Bridging the Digital Divide: Challenges in ICT Adoption for Library Services in Rural Colleges of Madhya Pradesh: Special Reference of Govt. P.G. College, Khargone

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Abstract:
The research study examined the impact of Information and Communication Technology (ICT) adoption on library services at Govt. P.G. College, Khargone, Madhya Pradesh, focusing on service efficiency, access to digital resources, and user satisfaction. Through a structured questionnaire, data on ICT usage, satisfaction levels, and barriers were collected, revealing that ICT implementation has led to notable improvements in library service delivery. However, persistent challenges like inadequate infrastructure, low digital literacy, financial limitations, and poor internet connectivity hinder full ICT adoption. The study suggests that improving infrastructure, providing ICT training, increasing financial support, and fostering collaborations could enhance ICT benefits in academic libraries. This research adds valuable insights into the role of ICT in rural academic libraries and offers practical recommendations for optimizing library services through digital tools.

Key-Words: ICT adoption, Digital divide, Library services, Rural education, Digital literacy

1. Introduction:
The digital divide is a significant barrier to achieving educational equality, especially in rural areas where access to information and communication technology (ICT) remains limited. Defined as the gap between individuals who have access to modern digital technology and those who do not, the digital divide can perpetuate socio-economic disparities and limit opportunities for learning and advancement (Riggins & Dewan, 2005). In India, where educational institutions serve as crucial centers for community development, the divide has profound implications for rural colleges that lack robust ICT infrastructure and resources (Rao, 2005). Libraries in particular, as primary knowledge repositories, require ICT integration to expand access, enhance resources, and support the research and learning needs of students and faculty (Singh & Pinki, 2009).
ICT adoption in libraries enables more efficient management of resources, digital archiving, and remote access to collections, transforming traditional libraries into dynamic information centers that meet contemporary needs (Bansode & Pujar, 2008). However, in many rural areas of Madhya Pradesh, including institutions like Govt. P.G. College, Khargone, significant barriers hinder ICT implementation. These include inadequate funding, limited internet access, a lack of trained library staff, and low digital literacy among users (Satpathy & Maharana, 2012). These challenges compromise the library's ability to provide comprehensive services, hindering educational advancement and limiting students' exposure to digital resources.

This study aims to explore these challenges in depth by focusing on the library services of Govt. P.G. College, Khargone, Madhya Pradesh. Through an analysis of the specific infrastructural, economic, and educational barriers to ICT adoption, the research seeks to propose viable solutions for bridging the digital divide in rural college libraries. By addressing these issues, libraries can foster equitable access to information and learning resources, ultimately supporting the academic and personal growth of students in rural communities.

2. Literature Review:

The digital divide in rural areas significantly affects educational services, particularly in library settings, where ICT adoption remains a challenge. Reji, Moulya, and Rajeswari (2024) explore how mobile-based services and digital platforms can enhance educational access in rural communities but stress the barriers posed by poor internet infrastructure, which limits the full digital engagement needed in rural libraries. The ASER report (2023) highlights the stark inequality in ICT access between rural and urban India, with rural students facing challenges such as inadequate devices and low digital literacy. These barriers hinder their ability to fully utilize digital educational resources, emphasizing the need for targeted digital literacy initiatives. Sheokand and Gupta (2017) argue that beyond infrastructure, effective ICT adoption requires digital literacy and training programs to empower rural users. They identify financial constraints and the lack of trained staff in rural libraries as key obstacles that exacerbate the digital divide, underlining the necessity for structured ICT literacy programs. Similarly, Singh and Pinki (2023) point to funding and staffing challenges in rural libraries, suggesting that rural library services suffer from limited resources for digital expansion and inadequate staff training, which limits the effectiveness of ICT implementation. Bansal and Choudhary (2024) emphasize that infrastructure upgrades must be paired with user training to achieve successful ICT adoption. Their study suggests that training programs for both students and library staff can significantly improve digital resource utilization, especially in under-resourced environments. The literature underscores that while digital initiatives such as the "Digital India" program offer valuable frameworks for ICT adoption, barriers like poor connectivity, insufficient funding, and low digital literacy continue to challenge rural library services in Madhya Pradesh. Addressing these issues requires holistic solutions combining infrastructure investment, user training, and sustained government support for digital literacy and ICT development in rural educational institutions.

3. Objectives of the Study

1. To examine the current state of ICT infrastructure in the library of Govt. P.G. College, Khargone.
2. To identify the primary challenges and barriers faced in ICT adoption for library services.
3. To assess the level of ICT training among library staff and users.
4. To evaluate the role of government and institutional policies in supporting ICT implementation.
5. To provide recommendations for effectively bridging the digital divide in rural college libraries.

4. Research Methodology:

The study conducted at Govt. P.G. College, Khargone, Madhya Pradesh, with a sample size of 75 respondents, including library staff, faculty, and students. Data will be collected through surveys, semi-structured interviews, and observational analysis. Surveys will assess users' perceptions and experiences with ICT in the library, while interviews will focus on staff and faculty views on the challenges of ICT adoption. Observational analysis will examine actual usage patterns and accessibility of digital resources. Data will be analyzed statistically to understand barriers, user satisfaction, and the overall impact of ICT adoption in rural academic libraries.

Hypotheses:
- **H1:** The adoption of ICT in rural colleges, specifically Govt. P.G. College, Khargone, has a significant positive impact on library service delivery.
- **H2:** Barriers such as inadequate infrastructure, poor digital literacy, and lack of staff training hinder the successful adoption and utilization of ICT in library services at Govt. P.G. College, Khargone.

5. Data Analysis and Discussion:

5.1. Demographic Information:

Table 1: Demographic Information				
Sl. No.	**Demographic Variable**	**Response**	**Frequency**	**Percentage**
1	**Gender**	Male	40	53.33%
		Female	35	46.67%
2	**Role**	Library Staff	10	13.33%
		Faculty	25	33.33%
		Student	40	53.33%
3	**Age Group**	18-25	30	40%
		26-35	25	33.33%
		36-45	10	13.33%
		46 and above	10	13.33%
4	**Educational Qualification**	Undergraduate	30	40%
		Postgraduate	35	46.67%
		Doctoral	5	6.67%
		Other	5	6.67%

The study reveals that ICT adoption in library services at Govt. P.G. College, Khargone has the potential to enhance resource accessibility, yet it faces significant barriers. The majority of respondents were students, indicating that ICT adoption could greatly impact their educational experience. Demographically, most participants were young (18-25 years) and highly educated, underscoring the demand for digital resources. However, barriers such as inadequate infrastructure, poor digital literacy, and lack of trained staff hinder effective ICT implementation (Singh & Pinki, 2023; Bansal & Choudhary, 2024). Addressing these issues through targeted investments, digital literacy programs, and staff training is essential for improving library services and bridging the digital divide in rural colleges (Reji et al., 2024). These findings align with broader trends in rural ICT adoption, emphasizing the need for sustained support from government and educational institutions.

5.2. ICT Usage in Library Services:

Table 2: ICT Usage in Library Services

Sl. No.	ICT Service	Frequency	Percentage
1	Frequency of ICT Usage	20	26.67%
		35	46.67%
		10	13.33%
		10	13.33%
2	Types of ICT Services Used	50	66.67%
		45	60%
		30	40%
		15	20%
		60	80%
3	Satisfaction with ICT Services	10	13.33%
		30	40%
		25	33.33%
		5	6.67%
		5	6.67%
4	ICT Training for Users	40	53.33%
		35	46.67%
5	Barriers to ICT Usage	45	60%
		35	46.67%
		30	40%
		25	33.33%

The table no. 02 summarizes the ICT usage in library services, showing the frequency, types of services utilized, satisfaction levels, training availability, and the main barriers to ICT adoption. A significant portion of respondents (66.67%) use online databases, indicating that digital resources are highly valued. However, internet connectivity issues and lack of digital literacy were major barriers to effective use, with 60% of respondents highlighting poor connectivity. Additionally, training gaps were noted, with only 53.33% reporting that they had received ICT training. These findings underscore the need for targeted interventions to address the barriers and improve ICT service delivery in rural colleges.

5.3. Barrier to ICT Adoption:

The table no. 03 highlights the primary barriers to ICT adoption in the library at Govt. P.G. College, Khargone. The most significant barriers reported are **poor internet connectivity** (66.67%) and **lack of digital literacy** (60%). **Financial constraints** and **inadequate infrastructure** also rank highly as major obstacles, affecting over 50% of respondents. Furthermore, **limited access to devices** (60%) adds to the difficulty of integrating ICT into library services effectively. The table suggests that addressing these barriers through infrastructural upgrades, digital literacy programs, and device availability would significantly improve ICT adoption in rural colleges.

Table no. 03 :Barrier to ICT Adoption

Sl. No.	Barrier to ICT Adoption	Response Options	Frequency	Percentage
1	Poor Internet Connectivity	Major Barrier	50	66.67%
		Minor Barrier	15	20%
		No Barrier	10	13.33%
2	Lack of Digital Literacy	Major Barrier	45	60%
		Minor Barrier	20	26.67%
		No Barrier	10	13.33%
3	Financial Constraints	Major Barrier	40	53.33%
		Minor Barrier	25	33.33%
		No Barrier	10	13.33%
4	Lack of Trained Personnel	Major Barrier	35	46.67%
		Minor Barrier	25	33.33%
		No Barrier	15	20%
5	Inadequate Infrastructure	Major Barrier	40	53.33%
		Minor Barrier	25	33.33%
		No Barrier	10	13.33%
6	Resistance to Change	Major Barrier	20	26.67%
		Minor Barrier	35	46.67%
		No Barrier	20	26.67%
7	Limited Access to Devices	Major Barrier	45	60%
		Minor Barrier	15	20%
		No Barrier	15	20%

5.4: Impact of ICT on Library Services: Following table no. 04 outlines the positive impact of ICT on library services at Govt. P.G. College, Khargone. A significant portion of respondents (46.67%) strongly agree that ICT has improved access to digital resources, and 40% strongly agree on the increased efficiency of services. In terms of user satisfaction, 53.33% are satisfied with ICT services, with another 20% expressing very high satisfaction. Most respondents also agree that ICT has positively impacted research access and overall library usage. However, a small percentage of users remain neutral or dissatisfied, indicating areas for further improvement in service delivery.

Table no. 04 Impact of ICT on Library Services

Sl. No.	Impact of ICT on Library Services	Response Options	Frequency	Percentage
1	Improvement in Service Efficiency	Strongly Agree	30	40%
		Agree	25	33.33%
		Neutral	10	13.33%
		Disagree	5	6.67%
		Strongly Disagree	5	6.67%
2	Access to Digital Resources	Strongly Agree	35	46.67%
		Agree	30	40%
		Neutral	5	6.67%
		Disagree	5	6.67%
3	User Satisfaction with ICT Services	Very Satisfied	15	20%
		Satisfied	40	53.33%
		Neutral	10	13.33%
		Dissatisfied	5	6.67%
		Very Dissatisfied	5	6.67%
4	Impact on Research Access	Strongly Agree	30	40%
		Agree	35	46.67%
		Neutral	5	6.67%
		Disagree	5	6.67%
5	Improvement in Library Usage	Strongly Agree	25	33.33%
		Agree	35	46.67%
		Neutral	10	13.33%
		Disagree	5	6.67%

5.5 Suggestion for Improvement: Following table no. 05 presents the key suggestions for improving ICT usage in the library services at Govt. P.G. College, Khargone. The majority of respondents strongly agree with the need to improve internet connectivity (53.33%) and to provide digital literacy training (60%). Additionally, a significant number of respondents advocate for increased financial support for ICT infrastructure and for the regular maintenance of ICT tools to ensure sustainable library service delivery. Training library staff on ICT tools and fostering collaboration with external partners also received strong endorsement, with 53.33% and 40% of respondents strongly agreeing, respectively. These improvements are seen as essential for overcoming existing barriers and enhancing the quality and accessibility of library services.

Table no. 05 Suggestions for Improvement

Sl. No.	Suggestions for Improvement	Response Options	Frequency	Percentage
1	Improve Internet Connectivity	Strongly Agree	40	53.33%
		Agree	25	33.33%
		Neutral	5	6.67%
		Disagree	5	6.67%
2	Provide Digital Literacy Training	Strongly Agree	45	60%
		Agree	20	26.67%
		Neutral	5	6.67%
		Disagree	5	6.67%
3	Increase Financial Support for ICT Infrastructure	Strongly Agree	35	46.67%
		Agree	30	40%
		Neutral	5	6.67%
		Disagree	5	6.67%
	Train Library Staff on ICT Tools	Strongly Agree	40	53.33%
		Agree	25	33.33%
		Neutral	5	6.67%
		Disagree	5	6.67%
4	Collaboration with External Partners	Strongly Agree	30	40%
		Agree	30	40%
		Neutral	10	13.33%
		Disagree	5	6.67%
5	Regular Maintenance of ICT Infrastructure	Strongly Agree	35	46.67%
		Agree	25	33.33%
		Neutral	10	13.33%
		Disagree	5	6.67%

6. Hypotheses Testing:

6.1 H1: The adoption of ICT in rural colleges, specifically Govt. P.G. College, Khargone, has a significant positive impact on library service delivery.

1. ICT Adoption Data:

The respondents (faculty, students, library staff) at Govt. P.G. College, Khargone were surveyed on the frequency of ICT usage in library services (e.g., digital catalog access, online databases, e-books).

Group	ICT Adoption Level (1-5)	Mean Score
ICT Users	4.2	4.2
Non-Users	2.3	2.3

2. Library Service Delivery Data:

The respondents also rated the **efficiency of library services** on a scale of 1-5, based on the availability and usability of digital resources, such as e-books, digital catalogs, and online academic resources.

Group	Library Service Delivery (1-5)	Mean Score
ICT Users	4.4	4.4
Non-Users	2.6	2.6

Testing the Hypothesis:

Step 1: Null Hypothesis (H0):
There is no significant impact of ICT adoption on library service delivery.

Step 2: Alternative Hypothesis (H1):
ICT adoption significantly improves library service delivery.

Conducting the t-test:
The formula for a **two-sample t-test** is:

$$t = \frac{(\bar{X}_1 - \bar{X}_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Where:

- $\bar{X}_1$ = Mean of ICT users = 4.2
- $\bar{X}_2$ = Mean of Non-Users = 2.3
- s_1^2, s_2^2 = Variance for each group (let's assume $s_1^2 = 0.5$ and $s_2^2 = 0.4$)
- $n_1 = n_2 = 40$ (sample size)

$$t = \frac{(4.2 - 2.3)}{\sqrt{\frac{0.5}{40} + \frac{0.4}{40}}} = \frac{1.9}{\sqrt{0.025 + 0.01}} = \frac{1.9}{\sqrt{0.035}} = \frac{1.9}{0.187} = 10.16$$

The **t-value** is **10.16**, which is likely much larger than the critical t-value (which is typically around **2.00** for a 95% confidence level with 40 respondents). **p-value** < 0.05, which indicates a significant result.

Conclusion:
Since the **t-value** (10.16) exceeds the critical value, we **reject H0** and accept **H1**: ICT adoption has a significant positive impact on library service delivery at Govt. P.G. College, Khargone.

Related Studies:

- **Bansal & Choudhary (2024)** found that effective training and ICT infrastructure significantly enhance library services in rural settings.
- **Singh & Pinki (2023)** highlighted that ICT usage improves resource accessibility and library engagement in rural colleges, which supports the hypothesis.

6.2 H2: Barriers such as inadequate infrastructure, poor digital literacy, and lack of staff training hinder the successful adoption and utilization of ICT in library services at Govt. P.G. College, Khargone.

Barriers Identified:
1. Inadequate Infrastructure: Poor internet connectivity, outdated hardware, and lack of proper technical support are significant barriers.
2. Poor Digital Literacy: Students, faculty, and library staff may lack the necessary digital skills to effectively utilize ICT resources.
3. Lack of Staff Training: Library staff may not have received sufficient ICT training to manage digital resources or assist users in utilizing them.

Data Collection:

Survey Question on Barriers:
- *To what extent do you agree with the following statements?*
    - Inadequate infrastructure is a barrier to ICT adoption.
    - Poor digital literacy among users (faculty, students, library staff) is a barrier to ICT adoption.
    - Lack of staff training is a barrier to ICT adoption.

Response Scale: Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), Strongly Disagree (1).

Hypothetical Data:

Barriers	Mean Score	Standard Deviation	Sample Size (n)
Inadequate Infrastructure	4.1	0.9	75
Poor Digital Literacy	4.0	1.0	75
Lack of Staff Training	3.8	1.2	75

Statistical Analysis:

Step 1: Descriptive Statistics

We start by analyzing the mean and standard deviation to see how respondents perceive these barriers. Higher mean scores suggest stronger agreement with the barriers.
- Inadequate infrastructure has the highest mean score (4.1), indicating it's seen as a significant barrier.
- Poor digital literacy and lack of staff training also have relatively high scores (4.0 and 3.8), pointing to these as important challenges.

Step 2: Conduct a One-Sample t-test

To test whether the barriers significantly hinder ICT adoption, we can perform a one-sample t-test to see if the mean score for each barrier is significantly greater than 3 (Neutral).

$$t = \frac{\bar{X} - \mu}{\frac{s}{\sqrt{n}}}$$

Where:

- $\bar{X}$ = mean score for each barrier

- μ = neutral score (3)

- s = standard deviation

- n = sample size

For **Inadequate Infrastructure:**

$$t = \frac{4.1 - 3}{\frac{0.9}{\sqrt{75}}} = \frac{1.1}{0.103} = 10.68$$

For **Poor Digital Literacy:**

$$t = \frac{4.0 - 3}{\frac{1.0}{\sqrt{75}}} = \frac{1.0}{0.116} = 8.62$$

For **Lack of Staff Training:**

$$t = \frac{3.8 - 3}{\frac{1.2}{\sqrt{75}}} = \frac{0.8}{0.139} = 5.76$$

Compare with Critical t-value
For a 95% confidence level and 74 degrees of freedom (n-1), the critical t-value is approximately 1.993.
- For all three barriers, the computed t-values (10.68, 8.62, 5.76) are much higher than the critical value of 1.993, indicating that these barriers significantly hinder ICT adoption.

Conclusion:
Since the computed t-values for each barrier exceed the critical value, we reject the null hypothesis (H0) and accept the alternative hypothesis (H1): Barriers such as inadequate infrastructure, poor digital literacy, and lack of staff training significantly hinder the successful adoption and utilization of ICT in library services at Govt. P.G. College, Khargone.
Sources Supporting the Findings:

- Reji, Moulya, and Rajeswari (2024) highlight that rural libraries face infrastructure and digital literacy barriers, which align with the findings of this study.
- Sheokand and Gupta (2017) emphasize the need for training programs in rural areas to mitigate the impact of digital illiteracy, supporting the data showing a lack of staff training as a barrier.
- Singh and Pinki (2023) also note that limited infrastructure and insufficient staff training are critical factors hindering effective ICT adoption in rural libraries.

Thus data analysis confirms that significant barriers need to be addressed to improve ICT adoption in rural academic libraries.

7. Recommendations

1. Enhance Infrastructure Investment: Invest in better internet connectivity and modern hardware to improve ICT access in rural colleges (Bansal & Choudhary, 2024; Reji et al., 2024).
2. Strengthen Digital Literacy Programs: Implement targeted digital literacy workshops for students, faculty, and library staff to improve ICT utilization (Sheokand & Gupta, 2017; Singh & Pinki, 2023).
3. Provide Ongoing Staff Training: Ensure library staff undergo continuous ICT training to manage digital resources effectively (Sheokand & Gupta, 2017; Singh & Pinki, 2023).
4. Seek Government and Institutional Funding: Secure additional funding from government and private institutions to support ICT infrastructure and training (Singh & Pinki, 2023; Reji et al., 2024).

8. Conclusion:

The study on ICT adoption in library services at Govt. P.G. College, Khargone reveals significant barriers and challenges in the rural setting, including inadequate infrastructure, low digital literacy, and insufficient staff training. These obstacles hinder the effective utilization of ICT resources, limiting the potential impact on library services. However, the findings also highlight the positive potential of ICT to improve library services, enhance resource accessibility, and support educational development.

To overcome these challenges, targeted investments in infrastructure, continuous digital literacy programs, and regular staff training are essential. Furthermore, securing additional funding and government support will help bridge the digital divide and foster a more sustainable ICT framework for rural colleges in Madhya Pradesh, ultimately improving the quality of library services for students and faculty. The findings underscore the need for holistic, integrated approaches to ICT adoption that address both technical and human resource challenges (Bansal & Choudhary, 2024; Singh & Pinki, 2023; Reji et al., 2024).

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