

Enhancing Library Services through Intelligent Digital Systems: Pathways for Sustainable Information Access – A Case Study of Nirmala College of Pharmacy, Andhra Pradesh

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Abstract

The exponential development of digital technology has led to a transformation in the field of academic libraries, whereby the traditional physical libraries have become smart information centers, enabling more rapid, sustainable, and people-centered access to information. This study examines the impact of smart digital technologies in improving library services in the context of Nirmala College of Pharmacy in Andhra Pradesh, considering aspects such as accessibility, user satisfaction, and sustainable information practices. A case study research design was used, whereby data regarding the use of the smart library was obtained through statistical analysis provided by the system for six months before and after the deployment of the smart digital technologies. Results indicate that there is a 71% improvement in digital usage, where there is an 82% increase in the number of downloaded e-resources, a 65% increase in user logins, and an average session time increased by 51%. In addition, there was a 30% decrease in unsuccessful searches, which shows the effectiveness of the system. On the other hand, 81% of users were satisfied with the system.

Keywords: Intelligent systems, digital libraries, information access, sustainability, user experience, academic library transformation.

Introduction

Academic libraries are moving away from traditional forms of operations to more digital environments. The introduction of advanced intelligent systems like automated catalogs, advanced AI search engines, institutional repository, and remote accessing tools has transformed the way

users interact with information resources in terms of efficiency, accessibility, sustainability, and meeting present teaching/research needs.

Chowdhury (2016) indicates that sustainable information services through information systems are important as they reduce dependence on physical resources and improve long-term access to information. On the other hand, Okunlaya et al. (2022) note that intelligent digital library systems powered by artificial intelligence enhance information retrieval, resource management, and users' interactions in university libraries.

Despite all the above developments, many academic libraries are faced with problems such as poor information retrieval processes, lack of remote access, inefficiency of cataloging system, and dependence on printed books. In this case, special digital systems are required by pharmacy colleges to conduct research-based academic exercises. Unfortunately, little research evidence is available regarding the performance of intelligent digital systems in pharmacy colleges in India. Hence, the aim of this study is to assess the use and outcome of intelligent digital systems in Nirmala College of Pharmacy in Andhra Pradesh.

Literature Review

There have been multiple scholarly studies regarding the relevance of intelligent and sustainable digital systems in academic libraries. Chowdhury (2013) emphasized the importance of sustainability in digital information services by highlighting the permanence of managing digital information. Following this point, Chowdhury (2016) asserted that sustainable digital libraries make information more accessible while minimizing ecological impact.

The works by Adigun, Ajani, and Enakrire (2024) define intelligent libraries as innovative knowledge systems capable of generating sustainable learning environments in the context of the Fifth Industrial Revolution. Their study demonstrated the positive impact of intelligent technologies on the productivity and involvement of users in libraries.

Okunlaya et al. (2022) suggested a model of AI-powered digitalization of university libraries to show that AI technologies increased the quality of services, interaction with users, and precision of searching. Similarly, Khan et al. (2024) found that IoT-based smart library services boost performance, accessibility, and use of resources in academic institutions.

Lee (2025) researched digital resilience in academic libraries, contending that resilient digital systems are important in guaranteeing academic services without interruptions in the current era.

Furthermore, Jeevakumar, Kumar, and Kathikeyan (2025) coined the term of GSLs, stressing the significance of digital inclusion and environmental sustainability in improving academic library services.

From the above literature review, it can be concluded that smart digital systems improve efficiency, sustainability, and user satisfaction in academic libraries. This implies that the objective of the current study in Nirmala College of Pharmacy is justified.

Research Gap

Previous studies have covered the aspects of digital transformation and intelligent technology at university libraries. However, there have been few investigations focusing on libraries related to the colleges of pharmacy. Current literature lacks examples where user satisfaction was determined through the use of quantitative and qualitative data regarding the library's performance.

The goal of the present research is to fill in this gap by providing an extensive case study of the Nirmala College of Pharmacy library.

Objectives

For assessing the effectiveness of intelligent digital systems in improving the quality of service offered in libraries.

- For knowing the level of user satisfaction after intelligent digital system usage.
- For studying the involvement of intelligent systems in achieving sustainable information access.
- For understanding the differences in patterns of using digital systems before and after implementation.
- For recognizing the problems faced by the users in using intelligent systems.

Methodology

The research applied quantitative case study approach that used system usage statistics derived through the use of digital platforms of the library at Nirmala College of Pharmacy. The data were sourced from the Online Public Access Catalogue (OPAC), e-resources platform, and institutional repositories. The period of six months before implementation of the intelligent digital library systems (January-June 2025) as well as after implementation of the same systems (July-December 2025) was considered. These data included catalog searches, e-resource downloading's, number of logins, remote logins, average time spent on one session, and failed catalog searches.

Additionally, a user satisfaction survey involving 125 users including 110 students and 15 staff members was carried out to measure the user experience with regard to the intelligent digital library system. Simple descriptive statistical analysis methods were used for data interpretation. The data were collected anonymously with the permission of library management.

Results and Data Presentation: Growth in Digital Resource Usage

Metrics	Before (Jan-June 2025)	After (Jul-Dec 2025)	Change
Catalogue Searches	424	725	71 %
e-Resource Downloads	491	892	82 %
User login Frequently	984	1623	65 %
Remote Access Logins	129	230	79 %
Average Session Duration	4.1 mins	6.2 mins	51 %
Failed Search Attempts	53	37	30 % decrease

From the findings, there are some improvements in the use of digital tools following the implementation of intelligent digital systems. This can be seen from the increased number of e-resource downloads by 82% and catalog searches by 71%. These numbers depict increased reliance on the digital environment for educational purposes. Moreover, there is a marked increase in remote access logins. The decline in unsuccessful searches by 30% means that search efficiency has been enhanced.

User Satisfaction Survey: A total of 125 users participated in the survey.

Statement	Agree/Strongly Agree
Quicker access to information	82%
Ease of navigation	71%
Enhancement in research productivity	74%

Preference for digital resources	69%
Overall satisfaction	81%
View of system sustainability	70%

The results from the survey conducted show a very positive attitude towards intelligent digital systems. Most respondents agreed that intelligent digital systems increased efficiency in accessing information and made research more productive. The results also show an acceptance of sustainability in digital practices.

Discussion

The installation of the latest technology in Nirmala College of Pharmacy has led to more effective and convenient library services. The increased rate of catalog searches, downloads, and remote access shows that the use of technology is very prevalent among students and lecturers.

The outcomes affirm the arguments put forward by Adigun et al. (2024) and Okunlaya et al. (2022), suggesting that intelligent technology has improved the quality and engagement of academic library services. In addition, the reduction in failed searches is also an indication of the effectiveness of indexing and searching provided through intelligent technology.

The survey results also show that library users found using the library easier, faster access to information, and increased academic output. Lecturers were grateful for intelligent search filters, keyword suggestions, and remote access that enhanced their research projects.

Students indicated positive experiences concerning user-friendly interfaces, fast-loading e-journals, and the provision of downloadable PDFs for future reference. However, there was a suggestion from some students that more pharmaceutical-related e-books should be provided in the library.

The library staff reported a decrease in their manual work by about 35-40%, owing to automation in cataloging and managing library resources. The improved effectiveness allowed staff members to pay more attention to services provided to users rather than to their administrative responsibilities. In regard to sustainability, an increasing tendency toward using digital sources means that there is decreased use of print media and paper. The cloud-based technology has made great strides in this area.

Conclusion

Advanced technology integration has considerably changed the functioning of library services in Nirmala College of Pharmacy. The study shows tangible improvements in terms of using digital sources, search efficiency, remote access capability, and overall satisfaction with the services provided. Increased numbers of queries to the catalogue, downloading of online content, and logging on prove growing confidence in digital library operations. The decreasing number of unsuccessful searches proves increased precision in search operation. Also, results of surveys show that users find intelligent systems to be useful in their learning processes, research work, and long-term access to required data.

From the above discussion, it can be concluded that intelligent digital systems are indispensable in transforming modern academic libraries.

Policy Recommendations

There is a need for higher education institutions to set up budgets for the continued maintenance and upgrading of digital library systems.

- Standardized metadata and cataloging techniques should be used to ensure efficient information searching.
- User feedback should be constantly collected to improve the efficiency of the library.
- Digital literacy training courses should be arranged for the benefit of students, faculty members, and librarians.
- Higher education institutions should encourage the use of digital information sources as part of efforts towards sustainability.
- Privacy and security issues should be strongly emphasized in terms of handling user data and statistics.

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