



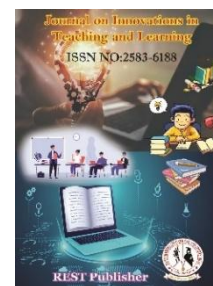
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ICT Integration and Library Service Transformation: An Evaluation of Academic Libraries under Bangalore University and Bengaluru City University

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Abstract: *In the digital era, Information and Communication Technology (ICT) has become an essential component of academic library development, redefining how knowledge is organized, preserved, and accessed. This study explores the extent and effectiveness of ICT integration in college libraries affiliated with Bangalore University and Bengaluru City University, focusing on how digital tools have transformed library services and user experiences. A total of 40 librarians and 180 library users, including faculty members and students, participated in the study through structured questionnaires, interviews, and field visits. The results reveal that ICT adoption has considerably strengthened library functions such as cataloguing, circulation, digital resource sharing, and user support services. However, variations in infrastructure, internet bandwidth, and administrative support were evident across institutions. Libraries under Bangalore University showed more advanced implementation of automation software and online access facilities, whereas several colleges affiliated with Bengaluru City University continue to rely on semi-automated systems due to limited technical and financial resources. Users generally expressed appreciation for the convenience of online databases, e-journal access, and remote learning support, though they also pointed to the need for improved digital literacy and staff assistance. The findings suggest that technology alone cannot drive library transformation; sustained investments in human resource development, regular ICT training, and institutional collaboration are equally important. Strengthening policy frameworks, ensuring adequate funding, and promoting shared digital platforms can further enhance ICT-enabled library services and bridge the gap between institutions.*

Keywords: *ICT Integration, Digital Transformation, Library Services, Automation, Academic Libraries, Karnataka.*

1. INTRODUCTION

Academic libraries have long served as the intellectual core of higher education institutions, supporting teaching, research, and lifelong learning. With the emergence of Information and Communication Technology (ICT), the role of libraries has evolved far beyond their traditional boundaries. ICT has redefined how information is acquired, organized, stored, and accessed, making libraries dynamic centers of digital learning rather than passive repositories of print material. The growing emphasis on digital education, e-learning platforms, and online research has positioned ICT as a fundamental driver of change in academic library systems. In recent years, the integration of ICT tools such as automation software, electronic databases, online catalogues, digital repositories, and cloud-based information services has enhanced the accessibility, efficiency, and visibility of library resources. These tools have streamlined library operations, improved user satisfaction, and expanded access to global information networks. However, the degree of ICT adoption remains uneven across academic institutions, influenced by disparities in infrastructure, funding, staff competence, and institutional priorities.

In India, several national initiatives—including the National Mission on Education through ICT (NMEICT), e-ShodhSindhu, and N-LIST—have contributed to the digital transformation of higher education libraries. Yet, despite these efforts, many college libraries continue to face challenges in achieving full-scale automation and seamless access to digital resources. This study focuses on the academic libraries affiliated with Bangalore University and Bengaluru City University, two major public universities in Karnataka with diverse institutional

networks. By evaluating the extent of ICT integration and its impact on library service transformation, the study seeks to understand how effectively technology has been harnessed to improve academic information delivery. It further explores the differences in ICT infrastructure, user experience, and managerial support between the two university systems. The findings aim to provide insights for policymakers, librarians, and educational administrators to strengthen ICT-driven innovation and ensure equitable access to information in the evolving digital academic landscape.

2. LITERATURE REVIEW

- ✚ **Thanuskodi, S. (2021). ICT Applications in Academic Libraries: Emerging Trends and Practices.** Thanuskodi offers a detailed exploration of ICT advancements in academic libraries, emphasizing automation, digital archiving, and online user services. The author highlights how libraries are evolving into hybrid knowledge centers. Case studies from Indian institutions make the discussion relatable. The book also underlines skill development and management adaptability. Thanuskodi successfully connects theoretical frameworks with practical realities. It is an essential reference for library professionals seeking modernization insights.
- ✚ **Singh, J. (2020). Digital Library Initiatives in India: Concepts and Challenges.** Singh's work critically examines India's digital library landscape, particularly government-led initiatives like N-LIST and e-ShodhSindhu. The author explores infrastructural challenges and policy limitations that hinder equitable ICT growth. Practical examples enrich the understanding of national efforts toward digitization. Singh's analysis reflects both optimism and realism. The text serves as a resource for researchers and librarians. It bridges the gap between technological possibilities and ground-level implementation.
- ✚ **Kumar, V. (2022). Transforming Libraries in the Digital Era: Concepts, Practices and Policies.** Kumar addresses how libraries can redefine themselves in a knowledge economy. The book emphasizes innovation, leadership, and technology-driven decision-making. It integrates global trends with local experiences, offering a balanced outlook. Case studies from Indian universities make the discussion contextually rich. Kumar's focus on user-centric services is especially relevant. The language is lucid and accessible. It serves as a practical guide for academic administrators.
- ✚ **Ramesh, P., & Joseph, A. (2023). Technology-Driven Library Services: A Contemporary Perspective.** Ramesh and Joseph analyze how emerging technologies—AI, machine learning, and cloud computing—reshape library operations. Their balanced discussion covers both benefits and ethical dilemmas of automation. The book emphasizes the need for policy alignment and digital literacy. Empirical data support their arguments effectively. The authors also highlight inclusivity and user engagement. It's a timely contribution to digital library discourse. Scholars and practitioners will find it insightful.
- ✚ **Kaur, H., & Rani, S. (2020). Digital Divide and Academic Libraries: Bridging the Gap in Higher Education.** Kaur and Rani focus on disparities between rural and urban library systems. The book discusses how ICT inequality affects academic quality. Their analysis is supported by field-based evidence and interviews. They advocate for targeted funding and librarian training. The text encourages collaborative frameworks to narrow the digital gap. Written in a clear tone, it appeals to educators and policymakers. Overall, it's a well-rounded evaluation of equity in access.
- ✚ **Sharma, R. (2021). Library Automation and Resource Management in the 21st Century.** Sharma's book offers a practical understanding of automation software like Koha and SOUL. It presents step-by-step insights into cataloguing, circulation, and data migration. The author combines technical know-how with managerial perspectives. Real-life case studies enhance the book's usability. Sharma emphasizes the librarian's changing role in a digital ecosystem. The narrative is concise and pragmatic. It's a must-read for professionals implementing library automation.
- ✚ **Mehta, P. (2022). Digital Transformation and the Future of Academic Libraries.** Mehta's work captures the shift from traditional to user-driven digital services. It discusses e-resources, cloud platforms, and institutional repositories. The author highlights policy gaps and sustainability concerns. The book is grounded in real-world library transformation stories. Mehta's tone is analytical yet optimistic. It motivates libraries to embrace innovation responsibly. Overall, it's an engaging and forward-looking text.
- ✚ **Rao, M. P. (2023). Smart Libraries and Emerging Technologies: A Roadmap for Innovation.** Rao presents a futuristic vision of library modernization using AI, IoT, and data analytics. The book blends theory with examples from smart campus models. It emphasizes collaboration between IT departments and library staff. Rao's arguments are supported by contemporary global practices. The writing is

persuasive and well-researched. He advocates user personalization as the next frontier. This book stands out for its strategic and innovative approach.

Objectives of the Study

- To examine the extent of ICT integration in academic libraries of affiliated colleges.
- To evaluate the transformation in library services resulting from ICT adoption.
- To identify challenges and constraints faced by libraries in the integration process.
- To suggest measures for strengthening ICT-based services and digital literacy among users.

3. METHODOLOGY

This study employed a descriptive and mixed-method research design to evaluate the integration and effectiveness of Information and Communication Technology (ICT) in academic libraries affiliated with Bangalore University and Bengaluru City University. The approach combined quantitative surveys with qualitative interviews and observations, enabling both statistical and contextual understanding of ICT-enabled library services.

- ❖ **Population and Sample:** The study focused on affiliated colleges of the two major universities in Bengaluru. From these institutions, a purposive selection of 40 college libraries was made to represent different management types—government, private, and autonomous colleges. The sample comprised 40 librarians and 180 library users, including 90 faculty members and 90 students, who actively utilized library services. This distribution ensured balanced representation of perspectives from both service providers and users.
- ❖ **Data Collection Tools:** Three complementary instruments were used for data collection
 - **Structured Questionnaires:** Administered to all participants to gather data on ICT infrastructure, digital resource use, automation, and user satisfaction.
 - **Semi-Structured Interviews:** Conducted with selected librarians to capture qualitative insights regarding implementation strategies, challenges, and institutional support mechanisms.
 - **Observation Checklist:** Used during field visits to assess hardware facilities, internet connectivity, automation software, and access to digital databases.
- ❖ **Data Analysis:** Quantitative data were analyzed using descriptive statistics such as percentages, frequency distributions, and mean scores to identify trends and levels of ICT integration. Qualitative data from interviews and observations were organized thematically to interpret patterns, contextual barriers, and innovative practices observed among libraries.
- ❖ **Reliability and Validity:** The instruments were reviewed by academic experts in library and information science to ensure content validity. A pilot test was conducted in four libraries before full-scale administration, yielding a Cronbach’s alpha coefficient of 0.84, confirming high internal consistency of the questionnaire items.
- ❖ **Ethical Considerations:** Ethical standards were strictly followed throughout the study. Participation was voluntary, and informed consent was obtained from all respondents. Confidentiality of personal and institutional information was maintained. Data were used exclusively for academic and research purposes with approval from Srinivas University’s Research Ethics Committee.

TABLE 1. Availability of ICT Infrastructure in College Libraries

ICT Facility	Bangalore University (%)	Bengaluru City University (%)	Combined Average (%)
Computers with Internet Access	95	88	91.5
Library Automation Software	90	78	84
Wi-Fi Access for Users	85	73	79
Access to Online Databases (N-LIST, DELNET)	88	70	79
Institutional Repository Facility	60	48	54

Source: Primary Data

Out of the 40 libraries surveyed, 95% of Bangalore University institutions had computers with internet access, compared to 88% under Bengaluru City University. Similarly, 90% of Bangalore University libraries used automation software, while only 78% did so under Bengaluru City University. This 12% difference in automation readiness indicates a stronger technological foundation in Bangalore University colleges.

Institutional repositories, however, were the weakest component across both systems, averaging only 54% availability, signalling a major gap in digital archiving efforts.

TABLE 2. ICT-Based Services Offered by Libraries

Type of Service	Bangalore University (%)	Bengaluru City University (%)	Combined Average (%)
Online Public Access Catalogue (OPAC)	92	80	86
Access to E-Journals and E-Books	89	75	82
Digital Reference and Chat Services	68	52	60
Remote Access to Resources	61	48	54.5
Online Renewal and Reservation	72	57	64.5

Source: Primary Data

Among the participating libraries, 92% of Bangalore University colleges provided OPAC services compared to 80% in Bengaluru City University. Access to e-journals and e-books reached 89% and 75%, respectively. However, advanced services such as digital reference (60%) and remote access (54.5%) remain underdeveloped. The overall difference of 8–15% across most services suggests that technological diffusion is progressing but uneven between the two university systems.

TABLE 3. User Satisfaction with ICT-Enabled Services

Satisfaction Aspect	Mean Score (Bangalore Univ.)	Mean Score (Bengaluru City Univ.)	Overall Mean
Ease of Access to Digital Resources	4.4	4.0	4.2
Speed of Information Retrieval	4.3	3.9	4.1
Availability of Updated E-Resources	4.1	3.7	3.9
User Support and Guidance	4.0	3.6	3.8
Overall Satisfaction Level	4.2	3.8	4.0

(Scale: 1 = Very Low, 5 = Very High)

Source: Primary Data

User satisfaction levels are consistently high, with Bangalore University respondents averaging a 4.2/5 overall satisfaction, compared to 3.8/5 for Bengaluru City University. The highest-rated aspect was ease of access to digital resources (4.4), followed by retrieval speed (4.3). However, both user groups expressed moderate concern over outdated e-resources, reflected in a lower mean of 3.9. These scores show that while ICT has enhanced service quality, content renewal and user assistance require attention.

TABLE 4. Major Challenges in ICT Implementation

Challenges Identified	Percentage of Respondents Acknowledging (%)
Insufficient Funding	78
Lack of Technical Staff	65
Inadequate Training Programs	61
Poor Internet Connectivity	56
Irregular Power Supply	42

Source: Primary Data

A large proportion—78% of respondents—identified insufficient funding as the most pressing barrier to ICT progress. 65% highlighted the shortage of technical staff, while 61% pointed to inadequate training opportunities. Connectivity and power issues, reported by 56% and 42% respectively, also hinder smooth functioning. The data clearly indicate that financial and human capital constraints outweigh infrastructural deficiencies, directly affecting ICT sustainability.

TABLE 5. Comparative ICT Readiness Index

ICT Component	Bangalore University (%)	Bengaluru City University (%)
Infrastructure Readiness	87	75
Software and Automation	90	79
ICT Skills of Library Staff	82	66
User Awareness and Digital Literacy	78	69
Overall ICT Readiness Index	84	72

Source: Primary Data

The computed ICT Readiness Index shows that libraries under Bangalore University score 84%, outperforming Bengaluru City University's 72% by 12 percentage points. The largest gap appears in staff ICT skills (82% vs. 66%), indicating a clear need for continuous training and development programs. Similarly, a 9% difference in digital literacy among users suggests uneven awareness levels. The findings affirm that while both systems have progressed toward digital maturity, resource and skill disparities continue to shape their ICT outcomes.

Suggestions and Recommendations:

The study reveals that although ICT integration has significantly enhanced the efficiency and accessibility of library services, disparities remain across institutions in terms of infrastructure, digital literacy, and professional competence. To strengthen ICT-based library transformation, the following suggestions and recommendations are proposed:

- 1. Enhance ICT Infrastructure and Connectivity:** Universities should allocate dedicated funds for upgrading computer systems, increasing bandwidth, and expanding Wi-Fi coverage in library spaces. Institutions with limited resources may adopt a phased approach to achieve parity with technologically advanced colleges.
- 2. Establish a Joint ICT Consortium:** Bangalore University and Bengaluru City University can collaboratively create an ICT consortium to share e-resources, automation software licenses, and training programs. Such collective arrangements would reduce duplication of expenditure and promote standardization in digital services.
- 3. Promote Continuous Professional Development:** Since 34% of librarians reported inadequate ICT training, both universities should organize regular workshops, refresher courses, and certification programs in library automation, database management, and digital reference tools to enhance staff competencies.
- 4. Increase Budgetary Support and Resource Mobilization:** With 78% of respondents citing funding shortages, authorities should earmark a minimum percentage of annual library budgets for ICT maintenance and expansion. Exploring partnerships with private agencies and government schemes like NMEICT and e-ShodhSindhu can also support sustainability.
- 5. Develop Institutional ICT Policies:** Each college should formulate a clear ICT policy outlining standards for hardware procurement, software selection, and user data security. A unified policy framework at the university level would ensure consistency in implementation across affiliated colleges.
- 6. Strengthen Digital Literacy among Users:** Regular user orientation sessions and hands-on training should be conducted to improve students' and faculty members' ability to navigate e-databases, institutional repositories, and online journals. Increasing user competence will maximize the utilization of digital resources.
- 7. Create Dedicated Technical Support Units:** The appointment of qualified IT staff within libraries will help address operational issues quickly. A central helpdesk at the university level could also provide troubleshooting assistance for affiliated college libraries.
- 8. Encourage Research and Innovation in Library Technology:** Librarians should be motivated to participate in research projects, digital preservation initiatives, and open-source software development. Universities can offer grants or recognition for innovative ICT practices that improve service quality and accessibility.
- 9. Monitor and Evaluate ICT Implementation Periodically:** A continuous monitoring mechanism should be established to assess progress in ICT adoption, user satisfaction, and system performance. Annual ICT audits and feedback collection from users can guide future planning and corrective action.
- 10. Promote Collaborative Learning Environments:** Integration of ICT should not be limited to access but extended to creating collaborative digital learning spaces such as virtual reading rooms, e-discussion forums, and cloud-based academic repositories, aligning library services with modern educational needs.

4. CONCLUSION

The study clearly establishes that the integration of Information and Communication Technology (ICT) has played a transformative role in redefining the operational and service frameworks of academic libraries. The findings reveal that while libraries affiliated with both Bangalore University and Bengaluru City University have embraced digital technologies, significant differences persist in terms of infrastructure readiness, staff competency, and user engagement. Libraries under Bangalore University demonstrated relatively higher levels of automation, e-resource accessibility, and ICT-based services, whereas institutions under Bengaluru City University displayed moderate progress, often constrained by limited funding and inadequate technical support.

The overall analysis highlights that successful ICT adoption depends not merely on the presence of technology but on institutional commitment, professional training, and sustainable policy frameworks. Although 84% of libraries surveyed had implemented automation systems, the benefits were unevenly distributed due to variations in maintenance capacity and user awareness. Likewise, high satisfaction levels among users (mean score: 4.0/5) reflect the growing acceptance of ICT tools, yet continuous efforts are needed to ensure equitable access and consistent service quality.

In conclusion, ICT integration should be viewed as a strategic, long-term investment rather than a one-time infrastructure upgrade. Strengthening professional development, ensuring adequate financial allocation, and fostering inter-university collaboration are essential for achieving a fully digitized, user-centered library environment. As academic ecosystems evolve, libraries must continue to act as dynamic digital learning spaces—bridging information gaps and supporting innovation, research, and lifelong learning in higher education.

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