Development of Smart Library and Technology use in Academic Libraries

Dr. Veena Prakashe
Information Scientist (Professor)
Campus Library, Rashtrasant Tukadoji Maharaj Nagpur University,
Nagpur, Maharashtra, India

Mrs, Shilpa N. Hirekhan
Research Scholar & Librarian
Seth Kesarimal Porwal College of Arts & Science & Commerce,
Kamptee, Nagpur, Maharashtra, India

Abstract

The evolution of libraries happens through three stages i.e. modernization, automation and digitization. A smart library (SL) is an information Centre with networks of many libraries and their services in a larger informational ecosystem around the globe. The components of smart libraries are encapsulated in the acronym "S.M.A.R.T." For "service, Methods, Automation, Resources, and Technologies'. Smartness means that the development of new library e-tools and services are measured on the assessment of real resources and users. Smart is more user-friendly than intelligent. The 'smart library 'requires smart librarians which gives service to user centric and user friendly. Library technology refers to those technologies which are mainly used in libraries for providing smart library services to their users, perhaps keeping in view of the implications of five laws of library science as envisaged by Dr. S.R. Ranganathan. This paper emphasis on the phenomenon of a smart library, alongside with the development of computer technology, telecommunication. This paper describes briefly details on smart library, its works, smart library concepts, various technologies and smart services.

Keywords: Smart Library, concepts, digitalization of libraries, computer technology

1. Introduction

Libraries have undergone various stages of evolution. The evolution of libraries has happened through three stages namely modernization, automation and digitization (Nahak,B. padhi, s., 2019) . In the same vein, library materials have also evolved from clay tablets, papyrus, cuneiforms, books, CDs, microforms, e-books, database resources, open access, to virtual resources. On a daily basis, technology evolves. This evolution simultaneously triggers changes in the management of libraries and allied institution as well. Each level of ICT advancement impacts on the library. Today, due to technological innovations, libraries have become smart.

Being smart literally means having or showing a quick-witted intelligence. Some libraries have

possessed this level of intelligence refers to the ability of a computer or computer-controlled robot to perform tasks commonly associated with intelligent beings such as humans. Emphatically, the term "smart library" appears in various contexts as a synonym for the concept of an 'intellectual library', 'digital library' or virtual library (Baryshev, R.A. Verkhovets, S.V. babino, O. I., 2018). As we all know that ranganathan's fifth law says that –Library is a growing organism deals with accommodating changes in technology, services, collections and users. Smart library is a system which is developed to maintain research and training activity. In digital environment smart libraries is just a library resolution to innovate library and information services. A library is built with smart technology is able to be open to library users without being personnel. The technology facilitates remote control of library building includes well-furnishedfurniture, automatics doors, lightening, self-services kiosks and open computers to all users.

2. What is smart library?

A library fitted with 'Smart library technology is able to be open to library users without being staffed. The technology enables remote control of library buildings, including automatic doors, lighting, self-service kiosks and public computers. This allows us to significantly extend library opening hours, so more people can use the library at times that is convenient for them. For a library to be smart, it must have machines programmed with human intelligence to perform library functions as though it was a trained librarian. In other words, a smart library is a conglomeration of hardware and software installed to act as librarians. It is the author's expression that the term SMART as used in this paper is an acronym for the components of a smart library. Thus, being SMART stands for:

S = Services

M = Methods

A = Automation

R = Resources

T = technology

These are the main components of smart library. (Orji, Sotonye; Anyira, Isaac Echezonam, 2021)

3. Review of Literature

Orji, Sotonye (2021). The study observes that smart libraries described its various services, methods, automation, resources and different types of technology. It also discussed the challenges associated with smart libraries in Nigeria. Based on the findings of the study, the researcher gave some recommendation about the smart library.

Shashikumar, A. A. (2021). The authors identified the major emerging technology trends for libraries and library professionals. The authors have selected the block chain, connected toys, data everywhere, drones, facial recognition, haptic technology, robots, unplugged, virtual reality and voice control. These are the various technology discussed in this paper.

Frederick, Abankwa (2019). The researcher discussed the smart technology that would be needed in the future for libraries to compete with other stakeholders. It also stated the various technologies adopted in some libraries and analysis it. The authors also gave the recommendation which is very useful for the academic libraries.

Nahak, Brundaban (2019). The author describes briefly details on smart library, smart services, smart readers, cloud service developing 'smart librarians', service visibility, service orientation of smart academic library and their e-service in digital era.

Schopfel (2018). The purpose of this paper is to provide new perceptions towards public and academic libraries. The study observes that the smart library concept and services described in four dimensions like smart place, smart services, smart governance and smart people.

4. Concept of smart Library

The concept of smart library began in 2000s with the advancement of the computer technology and digital interactions. Smart library is also known as digital library, virtual library and also intellectual library. The concept of smart library emerge in various perspectives such as the word 'smart' means elegant, flexible, stylish, acknowledging. According to their inquiries and requirements, smart library is a concept of the complexion hardware and software with a wide range of opportunities for searching and providing indispensable information to effective, interactive, informative, inventive, and changing and so on. The major purpose of the smart library is to convince information requests of the user, suing digital technology. To study an information need of a user is possible through implements of information technology. The author expresses here that smart library is library which is techno drive with artificial intelligence and internet of thing based service provider to smart readers. The smart library creates

- Creating of smart environment , mobile access, new knowledge creation
- Active content, Adaptively, smart technology of content formation
- Smart detection of knowledge, smart interface(organization of interaction with the user)
- Smart services (e.g. Personal informing and mobile applications usage) (Nahak,B. padhi, s., 2019)

5. **Smart Technology: -** some of the major technologies' trends are briefly discussed below

5.1 **Blockchain Technology: -** The concept of blockchain was introduced in 2008 proposed by santoshi Nakamoto to create a "purely peer-to-peer version of electronic cash," which would become the digital bitcoin currency in 2009. Blockchain technology trend was

used to distribute the databases that organize data into records. It helps in improving digital badges, facilitating the transfer, authority and reputation of awarded badges and other digital credentials. It promotes more secure and trusted certification and it could expand across formal and informal learning that happens in academic, public, school and special libraries. (ALA, Blockchain, 2018)

5.2 **Connected toys: -** A new crop of toys takes advantage of trends in wireless connectivity, the internet of things, artificial intelligence, and machine learning to create highly personalized exchanges between object and child. Connected toys, technology trends developed in response to children engagement in digital screens. It builds the expert knowledge platform and rebuts education where children establish the interaction. (ALA. Connected toys, 2018).

5.3 **Drones: -** Drones are part of research, transpiration and delivery, artistic production, news coverage and reporting, law enforcement and surveillance, and entertainment. It will provide new opportunities for content creation and research. Users may expect drones to be part of technology resources available from libraries. Additionally, video or survey content produced by drones may become content collected and managed by libraries. Drones can be used for delivery service for the library users who don't have the possibility to go to the library; be it because of a disability, or because of the long distance to the library.(Garland,2018)

5.4 **Facial Recognition:** - Facial recognition is a type of biometric technology that uses statistical measurements of people's features to determine identity digitally. The facial recognition technology can be used in library to identifying the library walk-ins, it could replace the traditional library cards and who they are, where they live what books they checked out, and if any overdue etc. Though facial recognition allow for more ease in day-to-day life, it comes with significant security and privacy issues that might cause concerns for users

5.5 **Internet of things:** - Internet of things is most influenced technology for the library services in current days. Smaller computing, radio devices, cloud, user interface, gateway, analytics and artificial intelligence will sense and transmit the data. IOT refers to the possibility of connecting everyday devices and transferring data between them. It provides" opportunities for library applications, from tracking room usage and program attendance to monitoring humidity levels for special collections and more". Therefore, the library can offer a better user experience by enriching its services and collections.

5.6 **Robots:** - Robots were initially introduced into industrial and factory settings to accomplish tasks that were deemed too dangerous or difficult for humans and moved to work, educational research and living spaces. There are the numbers of the library who have already successfully implemented robots for example, the Joe and Rika Mansueto Library in Chicago, Connecticut's Westport Library which acquired two robots. Libraries and other educational institutions may have a role in developing new skills for displaced

workers and improving skills so that workers can transition to new roles and responsibilities in environments where robots assume significant portion of the workflow.

5.7 **Virtual Reality**: - Virtual reality technology is the computer-generated simulation that provides users with the headset which transports them to immersive destinations. Today's libraries have an opportunities to offer the virtual reality services to their users bring virtual reality to education with many innovators focusing on two of the key services of libraries: collections and spaces.

5.8 **Voice control:** - Voice control technology provides a new option for interacting with computers and technologies through advanced machine learning, speech recognition, and natural language. Voice controlled technology also change the way people access and "read" content. The virtual assistants of voice control become more become intellectual equalizers, substituting in for a superb memory or acting as on-hand references.

5.9 **Radio frequency identification technology (RFID): -** RFID is an automatic identification technology that uses radio waves to track items by sending data to readers. The application of RFID technology in a library can promote its operational efficiency. RFID is used in the university libraries to reduce staff stress, increase efficiency, track and locate items quickly, book drop support at any time, easier circulation, promote self-check- in, check-out activities etc.

5.10 **Cloud Computing:** - cloud computing is "the name for the recent trend of moving software and computing resources to an online, shared-service model. It refers to computing resources that exist in the cloud external to an organization but accessible via the network. The delivery of on demand computing services- from applications to storage and processing power-typically over the internet and on a pay-as-you-go basis.

6. **Smart Services of smart Library:** - Smart services re based on artificial intelligence. In this case, technological devices carry out activities that librarians perform. Smart library services are not mutually exclusive from those rendered by library staff in a normal library. The main function of smart libraries is to systematically organize libraries collections, in a manner that users can interact with digital technologies to serve themselves. Smart library renders library services faster, better and smartly to its end users through digital technology in different software applications with the help of internet and intranet. Smart libraries are technologically driven with artificial intelligent systems. Smart library services were categorized into 8 by Nahak and Pashi(2019) as follows:
    1. Library marketing and promotion service, newsgroups/Newsletter services.
    2. Electronic selective dissemination of information (E-SDI), Bulletin board, discussion forum.
    3. Electronic board service, Atmospherics, Mash Ups, Linking different datasets.
    4. Ask the librarian, feedback process, webliography.

Web 2.0 and web 3.0	• Artificial Intelligence • Automated reasoning	• Web OPAC • Ontologies
	• Cognitive Architecture	• Ubiquitous Contents

5. Collaborative Digital Reference services, Video podcast
6. E-document delivery services, Institutionalization/personalization-portals
7. RSS (Really Simple Syndication), Virtual Library tours, Streaming media
8. Value added, aggregator services, open access publishing, metadata schemas

Following table shows the various technology and its applications in library

	• Composite Applications • Recombinant text • Semantic web • Semantic wiki • Software agent	• Geo Tagging • Virtual Reference Service • Semantic web • Cloud computing • Unique Search • Mobile library catalogues
Internet of Things	• Smart homes & Offices • Smart Grids • Wearable Devices • Industrial IoT • Disaster Management • Agriculture and Smart Farming	• Personalized Services • Locating Books and other Materials • Library Orientation and Information Literacy • Smart Circulation Control • Inventory Control
Artificial Intelligence	• Artificial intelligence has many applications	• Automatic keyword indexing and abstracting system • Translation of electronic resources and Optical character Recantation • Decision support system
RFID	• Pet and livestock tracking • Inventory management • Asset tracking and equipment tracking • Inventory control • Customer service and loss control • Improved visibility and distribution in the supply chain	• Book Drops • RFID Tagging • Counter Station • Counter station • Self check out station • Shelf Management • Anti theft detection
Block Chain Technology	• Money transfers • Financial exchanges • Lending • Insurance • Secure personal Information • Government Benefits	• Digital preservation and tracing • Inter Library Loans and Voucher system • Library verification of crediting

	• Secured Medical information • Artist Royalties	• Library card • Organizational Data management
Electronic Resource Management (ERM)		• Electronic based resources including electronic journals, databases and electronic books, web preservation and many more

Conclusion: -

Smart library is designed to serve all library services faster, better and smartly to its end users through the digital technology in different software application. There are a number of applications of Artificial Intelligence implemented and they have been creating a positive impact on libraries. This has proved that an application of AI saves time and money in almost all sectors. The applications of AI in the academic libraries have been increasing in very high speed.

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