Review Paper

Emerging ICT technologies and the academic libraries

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Abstract

The Information Communication Technology (ICT) has revolutionized with new emerging technologies day by day. This revolution has also brought drastic changes into the academic libraries. Information communication Technology in academic libraries is used to save the operating cost, to make repetitive housekeeping operations more effective and efficient to save time and as well as to provide access to huge number of resources to the library patrons. ICT has helped the libraries to upgrade the efficiency of academic libraries. The revolutionary development in ICT has facilitated to provide access to library resources 24 x 7 as well as remote access. How the ICT has been or may be applied in academic libraries to provide and maximize the web enabled information services to the patrons as well as improve the internal working of the library is the purpose of this paper.

Keywords: Academic library, information and communication technology, ICT, web enabled library services, interlibrary loan, LMS, RFID, RSS.

Introduction

Information is very important for the modern information society. For any kind of research and development, information is the key component and very essential to survive in today's' competitive world[1]. The Information Communication Technology (ICT) has revolutionized the concept of information itself as well as how it is accessed. Library and information centres are the repositories of information as well as institutions to disseminate it. Academic libraries are those libraries whose parent institution is academic institution, be it school, college or University. The mission of the academic libraries is to support the parent institution to achieve its goals. Main activities of any library include acquiring, organizing, preserving, retrieving and dissemination of information. Libraries strive to disseminate right information to the right user at the right time[2].

The rapid growth of information communication technology (ICT) has brought a great change in working of libraries. Traditional libraries have evolved into digital libraries where all work is done by computer. Libraries are being known as Digital Libraries, Virtual Libraries, Hybrid Libraries, Library without Walls, or Library 2.0 etc. ICT has brought library to the doorstep of the users, to be used at any time 24x7 as per their convenience[3].

Information Communication Technology (ICT)

The term information and communication technology represents four terms of technologies, namely computer, communications, networking and multimedia. The Information Technologies when applied to information system or service improve the efficiency and increase the effectiveness of that system or service. It is essential and important for library professionals to acquire technical skills as well as attitude to use, develop and maintain web enabled or IT based products and services in the libraries.

According to UNESCO training module the technologies which facilitate information society to generate, consolidate process, manage and disseminate information in varied formats are known as information communication technology (ICT)[4].

Implementation of the Information and Communication Technologies in the libraries to replace the manual housekeeping system is known as library automation. An automated library and information system encompasses following functional components[5]: i. Hardware: The physical parts of a computer, which perform input/output, storage, processing as well as communication are known as hardware. ii. Software: The set of instructions given to the computer to get a work done by it as per the user requirement. The instructions are given in a step-by-step manner. Software can be application software or system software. iii. Communications: The communication is the network which connects one or more computer to other computers. It is of various types e.g. Internet, Intranet and Extranets. In simple terms it is a transfer of digital data among the computes. iv. People: The end users as well as developers come under this category. The people are the most important part of the system.

In simple language amalgamation of information technology and communication technology is known as Information communication technology. Here information technology

includes hardware and software to collect, access, manage and disseminate the information while communication technology includes paraphernalia, infrastructure and the network[6].

Library Services

All the facilities provided by the library to facilitate access of any type of library resources and to full fill the need of the users are known as library services or information services. Some of most popular and traditional library services are circulation service (includes check-in/check-out, reservation and renewal), cataloguing, classification, display of new arrivals, current contents, current awareness service, selective dissemination of information, indexing and abstracting, reference service, document delivery, interlibrary loan etc,. Some of modern library services are access to online databases, e-resources, access to other library catalogues, bibliographic and citation services, online table of content (TOC) etc[2].

Web enabled library services

Web enabled library and information services are those services provided by the library with the help of internet and library portal or library website. These are provided using Library Management Software (LMS) and other web 2.0 tools.

From the users' point of view, some of web enabled library services are: Current awareness service, SDI service, Online Documentation delivery service, CD-ROM service, Internet access, Indexing and abstracting databases, Library portal service, Federated search, Alert service, Digital library services, Web OPAC service and links to other valuable resources i.e. virtual library. Due to the emerging technologies, many new trends can be seen in the field of libraries. These new trends have changed the libraries from: i. Printed collection to Web based publishing like digital collection, ii. Reference desks to Online/Virtual Reference Service, iii. Closed Access to anytime/ anywhere (24x7) access of material through internet libraries, iv. Manual indexing and Bibliographies to Full Text Databases, v. Manual Library Catalogue changed to OPAC (Online Public Access Catalogue) / Web OPAC, vi. Manual sharing of information to Networking of Libraries (Resource sharing networks), vii. Inter-Library Loan Service to Electronic Delivery of Information[3].

From the above said services we can understand the impact of globalization and ICT on the libraries. It has changed the every aspect of library. The Process to Acquire, Organize, Store, Retrieve and to disseminate the information have completely changed. The growth of information and ICT has brought a revolution in the field of library. It has also changed the way people think and communicate with each other.

Emerging ICT technologies applicable in academic libraries

The aim of using ICT is to enhance efficiency, improve reliability and reduce cost. It has a very positive impact on libraries. In present scenario, due to implementation of ICT in Libraries, the form and role of Libraries and Library professionals have changed[4]. The changes in the society and demand for information utilization have forced the library professionals to look for more effective and efficient methods for processing, storing and retrieving of information. To meet these challenges, librarians and information professionals have applied information technologies in their areas of work. Emerging technologies have affected the libraries in improving housekeeping operations as well as the various user services in the following ways:

1. Library housekeeping operations: With the application of ICT, the housekeeping operations of the library have changed drastically and have become quick and easy. There are many Library Management Softwares (LMS) available in the market to automate the library. Library professional can study the requirement of the library and take decision regarding the library software. Types of LMS are: i. Commercially available priced software; ii. Free software; or iii. Software developed in-house as per the requirement of the library.

The software includes modules for various sections of the library. Some of modules are cataloguing, acquisition, serials control to manage the periodicals / journals, and online library Catalogue also known as OPAC. It helps users in finding the required material with the help of different indexes generated through software.

Automated Circulation system helps in keeping record and track of library patrons as well as library documents. The Overdue reminders may be sent to patron through email. An Intelligent Return and Sorter System is also available which can be used in libraries for automating the check-in and sorting process. Users can quickly self return their issued items with "real-time check-in". The Intelligent Return and Sorter System help in decreasing the time span, increasing staff productivity and enhancing user satisfaction.

Automation also helps in serials control and article indexing. It is very easy to trace the missing or overdue issues of the serials and send the reminders to the publishers. Various reports of serials can also be generated through library software. Article indexing is used for CAS and SDI of the library.

Library professional can also take out any type of reports through LMS. e.g., Accession Register, Expenditure details, Invoice register, Daily Issue Report, User Login/ logout Report, Fine received Report, Member's Report etc.

Security of library collection: Academic libraries in India have a large collection of print material despite having access to e-resources. The libraries face the problems of theft, mutilation and loss of library materials. It can also be tackled through ICT. It is possible to install electronic security systems to overcome these threats to some extent. Some library software use barcode

technology along with EM (Electro Magnetic) strips for the security of the library collection. Barcode technology maintains record of the library circulation and status of the library collection. The electromagnetic security strips track the movement of the library documents. This technology is slow and becoming obsolete and at times also sabotaged by the mischief library users. The library has to bear the irreparable loss of its valuable stock. Here Radio Frequency Identification technology (RFID) has emerged as a boon for the Libraries and the librarians[3].

Radio Frequency Identification (RFID): It is the new wireless technology of radio waves which automatically identify individual items. Libraries use it for security of library collection and theft detection. This technology provides more efficient tracking of materials in the library along with the security. It also provides easier and faster check-in/check-out, stock taking, and inventorying the library material. It is a combination of two parts which are as follows: i. Integrated circuit for storing and processing information (also known as Tags). ii. Antenna for receiving and transmitting the signals.

RFID tags are placed on the library items and when these items come under the range of antenna; transfer the information to the computer system. If library material is not issued then a siren starts to buzz. This technology is very refined and improved then earlier used security systems. While many libraries have completed the automation, very few libraries are using RFID as it is very expensive.

2. Web enabled Library Services for patrons: The Web 2.0 has made a revolution in the field of library and converted traditional Libraries to Library 2.0. It is a two way web technology in which user can read and even write any information on the web anytime and at anywhere without the constraint of time and place. Web 2.0 services mainly include websites, Video Sharing, Photo Sharing, Instant Messaging, Social Networking, Blogs and Wikis, RSS, Mashup, and Podcasting. Modern libraries have started the web enabled services to make library user more comfortable. These services include web access of E-resources such as e-books and e-journals, electronic databases etc. Library patrons can access the e-resource through the library website[7]. Access may be password protected i.e. by entering the user id and password provided by the library or available in campus premises (IP based) only. They can make queries, see any notification from the librarian, and chat with them with the help of various tools of Web 2.0 and services. Some of the common web enabled services offered by the information centers are:

Library Portal: Many information services are provided through the library portal/websites/Web pages. It is a gateway to library and other useful resources. The service is offered using web designing software tools and by integrating the various web 2.0 tools. The various facilities, information services, resources and products available in the library are conveyed to the user

through the library portal. It gives all kind of general information about the library, rules, regulations and policies. Now a day's OPAC is also integrated in the library portal with the help of integrated Library Management Software. Recommendation for purchasing, registration of member, feedback or suggestion also may be given to the library through web portal. Access to e-resources is also provided through it. A library portal is very important for the online presence of the library and mirrors the strengths and weaknesses of the library.

Subject gateways: A very important component of library website is subject gateway. It facilitates access to high quality information quickly as well as effectively. It is designed on the basis of the need of library user. It provides easier access to e-resources in a defined subject area. Simplest subject gateways may be a set of web pages of library website and provide a simple search facility. It contains list of links of important and authoritative resources in the particular subject. Various indexes are also generated to offer advances and enhanced search facility through federated search engine. Subject gateways veer or redirect the library user to the website or library portal containing the original resource[8].

Web OPAC: It is an online catalogue facility available through World Wide Web. It helps to quickly browse or search the library database of books, journals and other library collection etc. Full detail of the documents related to search query are displayed to the user and save the energy as well as time of the user[2]. Online catalogue has changed the working of libraries as it also shows the availability status of the documents and user need not visit the library. The status of the document includes if it is issued, on shelf or withdrawn. It also gives facility of reserve a particular document, borrowing history and status of the patron. This can be accessible either on the campus (IP based) or through user ID-Password given by the library or open access on the website[9].

Networking of libraries: Networking of libraries has been made possible with the help of ICTs within the country and even throughout the world. It is also known as Consortia and has made major impact on the services of libraries for the users. It shares the resources and also arranges the Seminars, Workshops, Lectures, Tutorials and Training Programs etc. for the member libraries. Professional news can also be shared on the consortia platform. e.g. Delnet, Inflibnet and Shodhsindhu. The consortia help in following ways:

Resource sharing: The libraries can create and share bibliographic records and other information resources in digital format through resources sharing. Networked libraries can create Union Catalogue which is crucial to inter-library lending. Printed union catalogues, Computer Output on Microfiche (COM) catalogues and CDROM are now being replaced by union catalogues on the web. Union catalogues, standardization and machine readable catalogues are aimed at promoting resource sharing. Developments in ICTs have made it possible

to automatically update the catalogue records from member library systems, distributed searches using a single user interface, and value added services[10].

Interlibrary loan: It is a cooperative arrangement among libraries to borrow material from one another. It is a major service of the library and is very easily provided to the user electronically. Users can check the union catalogue of the network and get the resource from the member libraries on loan through their parent library.

Document delivery services: ICT has made the document delivery services very simple and reliable. From searching the holdings to ordering and delivery have been benefited by the use of ICT. The Document Delivery Service (DDS) delivers copies of journal articles and book chapters and even books from participating Libraries. Fees may be charged for Document Delivery Services. Digital documents are delivered through emails.

E-resources: Resources stored in electronic or digital format are known as e-resources. These require computer to access and use. Libraries may provide facility to either access locally or remotely through the internet. All the university libraries subscribe a limited number of e-resources due to budget constraints and so compensate their collection through becoming a member of different consortia. These consortia provide access to various online bibliographic as well as full text databases and e-journals. These cover free internet resources as well as resources purchased/subscribed by the libraries from either commercial publisher or from nonprofit making organizations. The links to all e-resources are available on library website/portal. Distant user with limited amount of time is very much benefitted by the availability of access to e-resources through web. She/he need not visit the library and can access at his/her own pace[11].

Virtual Reference service: The direct personal help or service given to the user or reader for finding relevant and accurate information is known as the Reference service. It is one of the most important services of the library[12]. When assistance is given virtually with the help of various web tools, it becomes Virtual Reference Service. Online chat or Instant Messaging (IM) is a technology or Web 2.0 tool that facilitates instant transmission of messages from sender to receiver through Internet. It helps in providing Virtual Reference service. It can be synchronous or asynchronous. Sometime the service is also made available through e-mail. Many academic libraries are doing it. The chat system may also be used for providing feedback/Suggestions to the librarian. e.g. Whatsapp, Wechat, Facebook, Messenger, Google hangout etc.

Current Awareness Service (CAS): The Libraries need to publicize their collection and service. They need to make library patron aware about the new acquisitions of the library. Libraries use display boards and shelves to draw attention to recent

additions, and many libraries produce complete or selective lists for circulation to patrons. Libraries also announce their workshops, seminars or other events etc. so that user can be a part of the event[3]. All of it combined together is known as current awareness service. In the changed scenario and due to implementation of ICT, it is now known as e-CAS. New additions are being announced through websites, blogs, or even facebook also. New additions' list is being circulated to the patrons through emails also. The tools available on the internet such as table of contents of journals, and discussion forums etc. assist library professionals in providing e-CAS services to the users.

Selective dissemination of information (SDI): When library patron is kept informed of new acquisitions or resources on specific subjects of their choice, it is known as Selective Dissemination of Information. Application of ICT on this service changes it into e-SDI. In most of the academic institutes, academicians are hard-pressed for time and are not able to visit the library personally. e-SDI service is the best to deliver current information to the academicians. In this service the users' research interest profiles are searched in the latest updates of Electronic Databases. Respective faculty members or academician may be given the relevant information through the e-mail. It is useful only when the user and document profiles are carefully constructed and matched. Now through ICTs, it has become very easy to create user and document profiles and provide the service. Various federated search engines facilitate this service. Alerts may also be created for the saved or defined search terms. E.g. Knimbus, Google scholar etc[13].

Social networking: Making online groups of people, sharing common interests or ideas is the trend today. Social networking sites are the tools which help in making these groups or communities. Various forums are also one of good example of social networking. Professional forums provide a platform for healthy discussion and for solving various problems. Libraries use this tool to help library professionals and users to interact with each other and share their thoughts, ideas, and opinions for current awareness of user and to bring improvement in library. Libraries forums are of immense help to professionals and academicians as they provide current information and also help them in getting reference service. They can also be used for announcement of library events and activities, so as to invite users to participate in them. The library staff also posts messages to discuss problems being faced by them; new techniques or practices adopted in libraries as well as circulate the information of new acquisition etc. Web 2.0 tools such as Blog, Facebook, and linkedin etc. may be used and a link may be given on the library website[14].

RSS feeds: A web 2.0 tool, helping users to get the updates and feeds from other websites is known as RSS. It provides users a way to conglomerate content from the Web and can republish it on their sites or blogs i.e. apparently distil the Web for their personal use. Libraries use it to broadcast the activities of the

library and alert users about the latest updates. It is also used to provide current awareness service. Software is used to read RSS contents and is known as "RSS reader", "feed reader", or an "aggregator". The user needs to check the RSS icon indicating subscription process or type the feed link into reader to subscribe it[15].

Newsletters: The library can publish e-newsletter on its website or circulate through Facebook, library blog, and email also. It is very useful service to the users as it may make available listing of available Internet services, resources, new acquisitions, useful Training, Conferences, Workshops, and other programs of library or programs of outside institution/organization and useful to their patrons. It may also be used to publish patron's views or feedback about the library.

User Education: In general all the library services are provided keeping in view users' need; bur user education is very important library service as it educates the user about the library, its resources, services, products and system procedures. The web enabled user education means user need not visit the library and provides flexibility and a high degree of interactivity to them. The library websites , social networking sites, forums etc. are used to provide web enabled user education E.g. teaching the skills to use the library, how to use OPAC, how to locate library collection, navigation of the library website, guidance to use electronic databases and other electronic resources. Even tutorials may be given to teach search query formation or searching technique, use of search engine to search web resources, use of Boolean operators to improve relevancy, and how to make efficient search strategies etc.

Web Forms: There are various application available on web (Paid as well as free), which may be used to make online forms. Some examples of web tools are Google form (free), and Survey monkey (free up to a limit only) etc. Libraries use these web or online forms for getting suggestions and comments of the library patrons to improve upon on the Library and its Services. Online forms may be used for different purposes. Some examples are acquisition recommendation, Request for interlibrary loan or electronic document delivery, virtual reference service, online form for reservation of document or to survey the user and feedback form etc. These online forms may be made available to the user through library websites, facebook or library blog etc.[16].

Institutional Repository: The intellectual strength of any academic institution lies in its research progress publicized through dissertation, theses, and research reports etc. Academic libraries need to acquire all the documents generated in-house. Now with information explosion, libraries are trying to develop digital repositories of such resources, and provide Internet or intranet access to the repository. Academic Libraries establish a rich digital Institutional Repository using DSpace (Open Source Software) and include thesis, articles or papers published in journals or presented in conferences, e-books, newsletters,

research reports, images, news clippings, multimedia, faculty publications, syllabus archive and question paper archive. All the resources are collected in digital format and those in print form are scanned to convert into electronic format. This way libraries help in archiving the institutional research and growth as well as ease of access to it[17].

Conclusion

User services are the backbone of the libraries. The Academic Libraries are trying to provide user web enabled information services to keep user satisfied. It can be concluded that Web enabled information services are essential for academic libraries as the shift of library services to the web based environment helps the users to access, assess, and use information effectively. The libraries support the net generation users or "digital natives" and help them in accessing relevant information through implementation of various emerging ICTs. In this paper, the emerging trends that have come in the library field due to revolution and application of ICT have been discussed. But these emerging technologies have also challenged library professional to acquire new skills to use them for the betterment of libraries and not to lag behind in digital era.

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