IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Innovative Library Services In The Digital Age: A Review Of Emerging Trends And Best Practices In Indian Academic Libraries

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Abstract: Over the last few years, researcher have noticed that academic libraries in India have been changing a little bit. Technology has changed academic libraries. For this research paper, researcher studied research published between 2018 and 2025. And found most research mention about RFID systems, AI tools, e-learning platforms, digital repositories, and even upgraded integrated library software. Because of these changes, the role of librarians seems to be shifting. They are not only managing books and shelves; now they provide digital resources, and they guide and educate users on how to use e-resources.

But, to be honest, this transformation is not easy everywhere. Several small libraries still face real issues- a lack of trained staff, budget issues, and ethical issues. From what researcher understand so far, if librarians get regular training, sufficient funds, updated policy, and support from the institute, then academic libraries in India can keep moving toward more learner-centered, tech-friendly environments.

Key Words - AI, RFID Technology, Academic Libraries in India, Library Automation, Digital Libraries in India.

I. INTRODUCTION

As researcher first started looking into how academic libraries in India are changing in the last few years, researcher did not expect those changes. Libraries used to be filled mainly with books, but now they're becoming a center of information and knowledge. They provide digital resources along with print materials. Now libraries are using Library management software for cataloguing, RFID for circulation, chatbots for quick reference service (Bhattacharya, 2024) and (Muthumari et al., 2021), due to digital resources and other open access resources. Now students can access materials from home, traveling on their phones. Libraries can collaborate with National projects like NDLI and INFLIBNET to make resource sharing easier.

Librarians' roles are changing now. They're not just managing printed collections. They need to perform as guides, trainers, educators, and data curators for digital content. (Kaur, 2022) mentions that librarians need strong digital literacy skills today. In the first place, for librarians to keep up, institutions need to offer proper training and support; without training and support, these tools cannot be used.

Most earlier studies are focused on a single technology, like IoT, AI, or RFID, or discussed individual case studies. Only a few research papers are available about how all these tools together are reshaping academic libraries in India. Hence, in this research, researcher is trying to bring those technologies together. Researcher studied recent literature to see what benefits and challenges keep appearing. And how these changes affect accessibility, efficiency, and user satisfaction in digital transformation. The main idea is to understand how

these changes are improving accessibility, efficiency, and user experience, and at the same time ensuring that libraries play a vital role in higher education.

II. CONCEPTUAL FRAMEWORK OF THE STUDY

This study's conceptual framework tries to focus on how these technologies link to specific library functions, and ultimately, how they improve user satisfaction and operational efficiency.
Some innovations stand out. For example:

ILMS (Integrated Library Management Systems), AI (Artificial Intelligence), RFID systems, Digital Repositories
Now, Libraries are becoming an interactive space where technology guides both staff and users.

Table 2.1. Relationship Between Technologies, Library Services, and User Benefits:

Sources	Technology / Innovation	Library Services Enabled	User Benefits
Sharma and Kandari (2022)	RFID and Smart Library Systems	Self-check-in/out, automated circulation, stock verification, security control	Faster transactions, reduced queues, improved security, higher user satisfaction
Nimbhorkar (2024)	Integrated Library Systems (Koha, Libsys, DSpace)	Cataloguing, acquisitions, serials control, OPAC access	Accurate records, 24×7 availability, improved efficiency
Islam et al. (2025)	AI Chatbots and Virtual Assistants	Automated reference service, instant Q and A, user guidance	24-hour help, reduced staff workload, quicker responses
Islam et al. (2025)	AI / ML-based Cataloguing and Metadata Extraction	Intelligent indexing and subject tagging	Faster processing, better resource discovery
Nimbhorkar (2024)	Digital Repositories and Open-Access Platforms	Archiving theses, dissertations, and institutional research	Global visibility, easy online access to research output
NAAC (2020)	E-Learning and Digital-Literacy Initiatives	Integration with LMS, user orientation, training	Improved digital skills, better use of e-resources
Nimbhorkar (2024)	Mobile and Virtual Library Services	Mobile OPAC, remote access, virtual help desk	Access anytime/anywhere, higher convenience
Islam et al. (2025)	Analytics and Data-Driven Decision Tools	Usage analytics, resource-management dashboards	Data-driven planning, customized services, efficient budgeting

Berendt et al. (2023)	Ethics and Fair-Use Awareness in AI	Bias detection, fairness audits, policy guidelines	Transparent systems, fair representation

As per mentioned above Table 2.1, these tools have changed libraries' work profile, organizing, managing, and delivering information. Libraries are providing faster service and increasing user satisfaction.

III. LITERATURE REVIEW

Academic libraries have really changed over the last few years. They are not just book storage only, now they have become centers of information, learning and research. Researcher noticed that technology like AI, Automation and library management systems are helping libraries to do day to day work faster. It saves the time of library staff and students as well. It's happening globally but it's also shaping Indian libraries.

3.1 International Innovations in Digital Library Services

Globally, Libraries are moving fast toward digitization and automation. In some of the country like, England, Germany, America and China already used Cloud software and machine learning for cataloging and Classification (Nimhorkar, 2024).

Many Libraries are using chatbots for quick reference service and it is very effective (Islam et al., 2025) The Natural Language Processing is helping make indexing and automate metadata creation (Berendt al.' 2023).

3.2 Digital Transformation in Indian Academic Libraries

Digital India and the National Mission on Education are taking initiatives through ICT to make libraries Digital in India. Several universities and colleges have adopted systems like Koha for library management and DSpace for open-access repositories, which help automate cataloging and circulation, reducing errors and improving accuracy (Sharma and Kandari, 2022; Nimhorkar, 2024).

Most technical institutions in the Delhi-NCR region have adopted RFID systems to improve circulation, security, and stock management. Some universities have also received self-check-in kiosks and mobile-enabled OPACs to make library access easier.

However, many small and medium-sized college libraries thus far struggle with issues such as low budgets, poor ICT infrastructure, and a lack of trained staff (Nimbhorkar, 2024). Thus, as these limitations, many institutions are actively promoting digital literacy, open access, and user-centered services to keep pace with the evolving educational landscape. Indian academic libraries are evolving into hybrid digital systems, blending automation, digital resources, and remote access to meet the needs of modern learners.

3.3 Technological Innovations and Best Practices

Indian academic libraries are adopting different digital tools to improve their services and better experience for users. Libraries are trying to use digital tools to make services better.

3.3.1 RFID and Smart Systems

Many Universities and big Institutions are starting to use of the RFID systems. It helps with borrowing and returning books automatically, even it is useful for stock verification and security. Some examples researcher can say IIT Delhi and NIT use RFID for self-check-in and check-out. It saves the time of library staff and users (Sharma and Kandari, 2022).

3.3.2 Artificial Intelligence Applications

AI helps to provide some library services, such as chatbots that provide instant answers and guidance to reference questions and 24 hours a day. (Islam et al., 2025). Machine learning helps the cataloging and metadata creation, increase speed of classification. But still exist some ethical issues like security and transparency (Berendt et al, 2023).

3.3.3 Digital Repositories

Repositories like Dspace or Greenstone are used to store dissertations and theses. This allows research to be disseminated and preserved to a wider audience. And since these repositories are linked to library software, they are easily accessible to the user.

3.3.4 E-Learning and Digital Literacy

Libraries support online learning platforms and digital literacy programs. They provide to e-books, e-journals and digital content to the students (NAAC, 2020). It helps the users to improve their research skills and effectively use e-resources.

3.3.5 Mobile and Virtual Library Services

Digital Library, web OPAC and open access e-resources users can access by mobile anytime, anywhere. Some institutions are trying with voice search and reality augmented for the information retrieval (Islam et al., 2025).

3.3.6 Ethical and Inclusive Practices

Now, Libraries are using digital technologies, but while using those technologies, clear policies should be developed for ethical issues, user data security and fair use of AI (Berendt et al., 2023).

Table 3.1. Technological Innovations in Indian Academic Libraries: Impacts and Challenges:

Key Sources	Technology / Area	Key Impacts Reported	Implementation Challenges
Sharma and Kandari (2022)	RFID and Smart Systems	Faster circulation, better tracking, improved security	High cost, lack of trained staff
Nimbhorkar (2024)	Library Automation (ILS/LMS)	Accurate records, quick access, efficient cataloguing	Budget limits, staff shortage
Nimbhorkar (2024)	Digital Repositories / Open Access	Wider research visibility, open access	Metadata issues, need for training
Nimbhorkar (2024)	Mobile and Virtual Services	Anytime access, user convenience	App cost, connectivity issues
Islam et al. (2025)	Artificial Intelligence	24/7 service, reduced workload	Early stage, ethical concerns
Islam et al. (2025)	Data Analytics	Evidence-based planning, better collection use	Lack of expertise, privacy issues
Berendt et al. (2023)	AI-based Cataloguing	Faster indexing, improved accuracy	Bias risk, limited oversight
NAAC (2020)	E-Learning and Digital Literacy	Better use of e-resources, improved skills	Uneven ICT skills, digital divide
Berendt et al. (2023)	Ethical and Inclusive Practices	Fair, transparent digital systems	Need for policy and awareness

Table 3.1, summarizes the main technologies are used the Indian academic libraries nowadays. While studying this literature and communicating with some librarians' researcher noticed that those tools or software like RFID technology, Library management software, chatbots are really helping to increase the speed and accuracy of manual work. Many of them said that, RFID technology really helps them to their book circulation

process run faster than before. Library users get their books without waiting and quickly. Even though that many benefits, several libraries are facing multiple problems while implementing those technologies. The main problem is funding. The institutions need enough funds and support for continue development.

3.4 Key Trends and Challenges

Work published in recent past, highlights (Sharma and Kadam,2022, and Islam, et al, 2025) that the Indian academic libraries are changing and it became hybrid. They provide traditional services along with Digital services. This includes automation technology and open open-access platform and content for using lending and reference. These changes are slow. In the process of this study, researcher noticed many self-financing institutions are having trouble getting sufficient funds, a lack of trained staff, ethical issues. The institutions need to continue funding and support along with professional development of librarians themselves for the adopt new technology. Tiny institution often witness low budget, trained staff, and weak ICT infrastructure. Rather well funded institutions and universities adopt new technology quickly with the help of budget and support (Nimbhorakar, 2024).

Along with these technological developments, some issues are rising like ethical issues, fairness with AI systems and user data privacy (Berndt et al., 2023). Many researchers suggest that the librarians need continue training program not only in tools but also in analytical skills. Researcher personally agree with this because, during our own review process, several librarians marked that those updates and new technologies are developing fast, but they don't get the quick training as per the technology Inventions.

Some successful examples like NDLI (National Digital Library of India, INFLIBNET, and IIT Bombay provide RFID based successful services. Those examples show that when institutions invest in collaboration, staff training, and steady funding, the library can do sustainable development and digital growth and user satisfaction with technology adoption.

IV. RESEARCH METHODOLOGY

For this study researcher used a descriptive and review-based approach as the intention was to understand how to different technologies are affecting on the Indian academic library services. Rather than conducting a survey or interviews, researcher decided to review existing literature, so it will provide clear idea of the overall trends, especially now that technological developments change quickly. While studying the previous research, researcher focused on the study of how researchers described advantages and challenges of the technology like AI tools, RFID, Automation and Digital repositories at the same time. This qualitative review helped us recognize recurring themes and practices that many libraries seem to adopt.

4.1 Data Sources

This entire study depends on secondary data. Researcher collected the papers from online journals, conference proceedings, and Institutional repository. Researcher used sources like Google Scholar, Academia, and Shodhganga. Researcher keep a limited period from 2018 to 2025 because it was a major period to adopt digital library services and technologies. Some studies like (Islam et al., 2025), (Sharma and Nimbhorkar, 2024), and (Kandari, 2022), they discussed the changes and digital transformation were happening in the libraries. While selecting the paper, researcher included large and small institutions' examples so that researcher could make this study fair enough.

4.2 Data Collection and Analysis

Researcher carefully studied every paper that was selected. Noted the themes and observations of the authors because different authors explained similar ideas in different ways in their research. While reading the paper, researcher noticed how technologies are used in the library for day-to-day work such as user access, circulation, and user convenience. Researcher used a simple conceptual framework for the research as mentioned in Table no 1. after sorting the information, researcher grouped similar ideas and findings and then organized them under the themes like ethical issues, RFID, AI, Digital repositories, Open access, and mobile access.

4.3 Scope and Limitations:

This research focused mainly on Indian academic libraries, although researcher studied some other international examples for the understand how they handled similar changes. Since researcher collected all the data from already published papers, researcher did not collect data from direct librarians or users. It is a limitation of this research. A few papers did not cover all the information or covered very less information about the themes. Still along with these limitations, the review helped us broad view of the innovations, best practices, and notable challenges that shape the digital transformation of libraries in India.

V. FINDINGS AND DISCUSSION

After reading all the different papers, researcher observed that most of the authors mentioned that new technologies are changing Indian Academic Libraries with the help of AI tools, automation software, RFID, and digital repositories. These changes are real and significant, but these changes are not happening everywhere. Many libraries have adapted this technology quite fast, while others are still struggling with a lack of budget and a lack of trained staff.

5.1 Automation and AI

In Daily Work Many libraries in India now use AI tools like Library management software or chatbots for cataloging and reference services. These tools are very useful for the daily routine work, like cataloging and circulation. Researcher found some research noted that users get quick service than before with the use of AI. Even though small institutions, especially in rural areas still facing difficulties in implementing those technologies because of insufficient funds and a lack of trained staff.

5.2 RFID and Smart Systems

RFID and smart systems are another technology researcher studied during the analysis. A few of the institutions have implemented this technology and RFID technology helps self-issue/returns transactions and reduces manual mistakes (Sharma and Kandari, 2022). It helps track the book and save time. However, installing and maintaining the RFID technology is very expensive. Therefore, that the institutions avoid installing the RFID.

5.3 Digital Repositories and Open Access

Most of the universities now have a digital repository, like DSpace and Greenstone platforms. The library stores Research papers, dissertations and other academic work in these repositories. Some libraries are linking repositories with learning management systems. It helps students a lot, but not all institutions have reached this stage. A few studies also highlight that, need regular technical support for maintaining these repositories.

5.4 Digital Literacy and E-Learning Support

Most libraries arrange user awareness programs and workshops to educate students on how to use e-books, databases, and search strategies (NAAC 2020). Earlier users had depended only on print materials but they have now more options to access study materials. Some research has noted that the effort helps reduce the digital gap among students who are new to the e-resources.

5.5 Mobile and Virtual Access

Users can access information 24/7 with the help of mobile apps and web-based catalogue, by which the library services have become flexible. Students can check the availability of books, access e-resources or renew the books without visiting the library. It is helping many who study at night or from home. Due to the virtual service library feels more open and accessible.

VI. CONCLUSION

The study points out that now Indian academic libraries are moving towards automation and digitization. It's not only technology, but even the librarian's role is also changing. They not only provide traditional services but also provide digital services, user training sessions, to make digital repositories, and provide online services (Kaur,2020). Platforms like NDLI and INFLIBNET have made it easier for libraries to share resources and work together.

But its changes have some issues themselves, like small institutions are facing trouble with the funds and less trained staff and poor ICT infrastructure. Some researchers discussed about ethical issues and user's data privacy (Berendt et al., 2023). It means technology brings more responsibility to libraries. If Institutions invested in basic ICT infrastructure and provided enough funds to the library for the implementation, the library could make better progress in the future.

Overall, now Indian academic libraries are developing with the help of technology. But it needs proper planning and direction with technical support.

- **Policy and Funding Support**

The library needs clear policies and steady funding by the government or institutions for continued technical progress, especially for those libraries which do not have enough resources.

- **Staff Training**

To handle or operate new technology or AI tools, Librarians and library staff should get regular training sessions.

- **Digital Literacy**

Libraries should organize workshops and user training sessions on using e-resources for the library users.

- **Ethical Issues**

Libraries must keep their systems transparent and fair for users' data security.

- **Collaboration**

The use of the NDLI and INFLIBNET Network and resource sharing can save money and improve the services of the library.
if above following points are followed by the library, Indian academic libraries can grow with the support of new technology and provide better service to users.

From these studies, researcher found that the AI tools, RFID technology, Library Management software and online repositories are transforming Indian academic libraries. The use of technology in the daily library work is making the work more accurate and faster. Nowadays, the Role of the Librarian has also changed. He is not only the custodian of the books and provides print materials, but also provides digital resources, and arranges training sessions for using digital resources. He has to see ethical issues before implementing any technology.

However, researcher noticed smaller institutions are still facing issues with low budget, not enough trained staff, and concerns about ethical issues. But future digital development libraries need support, enough funds, regular training sessions and a clear policy from the Institutions and Government. Then, Indian academic libraries can continue to grow in this digital age.

REFERENCES

[1] Berendt, B., Karadeniz, Ö., Kıyak, S., Mertens, S., and d' Bias, L. 2023. Bias, diversity, and challenges to fairness in classification and automated text analysis: From libraries to AI and back. KU Leuven / TU Berlin / Weizenbaum Institute.

[2] Bhattacharya, A. K. 2024. Innovations in library services: The integration of artificial intelligence and machine learning in modern libraries. Library Progress International, 44(3), 4685-4690.

[3] Islam, M. N., Ahmad, S., Aqil, M., Hu, G., Ashiq, M., Abusharhah, M. M., and Saky, S. A. M. 2025. Application of artificial intelligence in academic libraries: A bibliometric analysis and knowledge mapping. Discover Artificial Intelligence, 5(59).

[4] Kaur, G. 2020. The future and changing roles of academic library in a digital age. Gulbarga University, Karnataka.

[5] Muthumari, P., Kulkarni, A. M., and Kulkarni, C. M. 2021. IoT application in smart libraries. International Journal of Research in Library Science, 7(3), 113-121.

[6] National Assessment and Accreditation Council (NAAC). 2020. NAAC-recommended best practices in college libraries. NAAC Publications

[7] Nimbhorkar, S. P. 2024. Library automation in universities and colleges libraries in India and abroad. ShodhKosh: Journal of Visual and Performing Arts, 5(7), 325-333.

[8] Sharma, G. and Kandari. A. 2022. Impact of automation on the library services of technical institutions in Delhi-NCR region. Journal of Indian Library Association, 58(1), 135-140.

[9] Yan, R., Zhao, X. and Mazumdar, S. 2023. Chatbots in libraries: A systematic literature review. Education for Information, 39(4), 431-449.