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Smart Libraries in Digital Era: An Overview

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Abstract

The conceptualize, idea and phenomenon of a smart library, which began during 2000s, alongside with the development of computer technology, digital storage, telecommunications, Internet and Human-Computer Interactions. A smart library is an information centre with networks of many libraries and their services in a larger informational ecosystem around the globe. 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. In today's era, a library equipped with 'smart library' technology is to be allowed freely open to library readers with no library staff. Technology gives facilities for controlling and monitoring of library buildings, including automatic doors, lighting, auto-services pavilions, and any computers. It gives permission to use resources 24X7 hours so that the readers can use the library at times that that are convenient for them. The 'smart library' requires 'smart librarians which gives service to user centric and user friendly. This paper observes an overview of smart libraries aimed at providing better information resources and services for library users.

Keywords: Smart Library, Smart Library Architecture, Future of Libraries, Innovative Services.

1.1. Introduction

The term 'Smart Library' has recently been used more frequently, for labeling a vision of libraries of the future, in particular as part of the so called 'Smart City' concept. Libraries have undergone various stages of evolution. The evolution of libraries has happened through three stages namely modernization, automation and digitization (Nahak & Padhi, 2019). The concept 'Smart Library' appears in various contexts, as a synonym for the

concept 'Intellectual Library'. Such phrases as 'Digital Library' and 'Virtual Library' can also be found. The term 'Smart' means flexible, adaptive, extendible, acknowledging and human. Smart libraries are the new generation libraries, which work with the amalgamation of smart technologies, smart users and smart services, Smart libraries are becoming smarter with the emerging smart technologies, which enhances their working capabilities and satisfies the users associated with them. A smart library provides services, which are interactive, innovative, informative, actual, changing and international. The main purpose of a smart library is to satisfy information requests of a user, using modern information technology. It is possible to study information need of a user via instruments of information technology.

A smart library enables remote control of the library building including automatic doors, public access computers, and a self-service kiosk. It is a system developed to support library users. This system extends the library hours and makes the users able to use library services according to their convenience. The concept of the Smart Libraries has been discussed globally in different contexts and under different names. Consequently, there is a range of conceptual variants generated by replacing 'smart' with other adjectives, such as digital, intelligent and blended.

1.2. Concept of Smart Library

Smart is a network enabling free access to all libraries. The term Smart Library appears in various contexts as a synonym for the concept of an Intellectual library, digital or virtual library. Smart library is nothing but just a library solution in a digital way. It is also a very sophisticated true multimedia streaming and digital delivery solution through a device and browser agnostic (Khuntia, Mishra & Ramesh, 2016).

The concept of Smart Library is to serve all library services faster, better and smartly to its end users through digital technology in different software applications with the help of Internet and Intranet. The author expresses here that Smart Library is library which is techno-drive with Artificial Intelligence and Internet of Things based service provider to smart readers.

The Smart Library creates:

- Creating of smart environment, mobile access and new knowledge creation.
- Active content , adaptively and 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).

1.3.Vision of Smart Library

The vision of Smart Library is to create an 'indoor living lab', where readers and scholars can develop, test and presents smart technologies, access and analyze the collected data to carry out both qualitative and quantitative studies also by applying different types of open-source software as and when required accordingly. The author

wants to express here that it is online testing centers for readers and researchers on different subjects and different library open library software tools through which they get maximum service with unlimited time.

1.4. Elements for Smart Library

The core elements of Smart Library are:

- High Speed Internet, Uninterrupted Power Supply, Meta Data.
- RFID, Bar Code, Smart Card, plagiarism software, IR software.
- Wi-Fi /Li-Fi-premises of Library, ETD databases.
- Green Library Building, own library web site, library blog.
- Sound budget, Standard ILMS, e-library orientation.
- E-resources (e-databases-books, e-journals- e-reference tools, CD, DVD, Audio sets, e-newspapers, Mandalay reference tools).
- Good Scanner, Printer, Digital Photocopy Machine, CC Camera, Sensor, library digital gate.

1.5. Functions of Smart Library

The main function of Smart Library is to make systematic development of the collections, store, and organize information and knowledge in digital form and provides easy and affordable access to it from various locations via internet.

The basic functions of Smart Library are:

- Smart technology to promote the preservation and construction of digital resources. It records academic conferences, expert lectures and academic reports, then publishes them on academic video-on-demand platforms.
- Provide web-based library services to the readers and access to online learning materials.
- Gives ICT-based access to a range of digitally available publications for educational purposes.

1.6.Dimensions of Smart Libraries

The Smart Libraries has seven dimensions such as smart economy, smart mobility, smart environment, smart people, and smart living, and smart governance, Smart services. Out of seven dimensions, four prominent dimensions are described here they are i.e., smart services, smart people, smart place, and smart governance.

- **Smart Services:** It is the first dimension which can be described as the application of the ‘spirit of innovation’ of smart readers to the development of modern library services. The Smart Services can provided to the readers through RFID , mobile and wireless access, remote assistance, semantic web, and Artificial Intelligence, Internet of Things, machine translation, voice and image recognition, sensor, CCTV, natural language processing, augmented reality for delivering new experiences in enjoying cultural heritage

etc. The Smart Libraries is an information hub connected with other libraries and urban services in a larger informational ecosystem. However, these innovative tools and services are smart only insofar as they are user friendly and user-cantered.

- **Smart Readers:** It indicates smart living related to buildings and means, for instance, building monitoring and control, monitoring of electrical devices, personal safety, and a healthy environment for the staff, as well as for the public. The readers of Smart Libraries should be flexibility, creativity, tolerance, cosmopolitanism, empowerment, and participation in public life. It can be categorize into two levels of smart readers for smart community and production of knowledge. Smart community consists of smart citizen, user of SL services and staff of library. The library staffs are a part of smart people who controls production and analysis of information and data (data librarian) or to the control of discovery tools. The second level of smart reader's community can producer of new knowledge in Smart Libraries.
- **Smart Place:** The third dimension refers to the library as a building and as a place. In a general manner, this dimension can be described as 'smart environment' and environmental monitoring. The place should be technological as well as environmental smart so, that readers can seat comfortable and read smartly.
- **Smart Governance:** The last dimension of the Smart Library is smart governance. It includes all library features that represents to the concept of 'smart governance' in the state/country, which encapsulate, for instance, collaboration, cooperation, partnership, citizen engagement, and participation. The library user becomes stakeholder of the library and takes part in the library management and administration. The keyword of smart governance is collective intelligence, based on shared responsibilities between the library staff, the library community and other institutions.

1.7.Smart Library Services

The following best smart library services are:

- Library Marketing and Promotion Service, Newsgroups/ Newsletter Services.
- E-SDI , Bulletin Board, Discussion Forum, Start-Page/Home Page.
- Electronic Board Services, Atmospherics, Mash Ups, Linking different datasets.
- Ask the librarian /Contac us / Feedback Process, Webliography.
- Collaborative Digital Reference Services, Video Podcast.
- E- Document Delivery Services.
- Institutionalization/ personalization–portals.
- RSS (Really Simple Syndication), Virtual Library Tours, Streaming Media Value added, aggregator services, Open access publishing, Metadata schemas.

1.8. Internet of Things (IoT) Based Smart Library Services:

The Internet of Things (IoT) is the latest technology through internet in the present scenario, by this embedded technology the number of everyday devices or objects can be able to collect and transmit data in the library with human-human, thing-human, thing- thing, exclusive of human interface is possible. Its works to improve access to library materials or services and provide better learning opportunities to the patron. The Internet of Things enabled technologies can enhance the regular library experience. Usually a library user might be using a library through physical or digital form. First a user enroll himself in the library through his personal detail and area of preference mentioned in their profile, along with this library have created a data of particular user about the previous browsing or borrowing history. A library can provide a comprehensive information about the services of library through the Library app combined with Internet of Things there is a boost up for the users services. When the user visit the library they get welcome massage from the library in his/her smart phone. Then users can open this personal page designated in the app to check for the latest update on area of interest. When the users can come in the library for their desire information they can go near the shelves and the sensors on the shelf will redirect them to the right direction for their desire information. Another sensor recognizes the client detail and shares relevant information such as the most popular book or events from the library going to be done. When users decided to check out the book they can go to the shelf checkout counter and get the material checked out. After visit the library users can get the thank you massage from the library to his/her library application. Another part of the Internet of Things enabled Library is that users can get the full detail about the desire library materials from anywhere through the app and it can help to the users to visit the library they will be guided using a map and directions to the available items on the shelf. They also get a alerted if the book have been checked out already or even if it were miss-shelved, they would be able to find them without any help of library staff.

1.9.Related Technologies for Smart Libraries in Smart Campus

- **Cloud Computing:** Cloud computing is a general term for anything that involves delivering hosted services over the internet instead of accessing directly from desktop or internal server. It's provide independent of location network connectivity and afford multiple users accessibility through internet. Cloud computing is the delivery of computing services which including servers, storage, databases, networking, software, analytics and intelligence over the internet cloud to offer faster innovation, flexible resources, and economies of scale.
- **Pressure Pad Sensor**: Pressure pad sensor consisting of thin sheet sensor pad facilitated with Wi-Fi technology which connected to processing unit, which records and controls the system. Using pressure pad sensors in the aisle under the floor, frequently movement of the users in particular aisle is to be recorded so that collection of books of particular stacks can be increased to provide sufficient information, and its also links with energy system to minimize energy loss in the library.
- **Magic Mirror:** Magic mirror is a application technology could be added throughout library that will be able to sense what title the user is holding and recommended other library material, mention related events, gives a sneak peak into the books. Magic mirrors have lot of application as a technology advances. It's consisting of

smart camera, sensor with Wi-Fi enabled interaction between people and computers. Its works to deliver diverse information, such as location recognition, review of the contents, similar like material. Also the information of the users review stored in the database. This system will find their way into daily use very fast and advanced methods to provide intuitive user interfaces will be of high importance.

- **Wireless Sensor Network:** The Wireless Sensor Network refer to group of spatially discrete and dedicated sensors for monitoring and recording the physical conditions of the objects and organizing the collected data at a central location. Current technological advances in low power integrated circuits and wireless communications have made proficient availability, at low cost, low power tiny devices for use in remote sensing applications. The blends of these factors have improved the practicality of utilizing a sensor network consisting of a large number of intelligent sensors, enabling the collection, processing, analysis and dissemination of valuable information, gathered in a variety of environments.
- **Radio Frequency Identification:** This service is used for management of a library. It enables self check-in and check-out of books. RFID tags are placed both on books and on student's ID cards. Student's details and details of the books are already stored in the library database. Once the student scans his ID card his complete details are shown. The details of the book are taken by scanning the book and the book is allotted to that particular student. The whole system is protected with security doors which prevent the user from entering without scanning their RFID tags.
- **Wireless Technology:** One of the wireless technologies is Wi-Fi which is an IEEE 802.11 standard that is increasingly used, especially in enterprises and campuses with the aim of providing internet access to many devices. Wi-Fi connections and provide free Internet access to users due to high performance, low-cost network and simple technical implementation (Ikrissi and Mazri, 2020). Another form of wireless technology is known and referred to as ZigBee. This also is based on IEEE 802.15.4 standard. Generally, it is used to create personal area networks with applications and devices that require a long battery life, lower data rate and secured networking. It is often used in monitoring and control applications whose data reliability power efficiency, and affordability are crucial.

1.10. Challenges to Effective Implementation of Smart Libraries

There are several challenges that limit effective implementation of smart libraries in the digital environment. The challenges predominantly experienced in developing countries include Shortage of smart librarians, High cost of implementation, High cost of maintenance, Lack of ICT skills among library and information science professionals, Low level of partnership drive, Unavailability of digital infrastructure and Inadequacy of fund.

1.11 Conclusion

The key force driving smart campuses and smart libraries remain technological devices, therefore, library managers should ensure that adequate digital infrastructure are provided for effective creation and management of smart libraries. This can be achieved through collaborative effort. Heads of libraries in conjunction with heads of

parent institution can engage in sustainable collaborative programmes with hi-tech institutions or agency. Due to present thrust of digital tool in everywhere has made it possible to visualize data and information. This has opened a new vista for smart libraries. Going smart and eco-friendly, sustainable information systems are the need of the present generation which calls for immediate concentration. In this new dimension of information technology, the libraries and information centers necessitate enhancing the quality of their services by successfully adopting digital technology. Even the Government of India has taken so many initiatives to adapt advanced technology as a slogan 'Digital India' and some of Indian libraries have adopting advanced technology to fill the digital divide among the users and encourage to youths to works as smart as technology smart.

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