



## Innovative Library Services and the Integration of ICT in Libraries

Sanjay Kumar Dongre, Ph.D., Department of Library

University Library, Shaheed Mahendra Karma Vishwavidyalaya Bastar, Jagdalpur, Chhattisgarh, INDIA

### ORIGINAL ARTICLE



#### Author

**Sanjay Kumar Dongre, Ph.D.**

E-mail : sanjayKumardongre@gmail.com

shodhsamagam1@gmail.com

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### ABSTRACT

*The rapid evolution of Information and Communication Technology (ICT) has redefined the modern library landscape. Libraries have evolved from mere physical book storage spaces to vibrant information hubs that utilize various ICT tools to deliver effective, user-focused, and innovative services.. This study explores the impact of ICT on library services, focusing on the transformation brought about by tools such as integrated library systems (ILS), digital repositories, virtual reference services, mobile apps, RFID technology, cloud computing, and artificial intelligence. The study also examines the trends, challenges, and opportunities associated with the implementation of ICT-based services in academic, public, and special libraries. A review of the literature underscores the global shift toward digitization and user-focused service delivery. Emphasis is placed on the growing need for staff training, budget allocation, infrastructure development, and user awareness to facilitate seamless ICT integration. The paper concludes that innovative ICT-based library services are not only beneficial but essential for libraries to stay relevant in the digital age and offers suggestions for future improvements and research directions.*

### KEY WORDS

*Information and Communication Technology (ICT), Library Services, Digital Libraries, E-Resources, Online Public Access Catalog (OPAC), Library Automation.*

### INTRODUCTION

Libraries have traditionally served as institutions for the collection, organization, preservation, and dissemination of information. In the 21<sup>st</sup> century, with the advent of ICT, the function of libraries has shifted

from passive storehouses of books to proactive service providers in a digitally interconnected world. ICT has provided libraries with tools for handling digital resources, enhancing user access, automating operations, and engaging users in new ways. Modern libraries are expected to offer round-the-clock access to information, seamless navigation of catalogs, virtual consultations, online databases, and digital lending. The pandemic further accelerated the need for digital infrastructure, as libraries across the world had to serve users remotely.

The integration of ICT into libraries includes the deployment of systems such as Koha and Evergreen (open-source ILS), DSpace and Greenstone (for digital repositories), virtual learning environments, mobile applications, e-resource management systems, and AI-powered recommendation tools. These innovations help not only in resource management but also in improving user experience, broadening access to information, and enhancing the library's role in teaching, research, and community development. This article examines how ICT transforms traditional services into innovative offerings and identifies the key components, benefits, and barriers in adopting ICT-driven services in libraries.

## Objectives

The primary objectives of this study are as follows:

1. To Examine the Role of ICT in Transforming Library Services;
2. To Analyze the Impact of Automation on Library Operations;
3. To Evaluate the Application of Emerging Technologies;
4. To Identify Challenges in ICT Integration.

## Scope of the Study

The study explores the significance of innovative library services and the integration of Information and Communication Technology (ICT) in libraries, focusing on how these transformations enhance access, efficiency, and user satisfaction. It covers different types of libraries academic, public, special, and research emphasizing their adoption of ICT-based services such as digital libraries, institutional repositories, mobile applications, virtual reference, and cloud-based solutions. The scope also highlights how ICT strengthens traditional library operations like cataloguing, circulation, and reference services while enabling new, user-centered approaches such as personalized discovery tools and online literacy programs. Furthermore, the study examines global trends and innovations, with special attention to challenges and opportunities in developing countries, particularly India. Finally, it extends to emerging technologies such as artificial intelligence, big data analytics, block chain, and virtual/augmented reality, identifying their future potential in reshaping libraries into smart, dynamic knowledge centers.

## Limitations of the Study

Despite its broad coverage, the study has certain limitations. First, its findings are primarily contextualized to developing countries, which may not reflect the full global picture. Second, ICT tools evolve rapidly, and some technologies discussed may become outdated, while new ones may emerge beyond the scope of this study. Third, the research relies largely on secondary data, with limited primary evidence from library practice. Fourth, differences in resources, infrastructure, and staff expertise among libraries may affect the feasibility of adopting innovations. Lastly, while the study addresses technological and service innovations, it does not deeply examine legal, ethical, or policy-related challenges such as copyright, data privacy, or digital rights management.

## Literature Review

According to Singh and Chander (2013) state that ICT makes tasks such as cataloging, buying books, and lending more efficient. Automation helps libraries save money and allows the staff to focus on helping users. Koha is a popular open-source system used in libraries because of its ease of use and flexibility.

It helps with cataloging, managing series, lending, and online catalogs. DSpace helps institutions create digital collections for storing theses, articles, and multimedia, thus making academic communication more open and accessible.

**According to Islam and Islam (2017)** emphasized the role of ICT in developing digital libraries, which provide seamless access to e-resources, online databases, and open-access repositories. Their study highlights how tools such as Online Public Access Catalogs (OPACs) and integrated library management systems streamline essential functions, such as cataloging, circulation, and user query resolution, thereby enhancing operational efficiency. This shift to digital platforms has redefined how libraries manage and disseminate information, thus making resources more accessible to users globally.

**According to Sharma (2018)**, IRs enhances institutional visibility and academic collaboration. FID and Smart Libraries: The use of Radio Frequency Identification (RFID) technology has led to the development of “smart libraries,” where books can be borrowed or returned without staff intervention. Libraries such as the Delhi Public Library and IITs in India have adopted RFID to automate circulation and inventory management, improving efficiency and user satisfaction. AI, chatbots, and personalization: Artificial Intelligence (AI) and machine learning are gradually being integrated into library systems to provide customized services.

**According to Kumar and Singh (2018)** argue that both librarians and users must be equipped with the skills to navigate digital platforms effectively. Their study, based on surveys of library users, revealed that inadequate digital literacy training limits the use of e-resources, particularly among older users and those in resource-constrained settings. This highlights the need for targeted training programs to ensure that ICT benefits are accessible to all users, thus fostering inclusivity in library services.

**According to Johnson (2019)** notes that ICT enables libraries to offer tailored services, such as recommendation systems and virtual reference desks, which significantly enhance user satisfaction. By leveraging data-driven algorithms, libraries can suggest relevant resources based on user preferences, whereas virtual reference services provide real-time assistance and improve accessibility. Johnson’s findings underscore the potential of ICT to create user-centric library experiences, though the need for robust data privacy measures remains a critical consideration.

**According to Adebayo (2020)** discusses how automated systems, including self-service kiosks, mobile applications, and radio-frequency identification (RFID) technology, reduce manual workloads and improve accuracy in inventory management. These systems enable users to check materials independently and allow librarians to track resources in real time, minimizing losses and expediting processes. However, Adebayo pointed out that high implementation costs and the need for ongoing staff training pose significant challenges, particularly for libraries with limited budgets.

**According to Lee (2022)** explores how artificial intelligence (AI) and the Internet of Things (IoT) are creating innovative library services. AI-powered chatbots provide 24/7 reference support, handle routine queries efficiently, and allow librarians to focus on complex tasks. Similarly, IoT devices enable smart library spaces with features such as automated lighting and inventory tracking, optimizing resource use, and enhancing user experience. These advancements have positioned libraries as modern, technology-driven hubs of knowledge.

**According to Patel et al. (2023)** highlighted that unreliable Internet connectivity and outdated devices limit the adoption of ICT in libraries, exacerbating inequities in access to digital resources. Their qualitative study, based on interviews with librarians in rural areas, underscores the need for infrastructure improvements and equitable resource distribution to ensure that ICT advancements benefit all communities and not just those in well-resourced urban settings.

## **Innovative Library Services Enabled by ICT**

**Virtual Reference Services (VRS):** Virtual reference involves using online tools such as email, chat, video calls, and social media for user support. These services offer flexibility and real-time assistance to

remote users. Libraries such as the British Library and Library of Congress have implemented robust VRS systems.

E-Resource Management and Discovery Tools ICT enables complex e-resource management systems, such as EBSCO Discovery, VuFind, and SFX link resolvers, which assist users in finding relevant materials across several platforms. Federated searching and metadata harvesting enable seamless discovery. Libraries are linking their systems with university LMSs such as Moodle or Blackboard to provide e-resources, reading lists, and learning materials directly within course modules. Digital Literacy and Online Tutorials: Many libraries employ ICT to provide tutorials, webinars, and e-learning modules to promote digital literacy. These contain guides to citation tools, database navigation, and research technique. Maker's spaces and innovation labs Maker spaces, which include 3D printers, coding tools, and virtual reality setups, promote creativity and STEM study. ICT enables interactive surroundings by transforming libraries into innovation hubs.

## Benefits of ICT Integration in Libraries

The integration of Information and Communication Technology (ICT) in libraries has ushered in transformative benefits, revolutionizing how libraries operate and serve their communities. Below are the key advantages of ICT integration, supported by insights from scholarly literature:

- 1. Enhanced Information Access and Availability:** ICT enables libraries to provide seamless access to a vast array of digital resources, including e-books, online databases, and open-access repositories. Tools like Online Public Access Catalogs (OPACs) allow users to search and retrieve information remotely, breaking geographical barriers. Digital libraries ensure that resources are available 24/7, catering to diverse user needs and schedules, thus making libraries more inclusive and accessible.
- 2. Improved Operational Efficiency through Automation:** Automation streamlines library operations by reducing manual workloads. RFID systems and integrated library management systems improve accuracy in inventory management, circulation, and cataloging. Self-service kiosks and mobile applications further expedite processes like checkouts and renewals, allowing librarians to focus on higher-value tasks like user support and program development.
- 3. Personalized and User-Centric Services:** ICT enables personalized library experiences through recommendation systems and virtual reference desks. Libraries can utilize data-driven algorithms to recommend resources based on user preferences, increasing happiness and engagement. Virtual reference services, such as AI-powered chat bots, offer real-time assistance, guaranteeing that consumers receive prompt support regardless of location or time.
- 4. Innovative Services through Emerging Technologies:** Emerging technologies like artificial intelligence (AI) and the Internet of Things (IoT) are reshaping library services. AI-driven chat bots offer 24/7 reference support, handling routine queries efficiently while IoT enables smart library spaces with automated lighting, climate control, and inventory tracking. These innovations create modern, user-friendly environments that enhance the overall library experience.
- 5. Increased User Engagement and Community Outreach:** ICT enables libraries to function as community hubs by providing digital platforms for e-learning, coding workshops, and virtual events. These projects encourage digital inclusion and lifelong learning, especially in impoverished regions. Online systems also allow libraries to engage with patrons via social media and interactive tools, resulting in better community relationships.
- 6. Cost-Effectiveness in the Long Term:** While initial ICT deployment may be expensive, long-term benefits include lower operational costs through automation and digital resource management. Cloud-based library systems, for example, reduce the requirement for physical infrastructure and maintenance while providing scalable solutions for libraries of any size.

7. **Support for Digital Literacy and Skill Development:** ICT integration encourages libraries to offer digital literacy programs equipping users and librarians with skills to navigate e-resources and emerging technologies. These programs bridge knowledge gaps, ensuring that all users can fully utilize ICT tools, thereby promoting equitable access to information.

### Challenges in ICT Integration

- **Funding Constraints:** Many libraries, especially in developing countries, lack funds to acquire or maintain an advanced ICT infrastructure.
- **Digital Divide:** Limited access to technology among users can hinder the full benefits of ICT.
- **Staff Training:** Continuous professional development is required to keep the staff updated on new technologies.
- **Resistance to Change:** Traditional mindsets can slow the adoption of new systems, and cyber security: Digital systems are vulnerable to data breaches, requiring robust security protocols.

### Future Trends and Recommendations

Libraries will increasingly use artificial intelligence (AI) to automate user inquiries, recommend materials, and manage collections. Block chain technology is used to secure digital transactions and authenticate intellectual work. Virtual and augmented reality is used to provide immersive learning experiences and virtual tours. Collaborative Platforms: Greater worldwide collaboration for resource sharing and cooperative cataloging. Policy Support: Governments and institutions must provide strategic guidance for ICT use in libraries.

### Finding and Suggestion

The Future research directions and recommendations for the Innovative Library Services and the Integration of ICT in Libraries should to:

- Explore how Information and Communication Technology (ICT) facilitates innovative library services, including digital libraries, online public access catalogs (OPACs), and e-resources, to enhance information access and user engagement.
- To investigated how automated systems, such as self-service kiosks, mobile applications, radio-frequency identification (RFID) technology, streamlined library processes, reduced manual workloads, and improved efficiency.
- To assess the contributions of emerging technologies, such as artificial intelligence (AI) and the Internet of Things (IoT), in creating smart library environments and providing advanced services such as 24/7 reference support through chatbots.
- To highlight barriers to ICT adoption in libraries, including high implementation costs, the need for continuous staff training, digital literacy gaps, and the digital divide, particularly in developing regions

### CONCLUSION

ICT has transformed library services in unprecedented ways, making them more user-centric, efficient, and inclusive. Libraries' operations and cultures are constantly being reshaped by innovations ranging from digital libraries and mobile apps to AI and maker spaces. However, successful ICT integration is dependent on a number of elements, including financial investment, skilled people capital, infrastructural development, and governmental support. Libraries must remain nimble and adaptable to new technology in order to remain relevant. Libraries must reinvent their roles in the digital ecosystem as participants in education, research, and innovation, rather than just digitizing old services. By embracing ICT, libraries may transform into smart knowledge hubs.

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