals in the Universities of Kerala” defined the different aspects related to impact of ITC in libraries and its advantages and disadvantages. The author summarised and concluded that ICT is necessary to overcome the crises in collection development.

The developments in ICT made tremendous changes in the information handling capabilities of academic libraries and information centres all over the world. ICT is beneficial in all the activities of libraries like acquisition, processing, storage, retrieval and dissemination of information (Housekeeping operations) by means of applications of computers, communicating systems, computer technology, database creation and use, repro-micrographic technology, digital technology, network technology, telecommunication technology, web technology, barcode technology, multimedia technology, etc.

The most prominent role played by ICT is the introduction of advanced communication networks and the internet, which has necessitated a major shift in the role of academic libraries from ownership model to access model, from print to electronic media, from libraries as archives to libraries as access points, and from information collection to information analysis and repackaging (Goswami, 2009). The change from print to digital
information has a high impact on libraries, information centers and other institutions directly involved in processing information. The ability of computers to perform high volume error-free repetitive tasks at speeds and actions much faster than human beings, along with the emerging developments in the area of computing; telecommunications, networking and resource sharing, has made access to information anytime, anywhere possible (David, 2001). Now, in ICT era, librarians in an academic environment have the role of mediator between the vast network of resources and its users, and libraries, an access point providing access to different types of information resources.

### 4.8 Transformations of Libraries and Information Centers Due to ICT:

Applications of ICT in libraries have made positive changes in its practices. Few prominent activities performed due to IT are discussed below.

#### 4.8.1 Library Automation:

Library automation helped in automating the library processes and provides ease in access to information. Automation brought economy in management of libraries and developed cost effective models for collection development. The management of library is efficient due to reduction in repetitive tasks. Automation also helped in providing efficient and effective services to users in different forms using digital media.

#### 4.8.2 Internet Applications:

Internet is proved as a boon to libraries, librarians and users. Internet is a platform to users which allows to communicate with each other, provide access to internet resources, publish data instantly to establish monopoly, access to all the information sources available like journal articles, magazines, newspapers conferences, primary, secondary and tertiary resources etc. In addition to this internet provide access to databases. Current awareness services, reference services, referral services, selective dissemination services, document delivery services, literature search, searching information from various sources, inter library loan and resource sharing are the services provided by libraries using internet resources. Hence the use of internet is increased in libraries.
4.8.3 Development of Databases and Institutional Repositories:

Databases, OPACS, WEBOPACS are generated and made available to users to make aware of the availability of resources to others. This facility also helps in exchanging the information with others and helps in developing resource sharing practices. Recently Institutional Repositories (IR) is initiated due to need and ICT application to compile the institutional intellectual collection at single source.

4.8.4 Searching Databases Online and Offline:

Databases are developed by the different agencies to provide quick access to information to users and data can be easily accessed, updated, produced and distributed which save the time and cost, as well avoid duplication, saving space, access at any time from anywhere. CAS / STN, Library of Congress (LC), DELNET, WorldCat DIALOG (OPAC), MEDLINE etc. are holding collection of databases and provide access to users in different areas. Searching online is cost involved and hence offline databases are also made available to users on demand.

4.8.5 Development of Digital and Virtual Libraries:

ICT developed new practices in libraries and due to e-publishing, intent applications it is now possible to develop digital and virtual libraries which are more benefited than traditional libraries. These libraries are providing better and enhanced services to the users in electronic or digital form.

4.8.6 Resource Sharing:

Information explosion, rising cost of publications, users increased expectations from libraries, increased value to research and R and D, growing educational base and financial crunches made libraries to hunt for the sharing of information resources by developing different resource sharing projects. Many efforts have been taken so far and in the past like ILL, Library cooperation etc but ICT and availability of e-publications made it possible to develop library networks and consortium of group of libraries and achieved highest level of sharing information among society.
4.8.7 Web Tools and its Usage for Library Cooperation:

Web technologies also assisted libraries in developing different resource sharing application. The sharing is based on user to use, user to organization, organization to group of users etc. The different tools of Web like facebook, twitter, and blogs are more useful. RSS is the best tool proved for data gathering method. Thus web helped in developing both side communications and proved as a boon to support resource sharing.

4.8.8 Library Networking:

Library networking is sharing of computers, hardware devices, software, data, information and switching all interconnected with communications channels. It is used to establish a connection between network users. Networks can communicate with each other in different geographical areas like in a single room, on a same floor, within a building, in a campus, in between two different campuses and cities, and also communicate in all over the world. According to Tanenbaum (2012) network has three main types LAN, MAN and WAN. Networks allow resource sharing, and provides library services more effectives, facilitate exchange of information and avoid duplication. It saves budget, time, resources, manpower, and energy. Library networks are good in developing resource sharing projects at different level and joining libraries of similar interest.

4.8.9 Consortia:

Library Consortia is nothing but library co-operation, co-ordination and collaboration between groups of libraries for the purpose of sharing of information. A consortium is said to be a co-operative arrangement among groups or institutions or an association or society. Consortia are commonly formed to increase the purchasing capacity of the collaborating institutions, to expand the resource availability and to offer automated services. In other words, it is described as a group of organizations whose purpose is to collectively facilitate and support the work of a service program in ways that add material and human resources beyond those available to each organization/individual (Rajoli, Birdie & Karisiddappa, 2005). Consortia may be formed at a local, regional, national or international level, on a functional or format basis, or on subject basis. Library consortia are really helping the researchers, faculties and the students to retrieve the information
and save their time. Library consortia help to develop digital libraries, utilize funds, provide CAS and SDI services. It is available at any time 24/7. It is helpful for subscription of e-resources, preservation of subscribed e-resources. Consortium is accessible to a number of users at a time and the users can access huge information bases of electronic resources at economical cost.

4.8.10 Bar Code and RFID:

Bar code and RFID technologies are proved profitable as they are used in libraries for circulation operations, theft detection systems and physical verification. RFID-based systems move beyond security to become tracking systems that combine security with more efficient tracking of materials throughout the library, including easier and faster charge and discharge, inventorying, and materials handling (Boss 2004). RFID has improved library workflow, library staff productivity and customer services.

4.8.11 Mobile Technology and Library Services:

ICT has collapsed barriers and promoted fast communication and interactions across boundaries. Libraries are deeply interested in channels for the transmission of information, such as telephones and telephone lines, cellular networks, cable television, and the internet. The internet and websites have made it possible for library users to locate what they need without going to the library. It is useful for marketing communications perspective and the challenge for libraries to attract users to the library and to retain them. It focuses on information provider/user relationship. SMS facility is used to awareness between users and library staff. Library persons can send a renewal notification of library books, message for return the books, overdue library books and notices related libraries through mobile technology. Mobile websites offer free SMS to mobile phone services using internet. Chat, Skype, Smart phones, Web tools assisted in cooperative ventures in libraries.

4.8.12 Advanced Library and Information Service Using ICT:

The following new services can be provided using ICT in libraries in addition to improvements in traditional services.

- e-CAS
• e-SDI
• Alert
• Digest
• TOC
• Database development
• Online and Offline searching
• Internet based services
• Web tool based services
• Digital resource based services
• Network based services

4.8.13 Open Source Software Usage for Developing Libraries:

Libraries are using different library management software’s and automating libraries. The further development in libraries brought out by the library professionals by using open source software’s for developing IR, digital libraries, and web 2.0 / library 2.0. Open source is softwares are available free and after evaluation can be used for different purposes e.g. e-Granthalay for developing automated libraries, Dspace for developing IR, DL and Koha for developing digital libraries. Thus many open source software’s like Koha, PhpMyLibrary, OpenBiblio, GNU Library Management System (GLIBMS), Greenstone, Eprint, Evergreen, NewGenLib are proved beneficial for developing advanced libraries.

4.8.14 Cloud Computing:

A new area developed for resource sharing and running the systems in economical way is cloud computing. Information and communication technology is used extensively in libraries and information centers due to its multifold benefits and new avenues are emerging in the area of LIC. The libraries have been automated, networked and now moving towards paper less or virtual libraries. Cloud computing offer benefits to libraries and helps to reduce technology costs and increase capacity, reliability, and performance
for some type of automation activities. Cloud computing has made strong inroads into other commercial sectors and is now beginning to find more applications in LIC. Cloud computing introduces efficient use of bandwidth, staff, resources, and almost unlimited storage capacity. This also creates a data rich environment where skills to efficiently store, manage, and retrieve information.

4.8.15 Outsourcing and Crowdsourcing:

Outsourcing is the process of hiring outside agencies to perform different type of tasks and relieved the regular staff for the intellectual work. Outsourcing in libraries also proved beneficial in performing different tasks like AMC of computers, data entry, web page design, portal management in addition to regular tasks in the areas of cataloguing, classification, etc.

Crowdsourcing is a type of advanced stage of outsourcing where projects and services are kept open to public to take part and add value to it. It may be voluntarily done or fee based activity. The experts take the lead and develop the information products for the libraries. Use of internet is vital part in such cases. In nearer future these practices are definitely going to be adapted in libraries. Crowdsourcing has not been attempted but initiated the practice slowly. Apart from these social networking, library 2.0 are also practiced.

4.9 Future of Libraries Due to ICT Use:

Dahibhate et al (2011) in their communication elaborated the future of the libraries due to applications of ICT in libraries. Similarly Staley(2010) ACRL reported the top ten trends in academic libraries and pointed out few prominent trends like collection growth which depends on users or patron demands, needs to collect new resources, adapt new professional skill sets, demand for accountability and assessment of resources, digital collection, use of mobile phones, collaboration at different levels, and finally pointed out that libraries may need to be changed from physical to virtual environment for effective use of knowledge and resource sharing.

Staley and Malenfant ( 2010) expressed views related to future trends in academic library to be faced by the library profession in 2025 and expressed nearly about 26 changes in the
education and infrastructure including library system. He expressed the changes to be followed by 2015 and specified the positive trends and changes like change in academic culture, distance education, funding, globalization, infrastructure facilities, libraries, publishing industries, students learning practices, teaching methods etc. Further he explained the development of academic network, breaking textbook monopoly, development of cyber wars and cybercrimes etc and these forced to change the environment and practices followed in education and libraries.

It is an era of web technology and web tools helps in scholarly communicating interactively and many tools are found useful in academy and library. Libraries of the future called as Library 2.0 as they are using Web 2.0 technology extensively for getting and contributing the information globally and the professionals as Librarian 2.0. The scenario may shift to more usage of e-resources made available through networks, and library systems supports to functions like discover (finding current information), gather (collecting acquiring, organizing), create (annotating, indexing, abstracting analyzing, disseminating, filtering), share (writing, data sharing, teaching, publishing) information and may be called as “scholarly primitive behaviors” and provide advanced library services (Brown 2008).

4.10 Challenges in Developing Future Academic and Management College Libraries:

Following challenges are likely to be faced by the academic libraries, library professionals and while managing the future needs resource sharing through networking to be considered for effective use of information sources.

- Continuous evolution (change) to be faced by information professionals and advanced skills need to be accepted and practiced in profession
- Skills along with traditional, new skills like information collection and methods, e-content management, use of social media and use of traditional sources in new media may emerge.
- Virtual access to information
• Seeking information behavior of users to be analyzed
• Information technology literacy
• Embedded librarians role, which is responsible for training, competitive intelligence, and in depth subject support through research
• Evaluation of resources to select proper online or digital resources
• Cloud applications and web 2.0 technologies might be accelerated

4.11 Issues affect the implementation of ICT in Libraries:

There are many issues and problems faced by librarians while reshaping libraries due to application of ICT and this is true in case of management college libraries. The major problems faced are briefed in following paragraphs:

4.11.1 Major Problems:

• Insufficient funds: Inadequate financial support made use of ICT difficult in libraries. Similarly administrative barriers and weak management support is another cause in hindering application of ICT.
• Lack of e-resources selection and collection development policy: There is no comprehensive collection development policy for e-resources.
• Lack of required infrastructure needed for use of ICT effectively in libraries.
• Lack of long-term planning for collection development.
• Lack of use of standards for applying ICT.
• Inadequate qualified library professionals in IT.
• Lack of shared initiatives in group of libraries for achieving, maximum resource sharing.
• Lack of development of networks in group of subject libraries.
4.11.2 How to meet the Challenges:

Librarianship needs to function in advanced and different ways than in the past to meet the changing situation. The following activities in libraries might help in meeting out the challenges posed due to technologies.

- Manage resources, information services and facilities users
- User need based collection
- Support literacy and learning activities
- Restructuring or re-engineering of libraries to suit to modernization
- Need to develop new services along with enhanced of present services
- Revenue generation and marketing of information (by developing information products and delivering need based information services )
- Development of specialized databases using IR
- Advanced services to the end users ( alert, one window service, translation etc)
- Convert libraries to gateway of information
- Follow best practices (in the profession like academic audit, information / knowledge audit, information and technological literacy initiatives, applying management techniques (six sigma) and suitable for lifelong learning etc)
- Capacity building and acceptance of new skills with positive attitude

4.11.3 Recommendations and Best Practices:

Some recommendations and action plans which helps to overcome the barriers to use ICT in library system are listed below:

- Libraries need additional funds for implementing ICT, in addition to library budget.
- Training of library professional: Well-trained and skilled personnel are essential for implementing ICT in libraries. Steps need to taken to develop properly trained and competent staff for this purpose. Organize workshops and training programs for library staff to develop their knowledge and IT skills.
- Collection development in e-form: A comprehensive collection development policy for e-resources needs to be maintained by the libraries, in order to follow a
set of standard practices for acquisition and management of electronic information resources. There should be specific budget for new resources and the renewal of existing resources.

- Team working and capacity building practices need to be adapted for effective development of libraries.

- Library Networking is one of the most effective ways of serving users’ needs, and hence Networks need to develop in subject libraries at local level and help to share resources any each other.

- Prepare a long-term plan for the implementation of ICT in management college libraries.

### 4.12 Role of Academic Library Professionals:

Library functions, services, collections, policies are changing due to ICT applications and similar changes are also expected in library profession. Library profession has to develop greater technical expertise. Future librarians have to exhibit research skills and have to perform collaborative work, team building, competencies needs to be increased. Librarians change their role and work closely with other libraries, information technology and computer science departments, instructional designers, and information architecture specialists to serve users needs. It varies from organization to organization where they work and library managers no longer manage with physical sources and staff and work as educators, as well as collaborators, negotiator and business analyst, who could define the value of information services for their organization, for which they are serving. Next generation information professionals must serve as an agent of change

John Collins (2010), director of the Gutman Library, pointed out that “beyond collections, libraries are learning centers with group study spaces, galleries, cafes, and classrooms. Library certainly is a ‘social’ and collaborative place to work and a place to receive in-person research support.” Now it is not a time for relying on “good will”, but understanding organizational mission and business goals and providing information services to users and meets the goals of future. Next generation information professionals must lead their services aggressively. Next Generation college libraries have to be personalized, relevant and convenient for use. Information services may discover
knowledge rather than search for the information. In future libraries might be accessible to i-Google, face book, blackboard and blogs etc and competencies need to be developed.

**Summary:**

It is observed that there is a tremendous use of ICT in libraries which changed the practices, services and facilities provided by the libraries. Use of ICT in libraries gives the ability and satisfaction user a fulfill needs for information. It is apparent that a time has approached to apply ICT at any level of libraries as the environmental change is very fast. Today’s profession may be redefined and practices might be re-engineered even at college libraries also. This chapter gave insight to researcher regarding the future of library functions, services and facilities using ICT. The future is difficult without resource sharing. Use of ICT follows resource sharing and thus possible to achieve future needs comfortably.

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