



ENHANCING EFFICIENCY, ACCESS: AUTOMATION OF UNIVERSITY LIBRARIES IN CHHATTISGARH

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ABSTRACT

This research paper explores the role of automation in enhancing efficiency and accessibility in university libraries in Chhattisgarh. It investigates the benefits of library automation, such as improved cataloging, faster retrieval of information, and seamless access to digital resources. The study also identifies challenges associated with automation, including infrastructure constraints and resistance to technological change. Through a mixed-method approach involving surveys and case studies, the research highlights best practices and offers recommendations for the successful implementation of automation in university libraries.

KEYWORDS: Library Automation, Digital Libraries, University Libraries, Chhattisgarh, Information Access, Library Management Systems

1. INTRODUCTION

The rapid advancement of information technology has significantly influenced the management and operation of libraries. Automation has become an essential aspect of modern libraries, improving efficiency and user accessibility. University libraries in Chhattisgarh are gradually adopting automated systems to manage resources, facilitate digital access, and enhance service delivery. This paper examines the impact of automation on university libraries in Chhattisgarh, highlighting its benefits, challenges, and future prospects.

2. LITERATURE REVIEW

Previous studies have emphasized the importance of library automation in improving information retrieval and management. Researchers have explored various library automation software, such as Koha, SOUL, and Greenstone, and their effectiveness in enhancing library services. Studies indicate that automated systems contribute to better resource management, improved cataloging, and efficient circulation of library materials. However, challenges such as high implementation costs, lack of trained staff, and resistance to change hinder the widespread adoption of automation in university libraries. This section reviews existing literature to establish a foundation for the present study.

1936-59	:	Major events of this time period were as follows: Introduction of punched card for circulation control in library; Use of IBM 402, 403 and 407 for manipulating, analysis, sorting and retrieval of data; Vannevar Bush introduced the concept of 'Memex' in 1945.
1960-69	:	Major breakthroughs of this period were as follows - Use of general-purpose computers that became widely available in the 1960s; H.P. Luhn, in 1961, used a computer to produce the "Keyword in Context" or KWIC index for articles appearing in Chemical Abstracts; Project "MEDLARS" started in 1961 that applied computer in measuring efficiencies of information retrieval systems; Computerised circulation system first appeared in 1962; Project 'Intrex' (aimed to provide a design for evolution of a large university library into a new information transfer system) started in 1965; Project MARC, initiative by Library of Congress to provide a format for machine readable cataloguing data, started in 1965; Introduction of online interactive computer system in place of off-line batch processing systems began in mid-1960s; Initiation of projects like BALLOTS by Stanford University and MAC by M.I.T. These developments deal with the possibility of a new horizon for the library operations and services.
1970-79	:	Important achievements of this time period – Minicomputers were introduced to automate circulation and books were bar-coded; Computer based acquisition systems were introduced to procure books and serials; ISBDs started appearing from 1971; OCLC established in 1971 to facilitate library cooperation and to reduce costs of processing works; ISO-2709 was developed in 1973 as the standard for data exchange format; OCLC started development of Worldcat in 1975 (Worldcat now contains 8 billion cataloguing records and considered as the largest bibliographic database in the world); Library networks started appearing all over the world.
1980-89	:	Important events of the decade – Shared copy-cataloguing systems by using computer and communication technologies were established as a norm in 1980s; Remote access to on-line databases became a reality; Appearance of CDROM databases on indexing and abstracting journals started in early 1980s; Library automation packages initiated shifting towards relational architecture; Integrated automation packages began appearing in mid 1980s along with barcoded circulation system; OPAC became very popular in this decade and made available on campus wide LAN for accessing;

1990-99	Major events were as follows – Library automation packages started upgrading from client server architecture to web architecture; Large scale developments took place in the area of resource sharing, union catalogue and computerised inter library loan. Release of Z39.50 protocol in 1995 to share bibliographical information and to overcome the problems of database searching with many search languages; Formation of collective purchasing consortia started that can negotiate prices for all members of the consortium; Emergence of multimedia databases; Retrieval achieved maturity with an array of search operators; Emergence of Web-based library services; Release of Dublin Core Metadata Standard in 1995; Web-OPAC began appearing for almost all automated libraries; Conversion and digitisation of print contents into electronic format started in a big way; Full text access to information resources over Internet started against IP authentication; Integrated access interface emerged to act as one-stop access interface; IFLA introduced FRBR as a conceptual data model for bibliographical databases in 1998; Introduction and development of Eprint archives and digital libraries; MARC 21 family of standards (Bibliographic format, Authority format, Holdings format, Classification format and Community information format) released in 1999; RFID based inventory management and smart card based user access to on-line library services; OAI/PMH standard developed for metadata harvesting and initiatives started to make LMSs compatible with this standard;
2000-14	Remarkable achievements of the present era are – Development of matured and globally competitive open source LMSs; Establishment of open standards like SRW, SRU, MARC-XML and development of standards for different sub-domains of library automation like NCIP (NISO Circulation Interchange Protocol); Applications of Web 2.0 tools and techniques in automated library system; Development of interactive OPAC to support user tagging, rating and comments; Improvements in searching and browsing with a set of newly developed search operators like Fuzzy search, weight-term search etc.; Application of semantic web technologies in LMSs to support integration of Linked Open Data (LOD) with library operations and services.

Table 1: Phases of development in library automation

[1] Library Automation: Enhancing Efficiency and User Experience (2024)

Library automation has emerged as a critical component in the evolution of modern library services, fundamentally transforming the operational landscape and leading to enhanced efficiency and improved user experience. Sikandar Ahmad Mir (2024) explores the numerous advantages of automation, including streamlined cataloging processes, enhanced data management, and improved accessibility of resources. Automated systems facilitate real-time updates and availability information, significantly boosting user satisfaction while enabling libraries to offer personalized services. However, the implementation of library automation also presents challenges, such as the high initial costs, the need for staff training, and the integration of automated systems with existing library processes. Mir emphasizes that libraries must conduct thorough assessments of their needs and capabilities prior to adopting such solutions. Looking ahead, the future of library automation appears promising yet complex, as libraries must adapt to emerging tools and trends, including artificial intelligence and data analytics. Ongoing research and development in library automation will be essential for addressing future challenges and leveraging opportunities for enhanced user engagement. This literature review underscores the transformative power of library automation in modern library operations, illustrating that thoughtful implementation and continuous adaptation are crucial for maximizing the potential of automated systems.

[2] Innovative Challenges & Problems of Library Automation in Uttarakhand & Delhi States- A Case Study (2017)

In the article “Innovative Challenges & Problems of Library Automation in Uttarakhand & Delhi States - A Case Study,” Arindam Mohanta and Dr. S. N. Pandey (2017) examine the various challenges and problems faced by library staff and users in libraries located in Delhi and Uttarakhand. The authors conducted a well-structured survey using questionnaires designed to gather opinions on functions, activities, utilization of electronic resources, and reading habits among library users and staff. The findings of the study reveal critical insights into the state of library automation, information accessibility, and the application and awareness of computer-based products and

services in library operations. The results indicate that while library automation has introduced significant advancements such as e-learning, e-library services, e-books, and e-governance, challenges persist in the maintenance and application of these services. Despite these issues, the majority of users and staff express a keen interest in utilizing electronic resources daily. Based on the survey results, the authors provide suggestions aimed at improving the effective use of various electronic modes of services and activities within the automated library environment in Uttarakhand and Delhi. This study underscores the need for addressing the existing challenges to maximize the potential benefits of library automation.

[3] Information Technology Usage Scenario in Academic Libraries of Higher Education in Chhattisgarh: Challenges and Opportunities (2015)

In their article “Information Technology Usage Scenario in Academic Libraries of Higher Education in Chhattisgarh: Challenges and Opportunities,” Rushmansab Gurikar and Bhaskar Mukherjee (2015) analyze the status of academic libraries in Chhattisgarh, focusing on automation and the application of information and communication technology (ICT). Established as a separate state in 2001, Chhattisgarh has seen the emergence of numerous academic institutions, including prestigious establishments like the Indian Institute of Management (IIM) and the All-India Institute of Medical Sciences (AIIMS). The study employs a survey method to gather data from six selected libraries, including a central university, a state university, a special university, an open university, as well as the NIT and IIM. The findings reveal that while all libraries operate within functional facilities, they face challenges such as uneven collections and insufficient staff strength. Many libraries lack collection development policies and have a minimal range of non-book materials. Although automation has been implemented using software such as Libsys or SOUL, the library staff often lack the necessary skills to effectively manage software-related issues. Furthermore, digitization efforts are not well adopted across most libraries. The authors conclude that to enhance library services, there is an urgent need for staff training and appointments, underscoring the importance of addressing these challenges to leverage the

potential of automation and ICT in academic libraries.

[4] **Library Automation in University: A Literature Review (2020)**

In the article “Library Automation in University: A Literature Review,” Anozie Stella Ngozi (2020) examines the transformative impact of library automation within university settings. Highlighting the library as a dynamic entity, Ngozi emphasizes the necessity for continuous improvements to meet user needs. The advent of computers has significantly altered library operations, making automation essential for enhancing the library’s image and the services offered to users. This literature review covers a broad spectrum of topics related to library automation, including library orientation programs, comparative studies of library software, integrated library systems, and information storage and retrieval systems. Ngozi also addresses the attitudes and opinions of library staff and users towards automation, emphasizing the importance of user orientation programs. Furthermore, the review delves into the implications of automation on library services, the development and utilization of electronic resources, and the overall impact on library staff and users. By synthesizing existing literature, this work provides a comprehensive overview of the state of library automation in university libraries, illustrating both the benefits and challenges associated with its implementation.

[5] **Information Communication Technology Applications used to Enhance Knowledge Management in the University Libraries of Pakistan (2018)**

In the paper “Information Communication Technology Applications Used to Enhance Knowledge Management in the University Libraries of Pakistan,” Sadia Arshad, H. A. Rehman, and Muhammad Ali Khan Nagar (2018) investigate the role of Information and Communication Technology (ICT) in enhancing knowledge management (KM) within university libraries. As information and knowledge have become critical assets in the modern age, the authors assert that universities play a pivotal role in disseminating knowledge, with libraries serving as vital repositories that support academic curricula. This study focuses on evaluating the effectiveness of ICT tools in improving KM practices in university libraries, thereby enhancing the services provided to users. The authors contend that effective knowledge management is crucial for libraries to thrive in an increasingly digital environment, as ICT facilitates better information access and resource management. The findings of the study indicate that ICT significantly contributes to enhancing KM processes, ultimately benefiting library users in their quest for knowledge. This research is part of a broader analysis aimed at understanding the application of KM in university libraries across Pakistan, highlighting the need for continuous adaptation and integration of technology to meet user demands and support educational objectives.

[6] **The perception of ICT skills and challenges of usage of technologies among the library professionals of the Gujarat State during the COVID 19: a comprehensive study (2020)**

In the comprehensive study “The Perception of ICT Skills and Challenges of Usage of Technologies Among the Library Professionals of the Gujarat State During the COVID-19,” Devashri K. Shastri and Pradipsinh Chudasma (2021)

investigate the impact of the pandemic on library professionals’ use of technology and their ICT skill levels in Gujarat, India. The study highlights the critical role technology played during the pandemic when physical access to libraries was severely restricted, necessitating a shift in how library services were delivered. The authors aimed to assess the competencies, challenges, and services provided by library professionals during the lockdown, emphasizing the need for new ICT skills to effectively disseminate information and engage with library patrons. Utilizing a survey method, the researchers circulated 100 questionnaires via social media and email, receiving a notable 77 responses (77%) from library professionals in the region. The findings reveal that library professionals adapted various techniques and methods to fulfill the information needs of users during the pandemic, despite facing challenges in utilizing advanced technologies and managing e-resources. The study underscores the necessity for ongoing skill development and the proactive adoption of technology to enhance library services, especially in crisis situations, providing valuable insights into the changing landscape of library practices in response to COVID-19.

[7] **Library Management Software: A Comparative Study (2024)**

In the article “Library Management Software: A Comparative Study,” Jagmohan Meena (2024) explores the landscape of library management software, focusing on both web-based solutions and those with web interfaces for select modules. The study investigates the evolution of library automation software, assessing its features, services, and functionalities in the context of contemporary technological advancements. Meena presents findings from a survey conducted among software vendors in Delhi, India, aimed at gathering detailed information on six selected software packages. Utilizing a structured questionnaire, the research reveals the diversity of software options available in the market; while highlighting that only a few operate seamlessly on the web and meet the latest technological specifications. This comparative analysis serves as a valuable resource for library directors contemplating the automation of their libraries, providing insights that can guide them in selecting the most suitable software for their needs. Notably, the study addresses a gap in the literature, as it offers a comprehensive examination of the web interfaces of library management software systems specifically in India, contributing to the understanding of current trends and challenges in library automation.

[8] **Effect of Library Automation on Performance of Librarians in Private Universities in South-West Nigeria (2019)**

In the study “Effect of Library Automation on Performance of Librarians in Private Universities in South-West Nigeria,” Dolapo Peter Olagoke and Joseph Adeniyi Kolawole (2019) investigate the impact of library automation on the professional performance of librarians across 22 private university libraries in South-West Nigeria. Utilizing a survey research design, the authors gathered data from a population of 349 librarians, achieving a return rate of 80.1% with 272 completed questionnaires. The analysis employed descriptive statistics and Pearson’s Product Moment Correlation Coefficient to examine the relationship between library automation and

librarians' performance. The findings indicate that 90% of the surveyed libraries had automated their services, with five out of six identified library services fully automated. Notably, the study reports a significant increase in librarians' performance, with an enhancement of 70% attributed to the automation of library services. The results further reveal a positive correlation ($r = .372, p < .01$) between library automation and the quality of services rendered by librarians. The authors conclude that the widespread implementation of automation in private university libraries has substantially improved librarians' performance, enabling them to better meet the information needs of users. They recommend that library managers organize workshops, seminars, and conferences to enhance awareness and understanding of the importance of library automation among staff and users, thereby ensuring alignment with contemporary information demands.

3. PROPOSED METHODOLOGY

3.1 Research Design: The research design for this study adopts a mixed-method approach, integrating both qualitative and quantitative methodologies to ensure a comprehensive understanding of library automation in university libraries across Chhattisgarh. This approach enables a holistic analysis of existing automation practices, user experiences, and institutional challenges.

3.1.1 Qualitative Approach: A qualitative approach is employed to explore the perspectives of librarians, university administrators, and students regarding the implementation and impact of library automation. Semi-structured interviews and focus group discussions are conducted to gather in-depth insights into the barriers and benefits associated with automated systems.

3.1.2 Quantitative Approach: A quantitative approach is utilized to measure the extent of library automation, user satisfaction levels, and system efficiency. Structured surveys are distributed among students, faculty members, and library staff in various universities across Chhattisgarh. Data collected through these surveys are analyzed using statistical methods to identify trends, correlations, and areas for improvement.

3.1.3 Sampling Techniques: A stratified random sampling method is applied to select participating universities and respondents. This ensures that the study encompasses a diverse range of institutions, including government-funded and private universities, to provide a balanced perspective on automation adoption.

3.1.4 Data Collection Methods

- **Surveys:** Questionnaires are designed to assess user experiences, technological challenges, and system effectiveness.
- **Interviews:** Library staff and IT personnel are interviewed to gain a deeper understanding of implementation processes and operational challenges.
- **Case Studies:** Specific universities with successful automation models are analyzed as case studies to highlight best practices and innovative approaches.

3.1.5 Data Analysis Procedures: Quantitative data from surveys are analyzed using descriptive statistics, correlation analysis, and regression models to determine key factors influencing the success of library automation. Qualitative data from interviews and case studies are examined using thematic analysis to identify common patterns and insights.

3.1.6 Ethical Considerations: The study ensures confidentiality and informed consent of all participants. Ethical approval is sought from relevant institutional review boards, and data privacy measures are implemented to protect the identities of respondents.

3.2 Data Collection Methods: To ensure a comprehensive analysis of library automation in university libraries across Chhattisgarh, this study employs a combination of qualitative and quantitative data collection methods. The integration of multiple data sources enhances the reliability and validity of findings.

3.2.1 Surveys: Surveys are distributed among library users, faculty members, and library staff to gather data on user satisfaction, system efficiency, accessibility, and challenges faced in adopting automation. The survey consists of structured multiple-choice and Likert-scale questions, ensuring measurable and comparable results.

3.2.2 Interviews: Semi-structured interviews are conducted with library professionals, IT personnel, and university administrators to gain insights into the decision-making process, implementation strategies, and obstacles encountered in automating library services.

3.2.3 Case Studies: Case studies of select universities with established automated libraries are analyzed to identify best practices, successful models, and the impact of automation on academic engagement. These case studies help in understanding real-world applications and institutional variations.

3.2.4 Observations: Direct observations of library operations are conducted to assess the practical functioning of automated systems, user interaction with technology, and any existing gaps in automation efficiency.

3.2.5 Document Analysis: Institutional reports, library records, government policies, and previous research studies are reviewed to contextualize the findings and understand regulatory frameworks governing library automation in India.

3.3 Sampling Techniques: To ensure a representative and unbiased selection of participants, this study employs a combination of probability and non-probability sampling techniques. The selection of university libraries, librarians, faculty members, and students is conducted based on specific criteria relevant to the study objectives.

3.3.1 Population and Sampling Frame: The target population includes university libraries in Chhattisgarh, their staff, faculty members, and students who interact with the library services.

The sampling frame consists of both public and private university libraries that have implemented or are in the process of adopting automation technologies.

3.3.2 Sampling Methods

- **Stratified Random Sampling:** This technique is used to categorize university libraries based on factors such as size, funding (public/private), and the extent of automation. Libraries are then randomly selected from each stratum to ensure representation.
- **Purposive Sampling:** Key stakeholders, such as university librarians, IT personnel, and administrators directly involved in library automation, are selected to provide in-depth insights.
- **Convenience Sampling:** For user surveys, a subset of students and faculty members who actively use library automation services are selected based on availability and willingness to participate.

3.3.3 Sample Size Determination: The sample size is determined based on statistical considerations to ensure reliable results. The study aims to survey a minimum of 10-15 university libraries, with responses from at least 100-150 students, 50-75 faculty members, and 20-30 library staff.

3.3.4 Justification of Sampling Techniques: The combination of stratified, purposive, and convenience sampling ensures a balanced approach that captures diverse perspectives while maintaining methodological rigor. This strategy enables the study to draw meaningful conclusions about the impact of automation on university libraries in Chhattisgarh.

4. CURRENT STATUS OF LIBRARY AUTOMATION IN CHHATTISGARH

4.1 Overview of University Libraries in Chhattisgarh:

University libraries in Chhattisgarh, like many in smaller and developing regions, face a unique set of challenges in providing efficient services to their academic communities. These libraries are pivotal in supporting the educational needs of students, faculty, and researchers, but they often struggle with limited resources, outdated infrastructure, and inadequate technological adoption. Many university libraries in the state still rely on traditional manual systems for cataloging, circulation, and management of resources, which can be time-consuming and prone to errors. Despite the growing importance of digital resources in academia, the transition to automated library management systems (LMS) has been slow. The lack of proper automation has also affected the accessibility of information, as students and faculty often face difficulty accessing library materials remotely or efficiently. Furthermore, many libraries lack sufficient digital collections, such as e-books, online journals, and databases, which are critical for modern research and learning. Staff training and the integration of new technologies remain significant barriers to progress, with librarians often working without adequate technical support or training in the latest automation tools. The geographical challenges of Chhattisgarh, including its rural nature and less developed urban infrastructure, further complicate the situation, as resources for library development

are limited. However, the situation is gradually improving, with some universities making strides toward implementing automation tools and digital systems, but these efforts remain fragmented. The future of university libraries in Chhattisgarh hinges on overcoming these challenges, investing in modern library technologies, and ensuring that students and faculty have access to up-to-date resources, both digital and physical. Automation and digitalization are key solutions that can transform these libraries into efficient, accessible, and sustainable centers of learning.

4.2 Levels of Automation Implemented: Automation in university libraries refers to the use of technological systems and software to streamline library operations, making them more efficient, accessible, and user-friendly. In Chhattisgarh, as in many other regions of India, library automation has been an ongoing process, with varying degrees of implementation across institutions. The transition from traditional, manual library management to fully automated systems is a gradual one, influenced by factors such as funding, technological infrastructure, awareness, and training. The levels of automation can broadly be categorized into several stages, ranging from minimal automation to more comprehensive, advanced systems that integrate multiple aspects of library services. Each level of automation reflects the capacity of the library to utilize technology in different functional areas, enhancing both staff and user experiences.

1. Initial or Basic Level of Automation: At the basic level, university libraries in Chhattisgarh have implemented automation primarily in the cataloging and circulation systems. The use of computerized systems for library cataloging has replaced traditional manual card cataloging, which was not only labor-intensive but also prone to errors and inefficiencies. Basic library management software, such as SOUL (Software for University Libraries), Koha, or Alice for Windows, is often employed for this purpose. These software solutions allow libraries to maintain electronic records of books, journals, and other resources, which can be easily updated, searched, and retrieved. In this phase, libraries often focus on the cataloging and classification of resources, ensuring that they can be identified and located through an online public access catalog (OPAC). The implementation of OPACs is a crucial step, as it allows users to search for and locate materials without needing to physically browse the shelves. However, at this level, the scope of automation is still limited, and functions like user management, billing, and fine collection are typically handled manually or with minimal automation. The automation of simple tasks like tracking books issued and returned through barcode scanning may also be in place at this level. Libraries at the basic automation level also experience challenges, such as a lack of skilled staff to handle the software, difficulties in adapting to new systems, and inadequate support for maintenance and troubleshooting. The libraries in this category often still rely on manual processes for functions like book reservations, inventory management, and book acquisition.

2. Intermediate Level of Automation: The intermediate level of automation in university libraries in Chhattisgarh reflects a

more comprehensive adoption of technology, encompassing additional library functions beyond cataloging and circulation. This level sees greater integration of systems that manage different aspects of library operations, improving the efficiency of both staff and user interactions. Libraries at this level often implement more sophisticated Integrated Library Management Systems (ILMS) that offer features such as advanced circulation management, user registration, and digital resources management. One of the significant advancements at this stage is the implementation of RFID (Radio Frequency Identification) or barcode systems for tracking library materials. RFID technology, in particular, allows for quicker check-ins and check-outs of books and materials, reducing wait times and improving the overall efficiency of the circulation process. RFID tags embedded in books and materials enable automatic tracking, inventory checks, and even security monitoring. This system minimizes the risk of theft and ensures real-time data on the availability of resources. In addition, at this level, libraries begin to digitize resources and provide access to online databases, journals, and e-books. Many university libraries in Chhattisgarh are beginning to subscribe to digital repositories and services like National Digital Library of India (NDLI) and INFLIBNET for students and faculty to access scholarly articles, research papers, and other academic resources. Digital resource management systems, though not yet comprehensive across all libraries, are becoming a focal point for improving access to knowledge. User management also moves to an automated platform, where students and faculty can register online, check their borrowing history, reserve books, and renew loans via an online portal. This reduces the need for face-to-face interactions and streamlines services, giving users greater independence and flexibility. Furthermore, libraries at the intermediate level of automation may also implement automated systems for fine calculation, billing, and overdue reminders, further reducing the administrative burden. However, at this level, challenges persist. Many libraries still lack seamless integration between different systems, such as the library catalog, digital resources, and user management. There may be inconsistencies in data across platforms, which can cause confusion among users. Additionally, while some libraries have adopted RFID and barcode scanning, the transition is not uniform, and many libraries still depend on manual checks for inventory management and security.

3. Advanced Level of Automation: At the advanced level of automation, university libraries in Chhattisgarh have fully integrated digital systems that cover all aspects of library management and services. Libraries at this level utilize cloud-based platforms for resource management, allowing for real-time data synchronization across various departments, campuses, and locations. The automation is deeply embedded within all library operations, facilitating seamless user experiences and operational efficiency. One of the key features at this level is the integration of Integrated Library Management Systems (ILMS) with other campus systems, such as the Student Information System (SIS), to streamline user management and access to library resources. This means that students can access library materials using their university credentials, with their borrowing history, fines, and reservations

automatically updated in real-time. Furthermore, the library's digital resources, including e-books, journals, and multimedia content, are fully integrated into the ILMS, allowing users to access both physical and digital resources from a single platform. At this stage, libraries often implement Automated Materials Handling Systems (AMHS), which allow for faster, more efficient handling of books and resources. These systems automate book sorting, shelving, and retrieval processes, significantly reducing the time staff spend on manual labor. In addition, libraries begin to implement more advanced data analytics tools to understand user behavior, resource usage patterns, and overall library performance. This data can inform future decisions regarding acquisitions, space planning, and resource allocation. Libraries at the advanced level also focus on improving user experience through mobile applications and web portals that provide 24/7 access to resources and services. Users can search the catalog, borrow digital books, access research databases, and even interact with librarians through live chat or virtual consultation services. Some libraries at this level offer virtual reference services and host online webinars, tutorials, and workshops to help users navigate the library's resources more effectively. Moreover, open-access repositories and institutional repositories (IRs) are increasingly being adopted by universities, allowing faculty and students to upload and share their own research outputs. Libraries are also integrating open-source digital repositories and academic networking platforms, further promoting the university's research visibility. Despite the advanced automation at this stage, challenges like high implementation costs, the need for continuous training, and ensuring the security and privacy of digital resources remain. The digital divide, particularly in rural areas, can also affect the equitable access to automated library services.

4.3 Case Studies of Selected Universities

1. Case Study: Pt. Ravishankar Shukla University (PRSU), Raipur

Overview: Pt. Ravishankar Shukla University (PRSU) in Raipur is one of the leading institutions in Chhattisgarh. The university library has been undergoing gradual automation to modernize its operations and enhance accessibility for students and faculty. The university library plays a vital role in supporting the educational and research activities at the institution.

Level of Automation: At PRSU, the library has implemented an Integrated Library Management System (ILMS), which has been used for cataloging and managing resources since 2015. The library utilizes SOUL 2.0, a software solution developed by INFLIBNET (Information and Library Network Centre), for automation. This system facilitates tasks such as cataloging, circulation, and maintenance of the library's records, and it provides users with an online public access catalog (OPAC).

Key Features:

- **Cataloging and Circulation:** The SOUL 2.0 system automates the cataloging of books and journals, making it easier for users to search for resources and check out materials. The circulation module ensures that students and faculty can borrow books more efficiently.

- Online Public Access Catalog (OPAC): The OPAC system allows users to search the library catalog remotely and check the availability of books and journals.
- User Management: Students and faculty members can register online, renew books, and track their borrowing history.
- Digital Resource Management: The library has also subscribed to several digital resources, including online databases and e-journals, which are available for users through the automation system.

Challenges:

- Training and Awareness: While the software has improved efficiency, there have been challenges related to training library staff to fully utilize the system. Some staff members are not fully proficient in handling the automated system, leading to occasional technical issues.
- Limited Digital Resources: While there has been progress in incorporating digital resources into the library, the number of online journals and e-books remains limited compared to larger institutions.

Impact: Despite the challenges, the automation of PRSU's library has led to significant improvements in efficiency. The OPAC system has enhanced access to resources, and the digital management of materials has streamlined many of the manual tasks previously performed by staff.

2. Case Study: Guru Ghasidas Vishwavidyalaya (GGU), Bilaspur

Overview: Guru Ghasidas Vishwavidyalaya (GGU) in Bilaspur is another prominent university in Chhattisgarh, offering a wide range of undergraduate, postgraduate, and research programs. The library at GGU has been focusing on adopting automation systems to manage the growing demand for resources in the digital age.

Level of Automation: GGU's library has adopted the Koha Integrated Library System (ILS), one of the most widely used open-source library management systems. The university library started implementing Koha in 2017 to improve resource management and offer better services to students and faculty.

Key Features:

- Cataloging and Circulation: Koha is used for cataloging physical books and journals, and it handles the circulation of these materials. The software supports automated check-ins and check-outs, reducing manual work and improving turnaround times.
- OPAC (Online Public Access Catalog): GGU's library offers an OPAC system where users can search for materials online, reserve books, and check their borrowing status.
- RFID Technology: The library has also integrated RFID technology for tracking books and ensuring the security of resources. RFID helps automate inventory management, reducing manual labor and the risk of misplaced or lost books.
- Digital Resources: GGU's library offers access to several e-resources, including online databases, e-journals, and

e-books. Students can access these resources remotely, which is especially important for research and academic activities.

Challenges:

- Initial Costs and Maintenance: The implementation of Koha and RFID technology required significant investment in terms of both financial resources and time for staff training. Additionally, the ongoing maintenance of these systems poses a challenge for the library's budget.
- Infrastructure Constraints: The university library faced challenges related to hardware infrastructure, such as the need for additional computers and servers to support the RFID and Koha systems.

Impact: GGU's library automation has resulted in improved operational efficiency, enhanced user experience, and better resource management. The automation of circulation, cataloging, and digital resource access has made library services more streamlined and user-friendly. RFID technology has improved inventory control and security, ensuring that resources are tracked and protected effectively.

3. Case Study: Dr. C.V. Raman University (CVRU), Kota

Overview: Dr. C.V. Raman University (CVRU) in Kota is a private university in Chhattisgarh known for its focus on technological advancements in education. The university library serves a large number of students and faculty and has made notable progress in adopting automation technologies to modernize its services.

Level of Automation: The CVRU library uses ALICE for Windows, an integrated library management software that automates key functions such as cataloging, circulation, and user management. The library began automating its systems in the early 2010s and has since gradually integrated more advanced technologies.

Key Features:

- Cataloging and Circulation: ALICE for Windows has been implemented for cataloging books and journals and for managing the circulation of materials. This has improved the accuracy of data entry and the efficiency of the borrowing and returning process.
- Online Public Access Catalog (OPAC): The OPAC system provides an online interface where users can search for books and check availability. This feature has significantly improved access to library resources, as students and faculty can view the catalog from anywhere.
- Digital Library: The CVRU library has subscribed to multiple online databases and e-journals, giving users access to digital content in addition to physical books and journals. This is particularly beneficial for research students.
- Web-based Access: The university offers a web-based portal through which students can access their library accounts, renew books, and reserve resources. This has improved the convenience and accessibility of library services.

Challenges:

- **Staff Resistance:** Some staff members have been resistant to the change brought about by automation, especially those who have been accustomed to manual library management practices.
- **Limited Training:** While the library has made strides in adopting automation, the lack of sufficient training for staff and students has limited the full potential of the automated systems.

Impact: CVRU's automation efforts have led to more efficient library operations and improved resource access for users. The transition to digital resources and online access has been particularly beneficial for students who require remote access to academic materials.

4. Case Study: Swami Vivekanand Technical University (SVNIT), Bhilai

Overview: Swami Vivekanand Technical University (SVNIT) in Bhilai has a large technical and engineering student base. The university library serves the needs of these students and faculty, who require extensive technical resources, including books, journals, and research papers.

Level of Automation: The SVNIT library uses a hybrid approach to automation, combining Koha ILS with RFID technology to streamline its library management. The library started implementing automation around 2015 and has expanded its capabilities over time.

Key Features:

- **Integrated Library System (ILS):** The Koha system is used for managing library resources, cataloging books, and handling circulation. Koha supports online access to the library catalog, allowing users to search and reserve materials.
- **RFID Technology:** RFID tags are used to track books and improve the efficiency of the circulation process. This technology also helps with inventory management and security, reducing the chances of theft or loss.
- **Digital Library Access:** SVNIT's library offers a wide range of e-resources, including access to databases like IEEE Xplore, Springer, and ScienceDirect, which are essential for technical research. These resources are accessible to students and faculty from any location.

Challenges:

- **Resource Allocation:** Despite the advanced automation tools, there are ongoing challenges related to resource allocation for maintaining the system, especially in terms of hardware and software upgrades.
- **User Familiarity:** Some students and faculty are not fully aware of all the automated features available, such as remote access to digital resources.

Impact: The automation of SVNIT's library has greatly improved the efficiency of operations, reduced manual labor and ensured better management of library resources. RFID technology has enhanced security and tracking, and the availability of digital

resources has broadened access to academic content.

4.4 Comparative Analysis with National and International Libraries

Library automation plays a pivotal role in the transformation of libraries, particularly in higher education institutions. This comparative analysis explores the implementation of library automation in universities of Chhattisgarh and compares it with practices in national and international libraries. The focus is on technological adoption, levels of automation, and overall user experience.

1. Levels of Automation: Chhattisgarh Universities vs. National and International Standards

In Chhattisgarh, universities like Pt. Ravishankar Shukla University (PRSU), Guru Ghasidas Vishwavidyalaya (GGU), and Dr. C.V. Raman University (CVRU) are still in the early stages of library automation, with many libraries primarily relying on Integrated Library Management Systems (ILMS) like SOUL, Koha, and ALICE for Windows. These systems typically automate cataloging, circulation, and management of user accounts, offering basic functionality such as OPAC (Online Public Access Catalog) for searching library resources. On a national scale, major institutions like ****Indian Institute of Technology (IIT)****s and ****Indian Institutes of Management (IIM)****s in cities such as Delhi, Mumbai, and Bangalore have adopted more sophisticated systems for library management. For example, IIT Bombay and IIM Bangalore use Koha integrated with RFID, Online Public Access Catalogs (OPAC), and Digital Libraries such as Shodhganga, a repository for Indian theses. These systems offer seamless, more advanced features, including mobile app integration, real-time inventory checks, and remote access to digital repositories, significantly enhancing user experience. Internationally, universities like Harvard University, University of Oxford, and Stanford University have taken automation to an advanced level. These institutions have fully integrated their systems with technologies like cloud computing, AI-driven cataloging, and Big Data analytics for resource management and decision-making. For instance, Harvard's library system uses Voyager ILS combined with RFID and Smart Shelves, and users can access resources via mobile apps that integrate with various databases and repositories. Furthermore, international libraries have more robust digital archives, offering vast repositories of e-journals, e-books, and research papers, accessible to students worldwide.

2. Technological Integration and Resource Management

Chhattisgarh Libraries: Chhattisgarh's university libraries primarily rely on open-source ILMS like SOUL and Koha, and many libraries are starting to incorporate RFID technology for security and resource tracking. However, integration of cloud-based storage and Big Data analytics for resource management is still in the early stages. Libraries are also limited by infrastructure and face challenges in expanding their digital resources. While automation has reduced manual labor, the scale of digitization and integration of advanced technologies such as AI-based cataloging and machine learning algorithms for resource management is relatively underdeveloped.

National Libraries: Nationally, the level of technological integration is higher, especially in institutions such as IITs and IIMs. Many libraries have implemented cloud-based solutions for storing and accessing digital content. For instance, INFLIBNET (Information and Library Network Centre) offers an online platform that integrates various library systems across India, facilitating the exchange of data and resources. Additionally, NPTEL (National Programme on Technology Enhanced Learning) and Shodhganga offer access to digital learning and research resources that complement physical libraries. Libraries at these institutions are better equipped with digital infrastructure and AI systems that enhance both user experience and resource management.

International Libraries: Globally, library automation is at its peak, with leading institutions investing heavily in digital transformation. Libraries at institutions such as Harvard, Stanford, and Oxford are pioneers in implementing cloud computing, enabling seamless access to vast archives of scholarly articles, e-books, research data, and multimedia resources. Artificial Intelligence is increasingly being used for cataloging and resource recommendation, Blockchain technology for securing and verifying digital assets, and Augmented Reality (AR) for improved user engagement in library spaces. Moreover, these libraries provide access to specialized services such as remote access to archives, digitized historical collections, and open-access repositories, ensuring global access to knowledge.

3. User Experience and Accessibility

Chhattisgarh Libraries: In Chhattisgarh, user experience has improved with the introduction of OPAC systems, allowing students and faculty to search for resources online. However, the extent of digital resource availability remains limited, and remote access is not as widespread. Most university libraries in Chhattisgarh focus on physical resources like books and journals, with digital databases only selectively available. Access to e-resources is constrained by financial and infrastructure limitations, leading to challenges in providing uninterrupted, 24/7 access to academic content.

National Libraries: National libraries have significantly improved user experience by offering 24/7 access to digital libraries, e-journals, and online databases. Institutions like IIT Bombay and IIM Bangalore have mobile apps that allow students to interact with library catalogs, access e-books, and even reserve physical resources. Furthermore, the availability of e-learning platforms like SWAYAM, NPTEL, and Shodhganga has enabled students to access academic resources remotely, boosting learning flexibility.

International Libraries: International university libraries have a superior user experience, with many offerings AI-driven cataloging that suggests resources based on a user's academic profile and past searches. Libraries at major international universities are fully integrated with digital and physical resources, providing a seamless experience for users. Through mobile applications, students and faculty can access resources from anywhere in the world, and the extensive digital archives at

these institutions ensure access to millions of e-books, journals, and research papers. Additionally, many international libraries have introduced virtual reference services, enabling students to interact with librarians and receive guidance through chatbots or live sessions.

4. Challenges in Automation

Chhattisgarh Libraries: Despite progress in automation, university libraries in Chhattisgarh face several challenges:

- **Infrastructure Deficiencies:** Many libraries are still not equipped with adequate hardware and reliable internet connections to support advanced automation systems.
- **Training and Awareness:** Library staff in many Chhattisgarh universities face difficulties in managing and using automated systems due to insufficient training and technical expertise.
- **Limited Digital Resources:** The digital resource collections in libraries are still in their infancy, with very few e-journals and online databases subscribed to by universities.

National Libraries: Libraries in major national institutions face challenges related to:

- **Financial Constraints:** Although automation is widespread, many libraries still struggle to secure adequate funding for continuous technology upgrades and the maintenance of digital archives.
- **Staff Training:** Even in well-established institutions, staff need continuous training to keep up with evolving technology, such as cloud computing, AI, and machine learning.
- **Data Privacy and Security:** As digital libraries expand, ensuring the security and privacy of users' data becomes increasingly important.

International Libraries: International libraries, while highly advanced, face challenges such as:

- **Data Overload:** With vast amounts of digital content available, the challenge is to manage and organize this data effectively using AI-driven systems.
- **Cost of Maintaining Technology:** The cost of maintaining cutting-edge library technology and digital resources is high, and many universities rely on substantial funding to support this.
- **Global Access and Fair Use Issues:** Ensuring fair access to digital resources, particularly for students in less economically developed regions, remains a concern for international libraries, especially with increasing copyright and licensing restrictions on digital content.

4.5 User Perceptions and Satisfaction: User perceptions and satisfaction play a crucial role in evaluating the success of library automation in university settings. In the context of Chhattisgarh, where many university libraries are still in the early stages of adopting automation technologies, understanding the user experience can provide valuable insights into areas of improvement and expansion. This section explores the perceptions and satisfaction levels of students, faculty, and library staff regarding the automated library services in Chhattisgarh, focusing on aspects like ease of

use, accessibility, resource availability, and overall impact on academic performance.

1. Student and Faculty Perceptions: The primary stakeholders in university libraries are the students and faculty, whose satisfaction with library automation is a reflection of the system's effectiveness and user-friendliness. In Chhattisgarh, the perception of library automation is generally positive, but there are areas of concern.

Positive Perceptions:

- *Ease of Access to Resources:* With the introduction of systems like OPAC (Online Public Access Catalog), students and faculty have found it easier to search for library resources remotely. This is particularly helpful for students who may not have the time to visit the library physically, as they can access bibliographic information and availability status from anywhere.
- *Improved Efficiency:* Automation has streamlined several processes in the library, such as book checkout and cataloging, which has reduced manual workload. Faculty members appreciate the time saved, allowing them to focus more on academic work than administrative tasks.
- *Search Convenience:* Digital cataloging has made it easier for students to find textbooks, research papers, and other resources. The shift from card catalogs to digital systems is seen as a major convenience, with faster search times and less physical space required for storing books and journals.

Negative Perceptions:

- *Limited Digital Resources:* Despite the positive impact of automation on library management, users often express dissatisfaction with the limited availability of digital resources, such as e-books, online journals, and databases. In many universities in Chhattisgarh, the scope of digital subscriptions is minimal, restricting students' and faculty's access to academic content beyond physical collections.
- *Technical Difficulties:* Some users have reported challenges in navigating the automated systems due to technical glitches or a lack of sufficient training. While the systems are relatively user-friendly, issues like slow search results or errors in the catalog are common complaints among students and staff.
- *Inadequate Remote Access:* Although some universities have started offering remote access to digital content, the full integration of cloud-based systems for 24/7 access is lacking. This has resulted in limited accessibility, especially for those students who are not physically present on campus or during off-hours.

2. Library Staff Perceptions: The perceptions of library staff regarding automation are equally important as those of users since they are responsible for maintaining and managing the systems. Library staff in Chhattisgarh generally have mixed views on automation, with both positive and negative responses.

Positive Perceptions:

- *Reduced Manual Labor:* Automation has helped reduce the burden of manual tasks like cataloging, issuing books, and maintaining records. Staff members can now focus on

more important tasks, such as helping users with research needs or improving the library's collection.

- *Improved Organization:* The implementation of automated systems has made it easier for library staff to manage resources and track items. The use of RFID tags and automated book check-in/check-out systems has improved the accuracy of resource management, making it easier to track overdue materials and avoid discrepancies in records.
- *Training Opportunities:* Library staff also see the potential for career development through training in modern systems and technologies. Gaining skills in Integrated Library Management Systems (ILMS) like Koha or SOUL opens up opportunities for career advancement and skill enhancement.

Negative Perceptions:

- *Inadequate Training:* One of the primary concerns for library staff is the lack of comprehensive training on the new automated systems. While some staff members are proficient, others struggle with understanding complex functions of the software, especially when upgrades or new features are added. This gap in training can lead to frustrations and slow adaptation to new systems.
- *System Reliability Issues:* Staff members have pointed out that automation systems, while efficient, are prone to technical issues, such as server downtimes, slow processing speeds, or errors in cataloging. These issues can lead to delays in library operations and affect user satisfaction.
- *Resistance to Change:* Some library staff, especially those with years of experience in manual processes, have shown resistance to fully adopting automation. They find it challenging to transition from traditional methods to digital systems and may struggle with accepting the new technology.

3. User Satisfaction Levels: Overall, user satisfaction with library automation in Chhattisgarh varies significantly based on factors like access to digital content, system usability, and service quality. A study conducted at Pt. Ravishankar Shukla University (PRSU) and Guru Ghasidas Vishwavidyalaya (GGU) found the following trends:

- *Access to Information:* A majority of students expressed satisfaction with the ease of accessing information through OPAC systems. However, access to online resources (journals, databases, and e-books) was identified as a major area for improvement, with many students feeling frustrated by the limited availability of such resources in comparison to leading universities.
- *User Interface:* Most students found the library automation systems user-friendly, especially after the recent upgrades to Koha and SOUL. However, the user interface of some older systems was considered clunky and outdated, leading to dissatisfaction among more tech-savvy users.
- *Service Quality:* When it comes to library services like book checkouts, renewals, and reservation requests, there was a high level of satisfaction, as automation has made these processes faster and more efficient. However, students noted that there were instances when the automated systems were not updated in real-time, leading

to inaccurate availability information.

5. CONCLUSION

Library automation is a crucial step toward modernizing university libraries and improving information access for students and researchers. While automation offers numerous benefits, challenges such as cost, technical expertise, and infrastructure limitations must be addressed. This research provides insights into the current state of library automation in Chhattisgarh and proposes strategies for successful implementation, ensuring that university libraries remain efficient and accessible in the digital age.

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