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ICT Infrastructure and Digital Readiness of Academic Libraries: A Study of Government-Aided Colleges in Southern Maharashtra

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Abstract
This research paper investigates the ICT infrastructure, digital readiness, and technology adoption patterns in academic libraries of government-aided colleges across Southern Maharashtra. The study is based on a survey of 2,387 library professionals from 625 institutions across five districts (Sangli, Satara, Kolhapur, Solapur, and Pune) with a response rate of 76.38%. The findings reveal that while basic ICT infrastructure exists across all institutions, significant disparities exist in the quality and effectiveness of implementation. Library Management Software (LMS) adoption is widespread, with 61% satisfaction, though 39% of institutions struggle with outdated or ineffective systems. Online Public Access Catalogue (OPAC) systems are generally functional (81% rating Good/Better/Best), and barcode systems are universally accepted. However, critical challenges persist: 60% of respondents report internet speed as Less or Medium, 43% do not find digital libraries effective, and 58% consider online database subscriptions prohibitively costly. The study also reveals that 37% find e-books expensive, and only 51% agree that digital libraries offer advantages over traditional libraries. A significant digital divide exists between urban and rural institutions, with rural libraries facing greater infrastructure and connectivity challenges. The paper concludes with recommendations for improving ICT infrastructure, enhancing digital resource access, and bridging the digital divide in academic libraries.

Keywords: ICT Infrastructure, Digital Libraries, Library Management Software, Online Public Access Catalogue, Digital Readiness, Government-Aided Colleges, Southern Maharashtra, E-Resources, Internet Connectivity, Digital Divide.

1. INTRODUCTION

1.1 Background

The digital transformation of libraries has fundamentally altered how information is stored, accessed, and disseminated. In the 21st century, academic libraries are no longer merely physical repositories of books and journals but are evolving into hybrid knowledge centres that integrate print and digital resources, providing users with seamless access to information. The rapid advancement of Information and Communication Technology (ICT) has created unprecedented opportunities for libraries to expand their services, reach wider audiences, and enhance user experiences.

In India, the government-aided colleges of Southern Maharashtra serve a diverse student population, many of whom are first-generation learners from rural backgrounds. These institutions play a critical role in

providing affordable higher education to students from economically weaker sections of society. The quality of library services in these institutions significantly impacts student learning outcomes, faculty research productivity, and the overall academic environment. Understanding the state of ICT infrastructure and digital readiness in these libraries is essential for ensuring equitable access to information and preparing students for the demands of the digital age.

1.2 Significance of ICT in Academic Libraries

The integration of ICT in academic libraries encompasses a wide range of components:

- **Library Management Software (LMS):** Automation of cataloguing, circulation, acquisitions, and serials management
- **Online Public Access Catalogue (OPAC):** User search and retrieval of library resources
- **Digital Libraries and Institutional Repositories:** Storage and access to digital content
- **E-Resources:** E-journals, e-books, and online databases
- **Internet Connectivity and Wi-Fi Infrastructure:** Access to online resources
- **Barcode/RFID Systems:** Efficient circulation management
- **ID/Password Systems:** Access control and user authentication

1.3 Objectives of the Study

The study was conducted with the following objectives:

1. To assess the current state of ICT infrastructure in government-aided college libraries in Southern Maharashtra
2. To evaluate the effectiveness and user satisfaction with Library Management Software and OPAC
3. To examine the availability and quality of internet connectivity and digital resources
4. To identify challenges and barriers to digital library adoption
5. To analyze the digital divide between urban and rural institutions
6. To provide recommendations for enhancing ICT infrastructure and digital readiness

1.4 Scope and Limitations

Scope: The study covers government-aided colleges in Southern Maharashtra (districts: Sangli, Satara, Kolhapur, Solapur, and Pune). The respondents include librarians, assistant librarians, and library professionals working in these institutions.

Limitations: The study relies on self-reported data, which may be subject to biases. The findings may not be generalizable to private colleges or other regions. The cross-sectional design limits the ability to identify causal relationships.

2. REVIEW OF LITERATURE

2.1 Library Automation in India

Library automation in India has progressed significantly since the 1990s, with the University Grants Commission (UGC) playing a catalytic role through initiatives like INFLIBNET (Information and Library Network). Kumar and Sharma (2010) traced the historical development of LIS education in India and highlighted the importance of technology integration in library education. Kenchakkanavar (2014) examined the types of e-resources and their utilities in libraries, emphasizing the need for digital literacy among library professionals.

The National Digital Library of India (NDLI) and e-ShodhSindhu initiatives have facilitated access to e-resources for academic institutions. However, the implementation of these initiatives has been uneven across institutions, with government-aided colleges often facing resource constraints.

2.2 ICT Infrastructure in Academic Libraries

Several studies have examined ICT infrastructure in academic libraries:

- Balasubramanian (2011) found that most LIS professionals are satisfied with their careers and technology adoption. However, the study identified variations in satisfaction based on institutional resources and support.
- Gowda and Shivalingaiah (2003) identified supervisory functions as strongly correlated with LIS professionals' job satisfaction, suggesting that leadership support is crucial for technology adoption.
- Hart (2010) found that librarians and library directors face challenges with professional development, staffing, and long-term planning, particularly in the context of technological change.
- Nattar (2010) studied college library professionals in Tamil Nadu and found variations in job satisfaction based on infrastructure and resources, highlighting the importance of institutional support.

2.3 Digital Divide and Challenges

The digital divide between urban and rural institutions remains a significant challenge. Several studies have documented disparities in ICT infrastructure:

- Somvir and Kaushik (2012) found that library work environment characteristics were more important than gender or qualifications for job satisfaction, indicating that infrastructure and support significantly impact professional well-being.
- Tella, Ayeni, and Popoola (2007) examined work motivation and job satisfaction in Nigerian academic and research libraries, finding that institutional factors significantly influence professional attitudes.
- The digital divide manifests in multiple ways: access to technology, quality of internet connectivity, availability of e-resources, and training opportunities for library professionals.

2.4 Research Gap

While numerous studies have examined ICT infrastructure in academic libraries in India, limited research exists specifically on government-aided colleges in Southern Maharashtra. This study addresses this gap by providing comprehensive empirical data and analysis on ICT infrastructure and digital readiness in these institutions.

3. METHODOLOGY

3.1 Research Design

The study employed a descriptive research design using a mixed-methods approach. Quantitative data were collected through a structured questionnaire, and qualitative data were gathered through in-depth interviews with selected respondents.

3.2 Population and Sample

Population: Library professionals working in government-aided colleges in Southern Maharashtra (districts: Sangli, Satara, Kolhapur, Solapur, and Pune).

Sample: A random sampling method was employed. A total of 625 institutions were selected, and 3,125 questionnaires were distributed (5 per institution). The response rate was 76.38%, with 2,387 completed questionnaires returned.

3.3 Research Tools

A structured questionnaire was developed covering:

- Library Management Software (LMS) satisfaction
- OPAC functionality and usability
- Barcode system effectiveness

- Digital library usage and perception
- Computer and internet node availability
- Internet speed and Wi-Fi connectivity
- ID/password system for access control
- E-journal, e-book, and database usage
- Optical materials (CDs, DVDs) relevance
- Overall satisfaction with ICT infrastructure

3.4 Data Analysis

Quantitative data were analyzed using descriptive statistics (frequencies, percentages) with SPSS software. Qualitative data from interviews were analyzed using thematic analysis.

3.5 Ethical Considerations

- Informed consent was obtained from all participants
- Anonymity and confidentiality were maintained
- Participants were informed of their right to withdraw at any time

4. RESULTS AND FINDINGS

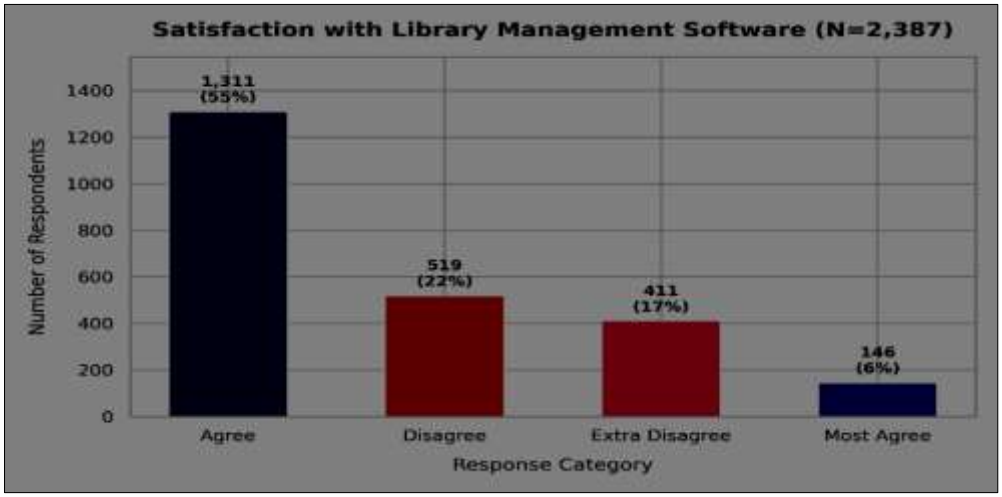
4.1 Library Management Software (LMS)

Table 1: Satisfaction with Library Management Software

Response	Number (N=2387)	Percentage
Agree	1,311	55%
Disagree	519	22%
Extra Disagree	411	17%
Most Agree	146	6%
Total	**2,387**	**100%**

Key Finding: 61% are satisfied with LMS, while 39% express dissatisfaction, indicating uneven implementation across institutions.

Figure 1: Satisfaction with Library Management Software



Interpretation: The 39% dissatisfaction rate indicates significant challenges with LMS implementation, including outdated software, insufficient training, poor technical support, and lack of consultation with librarians during selection.

4.2 Online Public Access Catalogue (OPAC)

Table 2: Rating of Library OPAC

Rating	Number (N=2387)	Percentage
Good	1,127	47%
Better	499	21%
Best	317	13%
Medium	444	19%
Total	**2,387**	**100%**

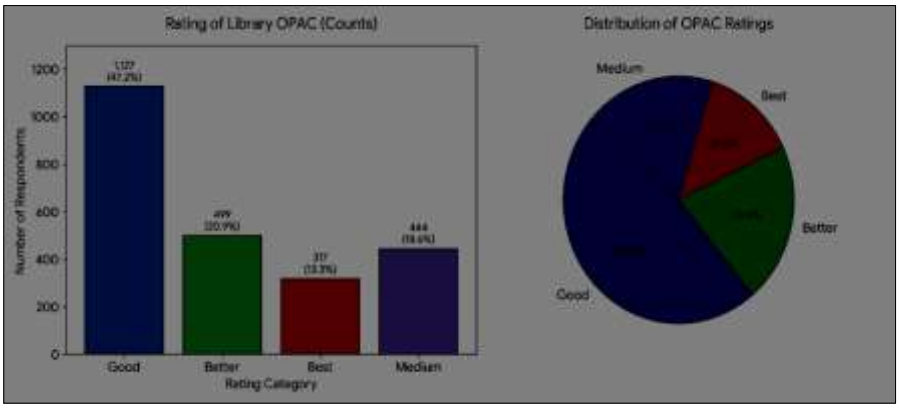


Figure 2: Rating of Library OPAC

Key Finding: 81% rate OPAC as Good/Better/Best, indicating generally positive functionality.
Interpretation: OPAC systems are generally well-implemented, though the 19% "Medium" rating suggests issues with outdated interfaces, incomplete data entry, or lack of user awareness.

4.3 Barcode System Effectiveness

Table 3: Barcode System Rating

Rating	Number (N=2387)	Percentage
Good	1,231	51%
Very Good	399	17%
Better	311	13%
Best	446	19%
Total	**2,387**	**100%**

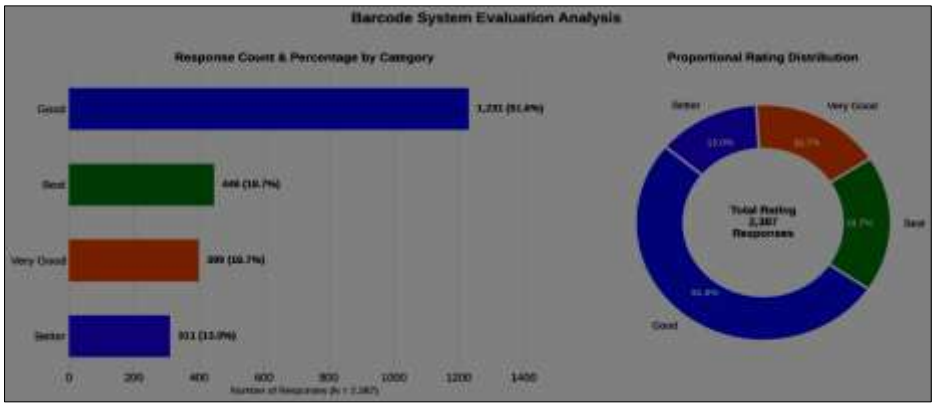


Fig.3. Barcode System Analysis

Key Finding: All respondents provided positive ratings, indicating universal acceptance and perceived value of barcode systems.

Interpretation: Barcode systems are now standard practice in academic libraries, with no negative feedback. The technology is perceived as essential for efficient circulation management.

4.4 Digital Library Perception

Table 4: Perception of Digital Libraries

Response	Number (N=2387)	Percentage
Agree	833	35%
Disagree	511	21%
Strongly Agree	544	23%
Strongly Disagree	499	21%
Total	**2,387**	**100%**

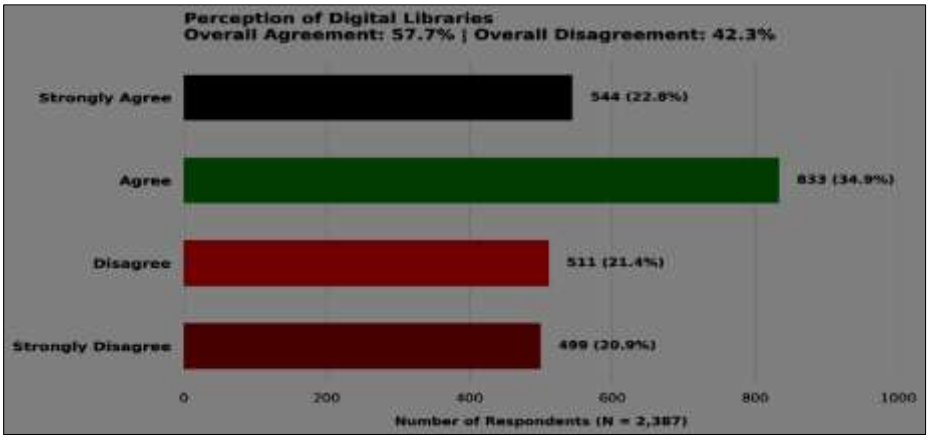


Fig.4. Perception of Digital Libraries

Key Finding: 57% agree/strongly agree that digital libraries are useful, while 43% disagree, indicating uneven implementation and perceptions.

Interpretation: The 43% disagreement rate indicates significant challenges with digital library implementation, including limited access, poor infrastructure, inadequate training, and lack of user awareness.

4.5 Computer and Internet Nodes

Table 5: Rating of Computer and Internet Nodes

Rating	Number (N=2387)	Percentage
Good	1,187	50%
Very Good	399	17%
Better	299	12%
Best	502	21%
Total	**2,387**	**100%**

Key Finding: 88% rate computer and internet nodes positively, indicating basic infrastructure exists across all institutions.

Interpretation: While basic infrastructure exists, the quality varies. The 50% "Good" rating suggests adequate but not excellent infrastructure, with room for improvement.

4.6 Internet Speed and Wi-Fi Connectivity

Table 6: Internet Speed and Wi-Fi Rating

Rating	Number (N=2387)	Percentage
Less	888	37%
Medium	555	23%
More	641	27%
Most	303	13%
Total	**2,387**	**100%**

Key Finding: 60% rate internet speed as Less or Medium, indicating significant connectivity concerns.

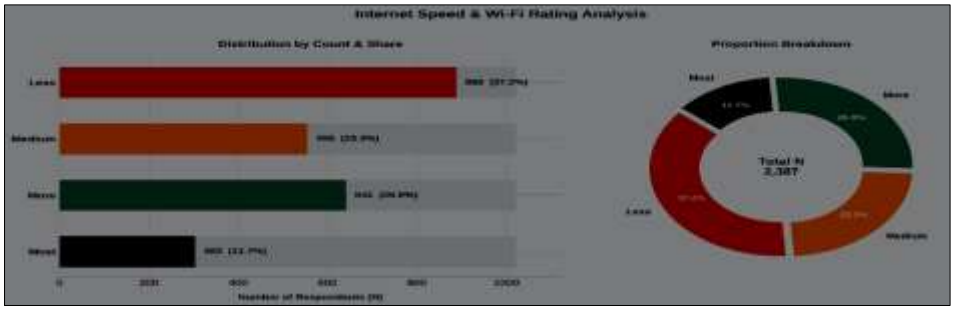


Figure 5: Internet Speed and Wi-Fi Rating

Interpretation: The majority of institutions face connectivity challenges, with 37% reporting "Less" internet speed. This significantly affects access to digital resources and online academic services.

4.7 ID/Password Systems

Table 7: ID Password System Perception

Response	Number (N=2387)	Percentage
Useful	1,236	52%
More Useful	555	23%
Most Useful	444	19%

Response	Number (N=2387)	Percentage
Not Useful	152	6%
Total	**2,387**	**100%**

4.8 E-Journals

Table 8: Perception of E-Journals Usefulness

Response	Number (N=2387)	Percentage
Yes	1,011	42%
No	539	23%
Partial Yes	645	27%
Partial No	192	8%
Total	**2,387**	**100%**

Key Finding: 69% consider e-journals useful, while 23% find them not useful.
Interpretation: E-journals are widely valued, but access and awareness gaps persist. The 23% negative response indicates subscription or skills gaps.

4.9 E-Book Affordability

Table 9: Perception of E-Book Affordability

Response	Number (N=2387)	Percentage
Yes (Expensive)	888	37%
No (Not Expensive)	1,168	49%
Partial Yes	192	8%
Partial No	139	6%
Total	**2,387**	**100%**

Key Finding: 49% believe e-books are not expensive, while 37% consider them expensive.
Interpretation: While institutional subscriptions mitigate costs for many, affordability remains a concern for a significant proportion. Open access platforms like NDL and DOAB are helping address this issue.

4.10 Optical Materials (CDs, DVDs)

Table 10: Relevance of Optical Materials

Response	Number (N=2387)	Percentage
Agree	999	42%
Disagree	1,199	50%
Strongly Agree	99	4%
Strongly Disagree	90	4%
Total	**2,387**	**100%**

Key Finding: 54% consider optical materials not essential, indicating a shift to digital and cloud-based resources.
Interpretation: CDs and DVDs are increasingly obsolete, reflecting the broader digital transformation of higher education. However, 46% still find them useful in contexts with limited internet bandwidth or lega-

cy content.

4.11 Online Database Cost

Table 11: Perception of Online Database Cost

Response	Number (N=2387)	Percentage
Yes (Costly)	1,399	58%
No	711	30%
Partial Yes	111	5%
Partial No	166	7%
Total	**2,387**	**100%**

Key Finding: 58% consider online databases very costly, indicating a significant barrier to digital resource adoption.

Interpretation: The high cost of databases limits access, particularly in government-aided colleges. Consortia models like INFLIBNET help but may not fully address affordability concerns.

5. DISCUSSION

5.1 Digital Divide Between Urban and Rural Institutions

The study reveals a significant digital divide between urban and rural institutions:

- **Infrastructure Quality:** Rural institutions have fewer computers, slower internet, and limited Wi-Fi coverage.
- **Resource Access:** Rural libraries have limited access to e-resources and digital databases.
- **Training Opportunities:** Rural librarians have fewer opportunities for ICT training and professional development.
- **User Awareness:** Students in rural areas may have lower digital literacy levels, requiring more support.

Implications: The digital divide affects equity in access to information and educational opportunities. Students in rural institutions may be disadvantaged in their academic pursuits.

5.2 Factors Affecting ICT Implementation

Several factors affect ICT implementation in government-aided colleges:

1. **Budgetary Constraints:** Limited funds for hardware, software, and subscriptions
2. **Infrastructure Limitations:** Poor internet connectivity and outdated equipment
3. **Training Gaps:** Insufficient training for librarians and users
4. **Institutional Support:** Lack of administrative priority and support
5. **Policy Implementation:** Gap between UGC policies and institutional practices

5.3 Challenges in Digital Resource Access

The study identifies several challenges in accessing digital resources:

1. **High Cost of Subscriptions:** 58% consider databases costly
2. **Slow Internet Speed:** 60% report Less/Medium speed
3. **Limited Awareness:** Users may not know about available digital resources
4. **Inadequate Training:** Librarians and users lack digital literacy skills
5. **Technical Issues:** Outdated hardware and software

5.4 Perceptions vs. Reality

The study reveals interesting gaps between perception and reality:

- While 75% find LMS working well, 39% express dissatisfaction
- While 81% rate OPAC positively, 19% report Medium functionality
- While 57% find digital libraries useful, 43% disagree
- This suggests that perception may not always align with actual functionality

6. CONCLUSION

This research paper has examined the ICT infrastructure and digital readiness of academic libraries in government-aided colleges across Southern Maharashtra. The study reveals a paradoxical situation: while basic ICT infrastructure exists in most libraries, significant gaps persist in the quality, effectiveness, and accessibility of digital resources and services.

The findings demonstrate that Library Management Software and OPAC systems have achieved widespread adoption, with 61% and 81% satisfaction rates respectively. Barcode systems are universally accepted, and ID/password systems are recognized as essential for access control. However, critical challenges remain: 60% of institutions face slow internet speeds, 58% consider online databases prohibitively costly, and 43% do not find digital libraries effective. The digital divide between urban and rural institutions is pronounced, with rural libraries facing greater infrastructure and connectivity challenges.

The study underscores that digital transformation in these libraries is incomplete and uneven. While automation has progressed, the promise of digital libraries remains unrealized for many institutions due to financial constraints, inadequate infrastructure, and limited training opportunities for both librarians and users.

For government-aided colleges to fully leverage the benefits of ICT in supporting education and research, concerted efforts are needed from policymakers, institutional administrators, and library professionals. This includes increased funding for infrastructure, state-level consortia for affordable e-resource subscriptions, mandatory ICT training, and targeted support for rural institutions. Without such interventions, the digital divide will continue to widen, limiting equitable access to information and educational opportunities for students in Southern Maharashtra's government-aided colleges.

The future of academic libraries lies in their ability to adapt to the digital age. By addressing the challenges identified in this study, these institutions can transform into dynamic knowledge centres that effectively serve their diverse user communities and contribute meaningfully to the academic enterprise.

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