

Impact of AI and Digital Transformation in Academic Library Services

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ABSTRACT

Academic libraries are quickly moving beyond their conventional functions as print collection repositories. Technological developments, especially artificial intelligence (AI), and digital revolutions are driving continuous innovation in library services. This paper examines the current range of library services offered by academic library librarian services of digital resource management, research assistance, and information literacy projects. We cover existing practices and future perspectives for library services using examples from in India, such as the NDLI, DELNET, and AI-driven library tools. The analysis brings together recent literature and case studies to give advice on how to keep and grow innovation during the digital transformation.

Keywords: Academic Libraries, Artificial Intelligence, Innovative Library Services, Digital Transformation, Digital Library, Electronic resources, Digital Repositories

INTRODUCTION

Traditionally, academic libraries have been seen as knowledge repositories that offer access through carefully chosen print collections and reference services. However, the demands on libraries have significantly increased in recent years due to developments in digitalization, open scholarship, and information and communication technology. Researchers, instructors, and students all expect quick, individualized, and remote access to information. For instance, Quigley et al. (2024) point out that conversations about new library jobs have been sparked by the introduction of AI-driven tools like ChatGPT and the growth of open science. As a result, innovation is becoming a crucial requirement for academic libraries. Libraries are creating innovative service models, incorporating cutting-edge digital resources, and working with other campus partners to stay relevant because institutions understand that traditional, one-size-fits-all approaches are insufficient. The notion and importance of innovative services in academic and research libraries are examined in this paper, which highlights instances from Indian and international

contexts and surveys key areas of action. In this paper, we describe how forward-thinking library services might enhance research, teaching, and learning in the digital era.

Objectives of the Study

- Examine the idea of library services and its significance in research and academic settings.
- Examine how artificial intelligence and digital tools have to use in library services.
- List the main categories of technology and services used by contemporary academic libraries.
- Describe how the duties of librarians are evolving to support these library services.

RESEARCH METHODOLOGY

The study's foundation is a qualitative analysis of professional practice and literature. We reviewed professional reports, research articles, and conference proceedings about academic library services. Finding recurring themes, patterns, and illustrative case studies is the goal of content analysis. Recent research and Indian context-specific examples, such as NDLI, DELNET, and AI-powered chatbots in libraries are

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highlighted. This method offers a thorough summary of the services that libraries currently offer.

Concept of AI services in academic libraries

AI and digital transformation services are new or significantly improved services, practices, technologies, or organizational models that enhance user experience and serve institutional goals in academic libraries. This can include organizational innovations like creating new roles or partnerships, process innovations like streamlining workflows or introducing new content management strategies, technological innovations like deploying AI-driven search or mobile apps, and library services like launching new outreach or reference initiatives.

Digital and Electronic resources in Academic Libraries

Academic libraries now offer a range of digital services that increase access beyond physical collections. E-resource management systems and digital library platforms are two important pillars. When integrated, they offer comprehensive knowledge asset identification along with simple access to both licensed and open access information.

a. Digital Libraries

Digital libraries are enable centralized access to born-digital content. E-books, e-journals, Theses, and other educational materials integrated into single platform. The National Digital Library of India (NDLI) in India is one well-known resource centre. Launched by the Ministry of Education at IIT Kharagpur, the NDLI functions as a "single-window platform" that offers educational resources across academic levels and disciplines. It unifies varied content into a uniform interface, enabling users to search across multiple collections from one site. Geographical and linguistic obstacles eliminated by digital libraries like NDLI, which provide anytime, anywhere access to a vast collection of excellent literature. According to Wagh (2025), NDLI has accessibility features (such text-to-speech for visually challenged users) and supports interfaces in 15 Indian languages. By doing this, NDLI encourages inclusive education throughout India. In order to preserve and disseminate scholarship, numerous universities maintain

institutional repositories and online archives. The World Digital Library, for instance, offers free access to rare books, maps, and other historical documents.

b. Institutional Repositories

Another important digital service is institutional repositories. An institution's scholarly output, including theses, dissertations, preprints, datasets, and faculty publications, is gathered, preserved, and made publicly accessible through institutional repositories. Institutional repositories promote open science and raise the profile of research by making this output accessible to everyone. Publicly financed research is now required by many funders to be publicly accessible, and libraries assist in fulfilling these requirements by providing repository platforms and archiving advice to authors. NDLI actively encourages repository development in India. In order to assist universities in building their own digital archives, NDLI offers hosting infrastructure and support for institutional repositories. As of right now, NDLI claims to be helping more than 42 Indian universities establish digital repositories. Through these collaborations, NDLI increases the institutions' online visibility and broadens the audience for scholarly production. Academic libraries have traditionally supported repositories. Many institutions operate their institutional repositories using either commercial systems or open-source platforms like DSpace. Local scholarship, including dissertations and preprints, can reach a larger audience thanks to these repositories, which are usually open to the public and searchable by search engines. Libraries support the objectives of open access and strengthen their position in scholarly communication by hosting and promoting institutional repositories.

Electronic resources

E-resource services include things like discovery tools, link resolvers, usage metrics, and personalized recommendation systems. Users can search through all of their electronic resources and integrated open material thanks to the discovery layers offered by modern libraries. The full text of books or articles can directly linked to search results using link resolvers. Platforms are increasingly using personalization, such as providing pertinent content based on user behaviour and previous queries. Libraries also employ

electronic resource analytics to guide their decisions. For example, vendors and librarians are increasingly providing dashboards that track download counts and usage trends for databases and Librarians examine such data to find underused subscriptions or justify increased investments in high-demand areas. Bryant (2024) highlights this tendency of evidence-based collection building by pointing out that in order to maximize collections and services, libraries frequently examine usage data like gate counts and circulation figures. The Developing Library Network (DELNET) in India is a prime example of resource-sharing innovation. DELNET facilitates the sharing of resources across more than 9,400-member institutions. Scholars in India can find books and journals held in any member library thanks to its Discovery Portal, which has a united catalogue of over 42 million items. Additionally, DELNET provides specialized portals, such a video lecture repository, which show how digital services can increase access to information outside the resources of any one library. In conclusion, the combination of robust digital libraries, open-access repositories, and e-resource management technology best represents library services. These developments make it possible for contemporary libraries to provide user-centered, anytime, anywhere access to knowledge, enabling research and education more successfully than was possible in the print period.

Artificial Intelligence in Library Services

Libraries are experimenting with "smart" services that enhance conventional functions thanks to developments in artificial intelligence - AI and machine learning - ML. AI- powered solutions may improve discovery, tailor user engagement, and draw conclusions from massive information. AI-powered discovery, chatbots for conversational agents, and data analytics applications are three particularly noteworthy areas of advancement.

User- Centric and Personalized Library Services

Academic libraries are concentrating more on tailoring services to individual users' requirements and interests. Customization can take many different forms. Libraries, for instance, provide instructors and students with customized alerts. For instance, patrons may receive news about pertinent workshops and

events, reminders of due or overdue resources, or email or smartphone alerts for new hires in their profession. Additionally, many libraries provide mobile applications that let patrons' access services, search the catalog, and manage their accounts from any device. Based on a user's prior interests, a library system may recommend books or periodicals. Other advancements in user-centric design address individual differences. In order to serve a wide range of users, library websites are increasingly multilingual and adhere to accessibility guidelines. Screen-reading software, workstations with adjustable heights, Braille materials, and adaptable furniture are examples of assistive technology that make it easier for users with disabilities to utilize library resources. Certain libraries set up activities specifically for certain user groups, such as informational meetings for foreign academics or research consultations for graduate students. Libraries increase user happiness and service engagement by concentrating on both individual and group requirements.

Role of Librarians in delivery of Library Services

Librarians as information specialists, educators, technologists, and administrators, librarians play a vital role in the efficient provision of library services. Their changing roles are crucial for promoting academic achievement, research innovation, and lifelong learning as well as for satisfying users' changing information demands. As knowledge managers, information access facilitators, and technological mediators, librarians are essential to the efficient provision of library services. In the rapidly expanding information world, the responsibilities of librarians extend far beyond traditional book distribution to embrace a wide range of user-centric and technology-driven services.

a. Information Access and Organising in Libraries:

Acquiring, organizing, classifying, and distributing information resources in print and digital versions is one of the main responsibilities of librarians. Librarians improve the effectiveness of library services by ensuring that content is readily found and accessible to users through methodical cataloguing, classification, and metadata management.

b. Collection Development and Resource Management:

Librarians are responsible for building balanced and relevant collections based on user demands and institutional goals. Through collection review, licensing of e-resources, budget management, and weeding of obsolete materials, librarians assure optimal utilization of resources and sustainability of library services.

c. Reference and Research Support Services:

Providing reference and research assistance is a basic function of librarians. Librarians improve teaching, learning, and research outcomes by answering user questions, providing subject-specific advice, and assisting academic research. Advanced services including bibliographic training, literature searches, citation management, and research impact analysis further support the delivery of library services.

d. Digital and Technological Facilitation:

Librarians act as a bridge between users and technology in the digital age. They oversee library management systems, digital repositories, electronic resources, and institutional archives. Additionally, librarians provide access to open access resources, internet databases, and cutting-edge technology like data analytics, artificial intelligence, and digital preservation tools.

e. User-Centric education in library services:

By assisting patrons in finding, assessing, and utilizing information resources efficiently, librarians serve as educators. To help users strengthen their critical thinking and research skills, they offer orientation programs, information literacy seminars, and user training workshops. By creating inclusive services for a variety of user groups, such as students, researchers, faculty, and users with disabilities, modern librarians prioritize user-centered service delivery. Improved user satisfaction is a result of feedback systems; selective dissemination of information (SDI), current awareness services (CAS), and personalized services.

Challenges in Implementing Innovative Library Services

Implementing innovative services is not without challenges, despite the obvious advantages. A frequently noted concern is insufficient funding: many university libraries operate on restricted budgets, and priority may be given to vital collections and manpower, leaving fewer resources for pilot projects or new technologies. According to Aslam et al. (2025), library employees frequently worry about losing their jobs when new technology are introduced, therefore librarians may likewise feel unprepared or nervous. Another issue is training gaps, since implementing innovations frequently necessitates learning new technical skills. Another limitation may be technical infrastructure. IT assistance and development frequently needed when integrating new platforms with old systems (such database providers, catalogues, and authentication services). In certain institutions, the adoption of data-intensive tools may restrict by hardware capacity and internet connectivity. Additionally, institutional commitment is necessary for innovation: Aslam et al. (2025) emphasize that adequate planning and finance are necessary for successful projects to prevent failure. Innovative projects may fail in the absence of strategic support. The difficulty increased by cultural variables. Adoption of new services may hamper by resistance to change excessive workloads and ambiguous evaluation metrics. Libraries involve stakeholders early to address these problems by forming cross-functional teams, conducting pilot studies, and requesting user input. Open communication on objectives and results is also beneficial. However, according to one review, innovation in libraries frequently necessitates overcoming "cultural, financial, and skill barriers" through dedicated leadership and training.

Best Practices and Strategies for Library services

To foster innovation, libraries have created a number of best practices. User-centered design, which involves users in the planning and testing of new services, one such tactic. For example, Calgary librarians examined previous help desk transcripts to find roughly fifty frequently asked queries in order to train a preliminary version of a chatbot before it completely launched. This prototype strategy ensured early success and helped scope the project. In a similar vein, libraries frequently begin new services with small pilots or beta tests, enabling modifications

based on early user feedback. Collaboration is another feature of successful invention. Libraries often collaborate with other departments or organizations to share resources and expertise. Consortiums like as OCLC and DELNET, for instance, enable collaborative creation of tools and catalogs. University library employees may collaborate with IT, instructors, or vendors jointly develop solutions. This collaborative mentality includes the adoption of open-source software (e.g., using platforms like DSpace or Koha), which helps institutions avoid duplicating development and take advantage of community advancements. Feedback and ongoing evaluation are crucial. Libraries gather user feedback and usage statistics on a regular basis to assess new services. For example, a library may examine chatbot logs or perform surveys to refine its offers. Oak Leaf (2010) places a strong emphasis on using systematic evaluation to show the impact of libraries. In actuality, this could entail monitoring whether new services boost usage or enhance learning outcomes and modifying the strategy as necessary. Libraries can develop creative solutions that successfully satisfy user demands and further institutional objectives by combining several best practices: concentrating on people, encouraging cooperation, and iterating based on data.

Future Trends in Innovative Library Services

In the future, a number of trends anticipated to influence library innovation. First, there will be a greater integration of AI and related technologies. According to Aslam et al. (2025), libraries can improve user efficiency and engagement by focusing on AI and related Internet of Things solutions. Libraries are experimenting with voice assistants and machine translation tools to enable multilingual users, and we may anticipate the development of AI-driven reference systems and sophisticated analytics. Second, libraries' functions will continue to impact by the Open Science movement. Libraries will probably increase their support for open scholarship by providing infrastructure for data sharing, open-access publishing platforms, and research data repositories. According to Pinfield et al. (2017), libraries are becoming more involved in data stewardship and open-access publishing. Libraries will play a crucial role in assisting researchers with compliance and publishing procedures as national and funder rules

demand transparency. The use of data analytics will continue to be popular. For collections and space planning, libraries are implementing increasingly advanced dashboards and predictive algorithms. Learning analytics may also use in library assessments to gauge the effect of library training on student achievement. Virtual reality (VR) and augmented reality (AR), two emerging technologies, expected to be used more frequently in libraries as tools in maker spaces and as immersive learning platforms (e.g., VR-based historical archives tours). Additionally, broader cultural developments will be important. Initiatives related to sustainability and "green libraries," like energy-efficient structures and material recycling, are gaining popularity. Future services will probably have even more accessible design and community involvement since equity, diversity, and inclusion remain top concerns. Digital transformation has accelerated because to the COVID-19 epidemic and hybrid services—which include virtual and in-person components—are here to stay. In conclusion, libraries will be well positioned for the future if they keep implementing AI, support open access, make use of data, and react to social trends. As student expectations and information environments continue to change, ongoing adaptability will be required.

CONCLUSION

Innovation in academic libraries is an ongoing activity needed to addressing contemporary teaching and research needs. This analysis has examined a wide range of new services to show the local and global aspects of library innovation, from shared consortiums and national digital libraries to AI-driven tools, maker spaces, and inclusive outreach. These illustrations demonstrate how libraries around the world are broadening their functions and approaches in response to societal and technological shifts. Research indicates that well-thought-out innovation produces tangible advantages. New services improve student learning and research productivity when libraries incorporate users in design, use data, and fit with institutional missions. According to Aslam et al. (2025), library innovations can lessen knowledge gaps and enhance educational results with proper planning and funding. Libraries must continue to be proactive and adaptable in the future. By regularly analyzing and iterating on new services, librarians

may guarantee they fulfil growing user expectations and advance academic aims. In this approach, cutting-edge library services not only assist present students and academics but also establish libraries as essential, future-ready collaborators in research and teaching. Libraries can become more dynamic and user-focused with the aid of artificial intelligence, resulting in a more interesting and accessible learning environment.

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