Chapter 2
Cutting Edge: Technology’s Impact on Library Services

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ABSTRACT
Libraries and librarians are constructing a better world by experimenting with the latest technology for their patrons. As technologies evolve from time to time, new tools have been discovered to provide optimal services in minimal time. In developed countries like USA, UK, and Germany, the libraries are adopting new technologies for learning, research, and information to give the patron the best possible services. Librarians are struggling more to implement these cutting-edge technologies for learning, research, and information for their users.

DOI: 10.4018/978-1-7998-1482-5.ch002
INTRODUCTION

According to Technopedia Technology Website Cutting-edge technology refers to technological devices” techniques or achievements that employ the most current and high-level IT developments; in other words, technology at the frontiers of knowledge. Leading and innovative IT industry organizations are often referred to as “cutting edge.” The cutting edge is also known as leading-edge technology or state-of-the-art technology”.

The basic aim of Libraries is to achieve the goal of acquiring, storing, preserving and organizing the information and distribute them in large scale. An era of Information technology many new features and devices have been implemented to impart the best possible services to the end users, forging closer work relations with other department, libraries in the modern era have hugged many technologies which bring users more closer to the services being offered by the libraries. For example, access to full-text journal databases impacts on the acquisition of serials while reference and inter library loan departments use full-text databases to bring the information and client together in a timelier manner.

The libraries of the current era are facing many challenges, as research and services are reshaping, and needs of researchers are increasing, people don’t have time to visit the libraries and get the desired material of their choices without wasting time. The cutting-edge technology has brought revolution in all walk of lifestyle. Similarly, libraries have also hugged this kind of technologies for the best possible services. To offer quick and quality services information to its users, the libraries are becoming trend-setter in the age of digitization, the world has become a global village and information in one corner of the world is quickly spreading in the other corner in no time.

The libraries in global age have adopted new technologies which work for the betterment of its users. The innovative styles in academic libraries are attracting more users in the cutting edge era. The last few years are considered to be the most glorious period of cutting-edge technologies. Many trades have highly been affected by these technologies. The libraries across the globe are striving to overcome these technological changes. For this purpose, they are experimenting numerous technologies in order to give an access to the material available in their library.

Libraries and librarians are constructing a better world by experimenting with the latest technology for its patrons. As technologies are evolving from time to time and new tools have been discovered to provide optimal services in minimal time. In developed countries like USA, UK and Germany, the libraries are adopting new technologies for learning, research and information to give the patron the best possible services. Librarians are struggling more to implement these cutting-edge technologies for learning, research and information for their users (Kumar, 2009).

SOME POPULAR CUTTING-EDGE TECHNOLOGIES

There are numerous technologies being adopted by librarians in their library services in order to satisfy the needs of their present and prospective members, some popular cutting-edge technologies are mentioned here:
Big Data

To create a personalized users experience library uses big data. The purpose of this technology is to
provide the user’s information about their choices, providing resources and services under this technol-
ogy the librarians must keep their personal data in mind (Cuifeng, 2013).

Virtual Reality

The users may be brought closer to the library under this technology virtual reality technology has been
implemented in developed countries which included training/workshops and a virtual tour of the library.
Many new technologies have been introduced across the globe, but the potential of virtual reality (VR),
Augmented reality (AR) and mixed reality (MR) are top trends among librarians to show the world the
experience being made in the library field. MR, AR, and VR are virtual field trips which could be used
in the library services for a solar system, tornado, walk around refugee camp, the 3D model for the hu-
man body, vacation spot, preview a college system or test driving a new car. These are some advanced
technologies being adopted in developed and many developing countries which can help the patron to
try it beyond the four walls of the library (Swanson, 2007).

Augmented Reality

This technology is based on combine digital with reality, in Pakistan people are also curious to imple-
ment the same technology in model libraries.

Artificial Intelligence

In our daily activities the Artificial intelligence is gaining more attraction as this application focus on
delivering information to the users. People are considering it as a challenging job to the libraries, but,
the name denotes that it is artificial, not human. By adopting this feature in services, the libraries can
connect people to information easily (Russell, et al, 2016).

Block-Chain Technology

Under this technology a decentralized database can be used, which provides access to everyone to the
pseudonymous digital transaction via networking, the data can be collected and stored for the user acces-
sibility. Block-chain technology is another tool-set being adopted by the librarians in different libraries,
this technology was introduced in 2008 initially, under this technology a decentralized database can be
used, which provides access to everyone to the pseudonymous digital transaction via networking, the
data can be collected and stored for the user’s accessibility (Nicholson, 2017).
Internet of Things

This technology has gained more momentum, as it has become essential for users; RFID and Internet of things are connecting various devices which can be used for transferring the data, in case of an Internet of things the data can be transferred over the internet only. The modern library adjust IoT in different segments such as smart building technology for example cooling, heating and lighting can be controlled from smart phones app under this technology. It can also be used for people countering in different section of the library.

Library Mobile Apps

Mobile apps have become a top trend after the invention of android applications. Through these apps, peoples have access constantly to their mobiles. By adopting mobile apps in the library services, the library will gain more usability of it. Converting services through mobile apps may connect patron and users on one page. Self-service printing, copying, and scanning solutions: As many people don’t print at their home, under this service, a central access to printing can be given to the users to print pages of their choice and pay dues online for the services (Hahn, 2012). Library services in modern information technology offer such services for the present and prospective members in order to update them about new facilities being launched in the library.

3D Printers

3D printing has also become a buzz word for the last few years. Many libraries have adopted these services because the charges of 3D Printing are becoming cheaper with the passage of time. As 3D printing has become a highly debated topic for last few years. Also, assuming the library could provide access to appropriate modeling software along with staff support; a 3D printer could enable and support rapid prototyping of experimental apparatuses and custom parts.

Robots

Robots technology in the 21st century has great value in Library services many developed countries have implemented such technology which is helpful for the users and patrons both.

Drones

The Drone is a small flying device which can be controlled remotely. Many librarians have implemented such technology in their libraries. These Drones can provide services to the handicapped peoples and all those who don’t have time to visit physically to the library. So, implementation of this technology will give more services to the users directly.
Digital Interface for Printed Books

Fujitsu has developed a prototype device which can be used to highlight the desired information in a digital book. For this purpose, a finger link may be used for a digital object. Everyone was talking about physical objects in real world. By implementing this technology in the library services one can find and highlights the important excerpts. thus, it is a combination of a real world with a digital object. There are many libraries which can implement these kinds of cutting-edge technologies in their services. The governmental institutes which have huge amount of budget can buy these technologies in their libraries, many other massive technologies being implemented in developed countries. There are also some other technologies needs to be implemented in library services those are (Ebbesen, 2019).

User-Focused Interfaces and Application

The personalized interaction between the system and the users have become a future perspectives of library services whether this is interaction via digital exhibitions featured on screen or an interactive game projected onto the floor for children to interact with. A big screen inside the library which displays different kind of information inspires users to find certain books or allowing them to take a selfie. Libraries are allowing users to use these digital technologies for experiencing purposes.

Driverless Cars

Sci-fi movies are experiencing these days in the library across the globe. According to author Ida Joiner in his book Emerging Library technology has described that Driver less cars may also be introduced in future which can travel between destinations with ought human drive can be of high importance for future libraries.

Library Maker-Space

This is also known as hack-lab or hacker-space which allow a library users to produce something special by implementing their intellectual skills such as Video, audio editing, 3D Printing, traditional arts and crafts to bring awareness among other users.

Me Card Technology

To provide users with greater and easier access to the information and collections held by libraries across the province. The technology developed by the project team underpins a reciprocal borrowing service among numerous libraries and features a self-service web form that allows users with a library card from one library to self- register to access collections of another desired library (or libraries)
Learning Management System (LMS)

For Virtual Learning Environments, the Learning Management System (LMS) should also be adopted in the library services, which enable the users to use the online delivery of courses material with the help of Web Applications and software.

Easy Video Creations

In partnership with Information Technology Services, enabled easy video creation for faculty and students. With only a flash drive and the push of a single button, users can activate a video camera, microphone and lights to begin recording.

E- REQUISITION SLIP

Digital Signboard System

Somerset County Library System developed a more dynamic and cost-effective way to promote programs and resources in high-traffic areas of the library. The creative solution brings together a Raspberry Pi computer, large-screen monitors, WiFi, and Google Docs Presentations to reduce digital signboard costs by almost $1,000 per display. The project also reduced poster printing costs and actually made it easier for staff to remotely update and push new content to their customers.

Coding Clubs

Coding clubs a new technology which teaches our children and us that how to make the use of technology the way we want it. As technology is everywhere which effects our live, but the question is how to use these technologies. BBC has designed a tiny programmable computer named Microbits. Which teaches the children how to code and how to get solved a problem and its proper solutions.

Digital Storytelling

Written words had always love affairs with Libraries in any format, such as papers, CD Rom, microfilm or web page. In current era libraries entertained writers and coders both to create new and interactive stories where from readers get benefits to control the narrative flow (Shen, et al, 2018).

Open Libraries

The concept of open library is new and controversial one but many peoples are getting benefits from the same library services. Such kinds of services are unmanned and beneficial for the communities and ensure the need for libraries is fulfilled. Open libraries are being used to extend open hours and not to
reduce staffed hours. Peterborough libraries are the first and best example of such kind libraries based on UK. The most valued aspect of such kind of libraries is the ability to borrow books and to access the information outside the normal opening hours.

**Cloud Printing, Copying, and Scanning**

The digital era has adversely affected the printing facilities at home. People are no longer taking interest to page large number of pages via their printers at home. Libraries provide these services to patrons and users are getting printing facilities from their libraries directly. The cloud printing support mobile networking and one can give direct printing command via cloud printing. These services attract more users who often do not visit their libraries but for printing facilities they use their smart phones, tablets and laptop anywhere.

**Kinetic Bikes in the Library**

This kind of technology is spreading all over the world. Under this technology a person who often visits the library have their smart phones and expects to charge their mobile phones at their library. Visitors in one place charge their mobiles in a charging kinetic bikes and reading the library material until get their mobile charged.

**Streaming Services**

Streaming services are increasing in many libraries across the world. Gone are the days when users were taking DVD on loans from the library. Streaming TV and film are becoming a reality and one can see movies and lectures through their library account. One member can stream ten films or episode per month under this technology.

**Embedded Digital Libraries**

Embedded Digital library is another milestone helps the librarian to expand the mission of their library by providing digital content services in a wider range.

**Digitallearn.org**

This is a free public library association website which allows the readers to use it as policy documents for internet privacy and cloud storage. These kinds of helpful stuff make our lives safer, easier and more reliable.

**Quantum Supremacy and Quantum Computing**

These computers are in experimental age which will be able a user to perform calculations faster than that of digital computers. Many Library Databases have been connected with the Alexa and Siri by the modern libraries. Under this technology some voices technology from Microsoft, Google, Apple and
Amazon allow the users to ask any questions in their natural language and command the computer to answer them. Usages of this kind of technology in library services will allow the librarians to respond to their patrons with the help of these devices.

**CUTTING-EDGE TECHNOLOGY DISADVANTAGES**

Electronic technologies have number of advantages and people are utilizing them in all walk of lives. Similarly, libraries across the globe are also experiencing the same technologies. Albeit cutting-edge technology has made the work of librarians easier but since then these technologies have also some disadvantages which should not be ignored when it comes to electronic technologies and must be taken into consideration when evaluating how a new tool may or may not enhance the service.

There is tremendous pressure to jump on the bandwagon, to be on the ‘cutting edge,’ to be seen as forward thinking, and to have the advantage over the competitors. This pressure often encourages institutions to jump too soon without consideration to the market it serves. Sometimes, it may be all right not to be on the ‘cutting edge.’

Something that is easy to overlook, goes unnoticed until it isn’t working, is time consuming, but is very important, is the maintenance, upkeep, upgrades and regular testing of all the various tools we employ. We have to change, fix, correct, improve, check, and update more in technical options we provide.

It is critical to have an organized maintenance program. As technology is becoming obsolete with rapid changes in IT sector, user get frustration while using poorly maintained tools in their distance education, it becomes very difficult for the staff to upkeep these technologies with rapid changes. It is a balancing act to determine when, how or why it is necessary to change, and the ripple effect of a change in on campus technology to the end users of that technology.

A strong feedback from users and experts is required while selecting the right technology for the delivery of information for the distance education. A careful evaluation, collaboration and feedback from users, and constructive criticism to the creators and vendors of the products may kindly be entertained before selecting the same tools (Black, 2001).

**PRESENT AND FUTURE PERSPECTIVE OF CUTTING-EDGE TECHNOLOGIES**

**Present Perspective**

Researchers in the contemporary environment are strongly believed in digital contents rather than to retrieve books and similar material. For this, they want to access learning materials online. Their changing expectations are highly affecting the library professionals, but keeping in view their extensive demand the librarians are exploring new ways to fulfill their demand without any hamper. New tools and technologies have been introduced and people are expecting to use these technologies to get optimal benefits from these available resources.

Libraries are adapting new trends based on digital applications and artificial intelligence in the current era of information technology. As new horizons of technology trends have highly affected different services. Similarly, Libraries are a trendsetter and implementing these new technologies for their patron to provide them with access to reach the library resources and services without wasting time.
Many Libraries in Developed countries like USA are Striving their bests to offer sustainable information resources and services at affordable prices to meet the dynamic needs of the library users. Therefore, many library practitioners, administrators and academia are trying to adopt emerging technology in order to answer the questions being raised via stringent budget and high expectations of library users (Clark, et al, 2015).

Emerging technologies in education are defined as “tools, concepts, innovations, and advancements utilized in diverse educational settings (including distance, face-to-face, and hybrid forms of education) to serve varied education-related purposes (e.g., instructional, social, and organizational goals)” . For librarians, “emerging technologies refers to any new technology that can help support user services, instruction, library management, and technical services”. Today’s technology boom brings with it many opportunities for libraries to boost its services. “Emerging technologies are new evolving innovative technologies with great uncertainty and unpredictable futures”. (Rotolo, et al, 2015).

Emerging technologies in the context of libraries can be any tool that is being used in a novel way to serve your users (Jain, 2014). An emerging technology is not necessarily a new invention. As a matter of fact, many older technologies are being reinvented and used creatively for modern purposes. However, the term ‘emerging technologies’ is often used without a clear meaning or definition (Halaweh, 2013).

**Future Perspective**

The future libraries are seen to be most productive than those of the past. The Information portals and robotic assistant will be used as guides in the coming few years. The real innovations remain to be seen in the library services across the world. In the digital age, Information technology, Internet and World Wide Web (WWW) has become an information superhighway for global libraries to deliver and disseminate information to the end users. Utilizing the internet platform, in the era of digital technology, networking and computer technology and much more have provided the global libraries with innovative approaches to enhance and integrate information resources and services Yang, et al, 2015).

**SOME SUGGESTION FOR LIBRARY PRACTITIONERS**

The library practitioners must keep in mind Some important steps while coming across these cutting-edge technologies

**Start Experimenting**

Do you know that some shortcut/hack can make your work more productive? Are there any tools/programmes being not implemented and could be used as supportive tools? You can consult with your professionals to apply the same who already used them. One can search it online for inspiration and then get stuck in. So start them as experimenting based and you will be aware latterly.
Mentors are King

Mentors are known to be the king in concerned field. There are some guru in the market who designed and implemented them successfully. There are some people who are python champion. There are some more people in your colleague who discovered some niche or industry specific. You may request them politely to share it with you or can give you few tips to help you out. People are usually sharing knowledge about such tools pleasurably.

Be a Tech Guinea Pig

If any library is installing new software for their team, just test it on volunteer basis or if a new programme has already been installed then check it again and again and make yourself as a champion of internet. Testing and checking it repeatedly will make you stronger and expert in the same software which can help you in your promotion. Become needs of the boss and make sure that without you no one other than you understand it effectively. Experiencing new tools always make a man stronger and skillful.

Create Something

Excel yourself in library career will make you more superior. Learning is a fun and taking interest in new technologies will boost your skill up. Sometime people are enjoying spending time on some good software for deeper knowledge. Make everything as an enjoyment tools in IT especially in emerging tool. There is no better solution other than taking interest in new tools and make them your hobby.

Sign up to Learn

All digital technologies once introduced in any field provide demo information to make it more prominent. In this case you must sign up to learn everything online. This kind of practice will make you more technical while operating them. There are always more websites which experiencing the same tools as you are going to launch them. Experiencing them will make your work easier.

CONCLUSION

Libraries have become one of the key nodes of delivery and distribution of information in this digital age. Library patrons do not usually find time to visit the library personally to access and search the library material they need. As emerging technologies are affecting all trades of life, similarly libraries are also experiencing the same technology in order to fulfill the dire needs of their users.

The data browsing, information visualization and library digitization have highly involved the staff and users both to quench their thirst of knowledge in the age of information technology. The emerging technologies have highly affected the users and library practitioners both to full their needs in the post-
This chapter provides librarians an idea that how to adapt useful technologies to fulfill the dire needs of their community. Although adapting such technologies will create some hurdles initially, but slowly and gradually the library practitioners will make their users abreast in near future. This chapter is just a glimpse of some of the fantastic technologies being occurred in the field of librarianship and library services.

We know that Libraries have always been about sharing knowledge, culture and skills and these new digital tools will make the librarians more skillful/knowledgeable to provide maximal services in minimal times. We hope adapting these technologies will make the work of librarians easier and up-to the mark for the entire community relying on libraries.
REFERENCES


