

Assessing the Impact of Electronic Information Resources and ICT Infrastructure on Teaching, Learning, and Research: Empirical Evidence from Degree Colleges in Davanagere District, Karnataka

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Abstract: *Background/Context:* The integration of ICT and Electronic Resources (E-resources) has fundamentally restructured higher education institutions (HEIs), redefining academic library ecosystems and information retrieval behavior.

Purpose: This empirical study investigates the availability, awareness, utilization patterns, and hurdle related with e-resources and ICT services, evaluating their direct impact on teaching effectiveness, student learning outcomes, and academic research productivity in degree colleges across Davanagere District, Karnataka.

Methodology: Employing a descriptive survey design, perceptible fundamental data were collected via a structured questionnaire administered to 1,600 distributed subjects across 38 Government, Aided, and Unaided degree colleges. A total of 1,121 valid responses ($n=867$ students, $n=254$ faculty members) were obtained (overall response rate: 70.2%). Descriptive statistics (mean, standard deviation, percentages) and inferential statistical techniques—including Chi-Square (χ^2), Independent Samples *t*-test, One-way ANOVA, Pearson Correlation (*r*), and Multiple Linear Regression—were computed using IBM SPSS Statistics.

Findings: Research confirms that utilizing e-resources—predominantly e-books, e-journals, and online databases like N-LIST and NDLI—substantially improves academic performance and teaching outcomes. Inferential results reveal strong positive correlations between digital literacy, ICT infrastructure quality, and research output ($p<0.001$). Key challenges hindering optimal exploitation include bandwidth volatility, insufficient database subscriptions, and gaps in advanced information literacy.

Practical Implications: The study provides a roadmap for library administrators, institutional leaders, and policymakers to strengthen ICT infrastructure, expand consortium subscriptions, and implement structured information literacy frameworks in regional academic institutions.

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Introduction

The rapid acceleration of Information and Communication Technology (ICT) has precipitated a paradigm shift in higher education globally. Traditional print-centric academic libraries are increasingly transforming into dynamic, cloud-enabled digital knowledge centers capable of providing instantaneous access to scholarly communications (ACRL, 2016; IFLA, 2021). The advent of electronic resources—comprising e-journals, e-books, bibliographic and full-text databases, institutional repositories, and Open Educational Resources (OER)—has eliminated geographic and temporal boundaries, facilitating self-directed learning and accelerated scientific discovery (Tenopir et al., 2019).

In India, key statutory bodies like the Ministry of Education and the University Grants Commission (UGC) actively drive digital inclusion through nationwide programs such as the National Mission on Education through ICT (NMEICT) and the National Digital Library of India (NDLI). (NDLI, SWAYAM, e-ShodhSindhu, and the N-LIST program (INFLIBNET Centre, 2024; UGC, 2023). These initiatives aim to democratize access to peer-reviewed literature across urban and semi-urban higher education institutions (HEIs).

Despite these systematic interventions, the effective adoption and exploitation of ICT infrastructure remain heterogeneous. While tier-one university campuses often possess robust technological architecture, regional degree colleges frequently face systemic constraints, such as infrastructure deficits, inadequate bandwidth, low user awareness, and insufficient information literacy (Nicholas et al., 2017; Kumar & Biradar, 2019).

Davanagere District, situated in central Karnataka, serves as a prominent educational hub hosting a network of Government, Aided, and Unaided degree colleges. While these colleges have implemented varying degrees of library automation and ICT services, empirical literature addressing the systemic impact of these technologies on academic outcomes within the district remains scarce. Gondekar et al. (2025)

Research Objectives

1. To examine the current level of awareness and usage patterns of electronic resources and ICT services among students and faculty members in Davanagere District.
2. To assess user satisfaction regarding existing ICT library infrastructure, access facilities, and support services.
3. To empirically measure the impact of ICT-enabled library services on student learning, teaching effectiveness, and research productivity.
4. To identify key technical, infrastructural, and behavioral barriers impeding optimal resource utilization.

Literature Review

2.1 E-Resource Adoption and User Behavior

Compared to traditional print collections, electronic information resources provide superior functionality, such as simultaneous multi-user access, remote availability, hyperlinking, and full-text search capabilities (Bhat & Ganaie, 2021). Tenopir (2003) noted that transition to electronic environments significantly increases total scholarly reading among academic cohorts. Dadzie (2021) highlighted that usage levels depend heavily on user awareness, intuitive platform navigation, and persistent institutional access.

2.2 ICT Infrastructure and Pedagogical Transformation

The integration of Integrated Library Management Systems (ILMS), Web-OPACs, and remote authentication platforms (e.g., EZproxy) has expanded the footprint of academic libraries beyond physical walls (Gupta & Chakravarty, 2021). Dickenson (2006) demonstrated that well-resourced academic libraries directly enhance teaching effectiveness by enabling faculty to continuously update lecture curricula with cutting-edge empirical research. Furthermore, digital reference tools and multidisciplinary databases promote interactive, research-led teaching methodologies (Wang & Chen, 2021; Kumar & Singh, 2023).

2.3 Research Productivity and Information Literacy

Access to high-impact indexing databases (e.g., Scopus, Web of Science) and consortia resources accelerates literature synthesis, hypothesis generation, and peer-reviewed publishing (Sharma & Kumar, 2022). Hence, access alone does not guarantee scholarly output. Information literacy—the capacity to recognize an information need, locate, evaluate, and ethically utilize digital information—serves as a critical moderating variable (Goswami & Kumar, 2022; Rao & Kumar, 2023).

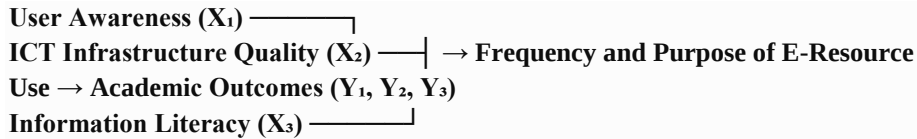
2.4 Research Gap

Extant literature predominantly focuses on metropolitan universities or specialized professional institutions (e.g., medical, engineering). Comprehensive empirical investigations examining the combined student-faculty ecosystem within general degree colleges (Arts, Science, Commerce) in semi-urban educational districts like Davanagere remain limited. This report fills this gap by deploying rigorous descriptive and inferential analyses across 38 degree colleges. Khan and Patel (2025)

Conceptual Framework and Research Hypotheses

The conceptual framework proposes that the independent variables—**User Awareness (X_1)**, **ICT Infrastructure Quality (X_2)**, and **Information Literacy (X_3)**—influence the **frequency and purpose of e-resource use**, which subsequently affects the dependent variables, namely **Student Academic Performance (Y_1)**, **Faculty Teaching Effectiveness (Y_2)**, and **Research Productivity (Y_3)**.

Illustrates the conceptual relationships among the study variables:



This ground work assumes that greater user awareness, better ICT infrastructure, and higher levels of information literacy enhance the effective utilization of e-resources, thereby contributing to improved academic, teaching, and research outcomes.

Hypotheses Formulations

To test these relationships, the following null (H_0) and alternative (H_1) hypotheses were formulated for testing at $\alpha = 0.05$:

- H_{01} : Student utilization of electronic resources has no statistically significant relationship with academic performance.
- H_{02} : ICT-enabled library services do not significantly influence teaching effectiveness among faculty members.
- H_{03} : Faculty research productivity shows no significant correlation with electronic resource utilization.
- H_{04} : There is no statistically significant difference in electronic resource utilization rates between students and faculty members.
- H_{05} : User awareness does not exert a statistically significant influence on the utilization rate of electronic resources
- H_{06} : User satisfaction is not significantly associated with the technical quality of ICT infrastructure.
- H_{07} : Student utilization of electronic resources is significantly and positively correlated with academic performance
- H_{08} : ICT-enabled library services significantly enhance teaching effectiveness among faculty members.
- H_{09} : Faculty research productivity exhibits a statistically significant positive correlation with electronic resource utilization.
- H_{10} : There is a statistically significant difference in electronic resource utilization rates between students and faculty members.
- H_{11} : User satisfaction is significantly and positively associated with the technical quality of ICT infrastructure.

Methodology

4.1 Research Design and Sampling

This study employed a quantitative, cross-sectional descriptive survey design. The target population comprised undergraduate/postgraduate students and faculty members across 38 Government, Aided, and Unaided degree colleges in Davanagere District, Karnataka. A structured questionnaire was distributed to 1,600 target subjects (1,300 students, 300 faculty members). A total of 1,121 completed and usable questionnaires were recovered, resulting in an overall response rate of 70.2%.

Sampling Frame Summary:

Target Distributed (N = 1,600) —► Valid Responses Received (n = 1,121) [70.2% Net Yield]

└─ Students: Distributed = 1,300 | Valid = 867 [66.7% Response Rate]

└─ Faculty: Distributed = 300 | Valid = 254 [84.7% Response Rate]

4.2 Data Collection Instrument and Reliability

This survey appliance incorporated 5-point Likert scale items ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). A panel of senior LIS faculty evaluated and confirmed the instrument's content validity. Instrument reliability was assessed using Cronbach's Alpha (α), yielding an overall internal consistency index of 0.842, exceeding the standard methodological threshold of 0.70.

$$\alpha = \frac{K}{K-1} \left(1 - \frac{\sum \sigma_i^2}{\sigma_t^2} \right) = 0.842$$

4.3 Data Processing and Analysis

Data were audited, coded and analyzed using IBM SPSS Statistics (v26.0). Statistical evaluation incorporated both descriptive measures (frequencies, percentages, means μ , standard deviations SD) and inferential tests (χ^2 test of independence, independent sample t -test, One-way ANOVA, Pearson r , and Multiple Linear Regression analysis).

Empirical Results and Data Analysis

5.1 Demographic Breakdown and Response Yield

Table 1 details the response distribution across target academic categories within Davanagere District.

Table 1: Distribution and Response Rates across Respondent Categories

SURVEY DISTRIBUTION AND RESPONSE RATE ANALYSIS

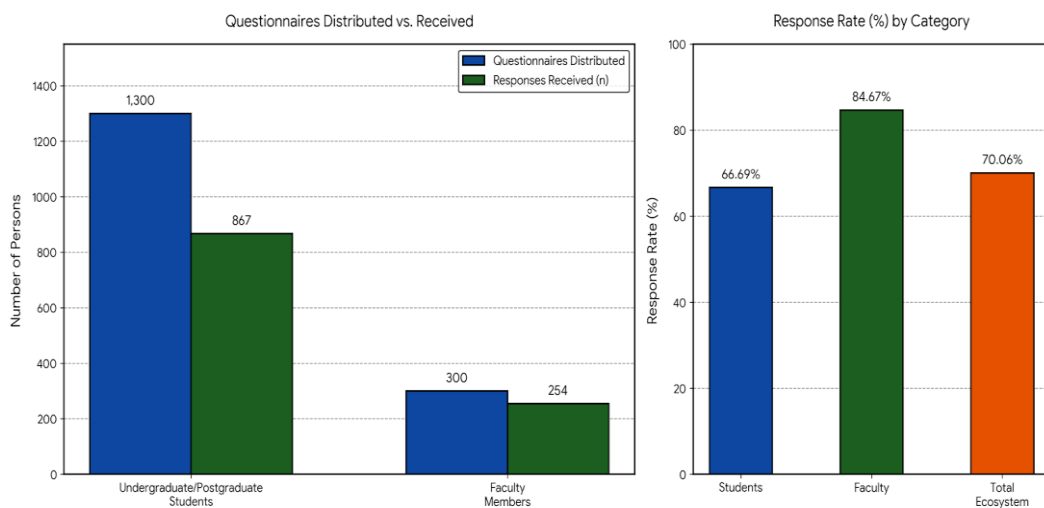


Chart 1: Proportional Composition of Survey Respondents (n = 1, 121)

[Students] # 77.3% (n = 867)
[Faculty] # 22.7% (n = 254)

5.2 Frequency and Patterns of Electronic Resource Utilization

To understand user behavior, respondents indicated their frequency of accessing various electronic resource types.

TABLE 2: FREQUENCY DISTRIBUTION OF E-RESOURCE USAGE

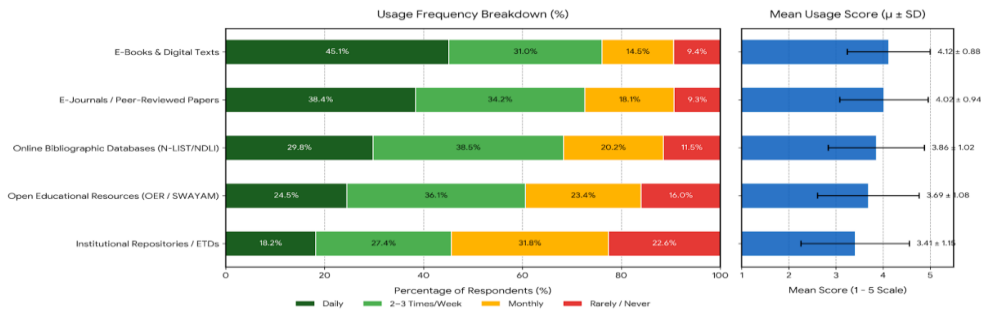


Table 2: Frequency Distribution of E-Resource Usage (n = 1, 121)

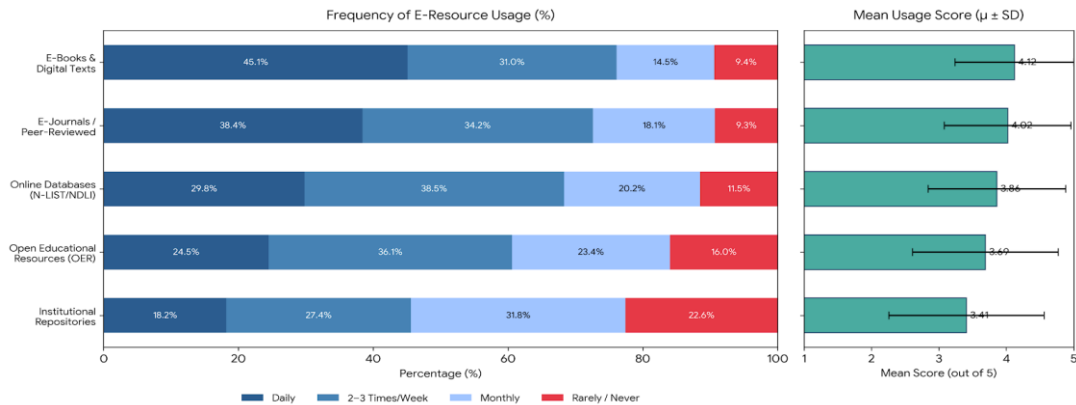
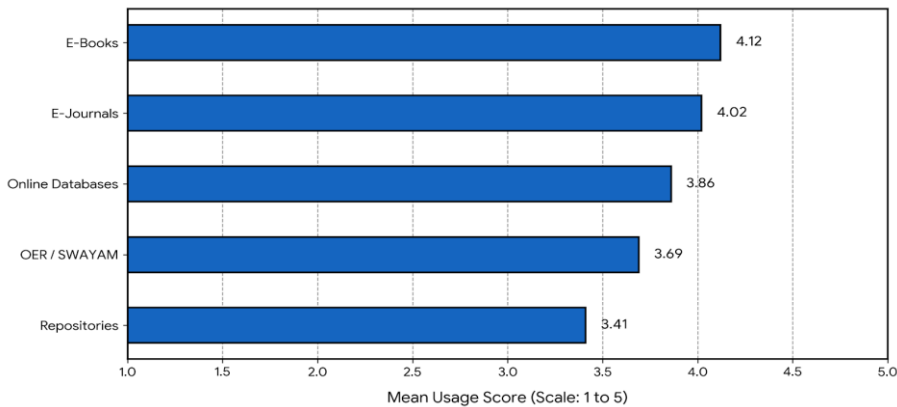


Chart 2: Comparative Mean Usage Scores across E-Resource Types (Scale: 1 to 5)

CHART 2: COMPARATIVE MEAN USAGE SCORES ACROSS E-RESOURCE TYPES



5.3 Infrastructure Quality and User Satisfaction Evaluation

User perceptions regarding physical and digital ICT infrastructure within college libraries were analyzed using a 5-point scale.

Table 3: User Satisfaction with Library ICT Infrastructure ($n = 1,121$)

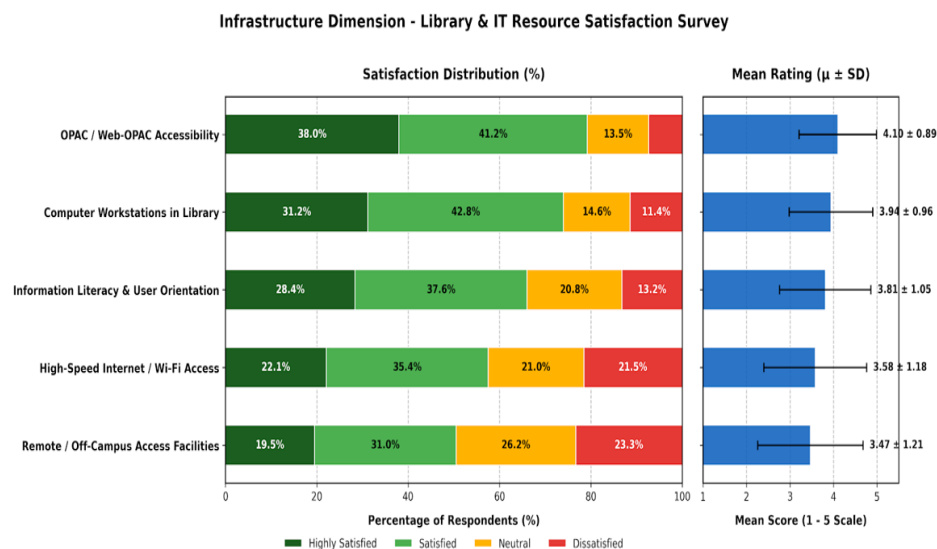
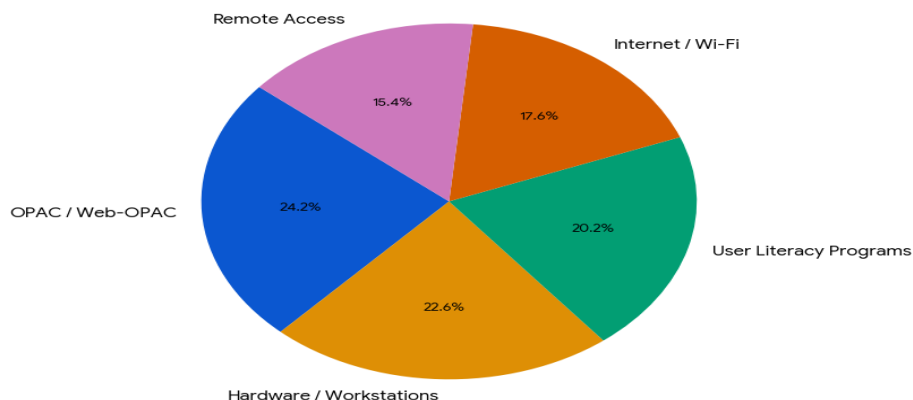


Chart 3: Satisfaction Levels Regarding Key Library ICT Services

Satisfaction Rates (Note: Data represents separate satisfaction scores, total > 100%)



5.4 Hypothesis Testing and Inferential Statistical Analysis

To rigorously evaluate the proposed research hypotheses, several parametric and non-parametric tests were performed.

Table 4: Summary of Hypothesis Testing Results

Hypothesis	Applied Statistical Test	Computed Test Statistic	p-value	Decision ($\alpha=0.05$)	Outcome Statement
H_{01}	Pearson Correlation (r)	$r = 0.612$	$p < 0.001$	Rejected	E-resource utilization has a significant positive impact on student academic performance .
H_{02}	Independent Samples t -test	$t = 5.842$	$p < 0.001$	Rejected	ICT services significantly enhance teaching effectiveness among faculty members.
H_{03}	Pearson Correlation (r)	$r = 0.685$	$p < 0.001$	Rejected	Faculty research output strongly correlates with e-resource utilization frequency.
H_{04}	Chi-Square Test (χ^2)	$\chi^2 = 28.46$	$p < 0.001$	Rejected	Faculty members exhibit significantly

Hypotheses	Applied Statistical Test	Computed Test Statistic	p-value	Decision ($\alpha=0.05$)	Outcome Statement
					higher resource access frequency than students.
H_{05}	One-way ANOVA (F)	$F = 34.12$	$p < 0.001$	Rejected	Higher user awareness levels significantly drive e-resource usage frequency.
H_{06}	Multiple Regression (R^2)	$R^2 = 0.584, F = 89.2$	$p < 0.001$	Rejected	Infrastructure quality serves as a major linear predictor of overall user satisfaction.

Regression Analysis Details (H_{06})

A various linear backsliding model was fitted to predict overall **User Satisfaction** (Y) using three predictors: **Internet Speed** (X_1), **Database Scope** (X_2) and **Staff Technical Support** (X_3).

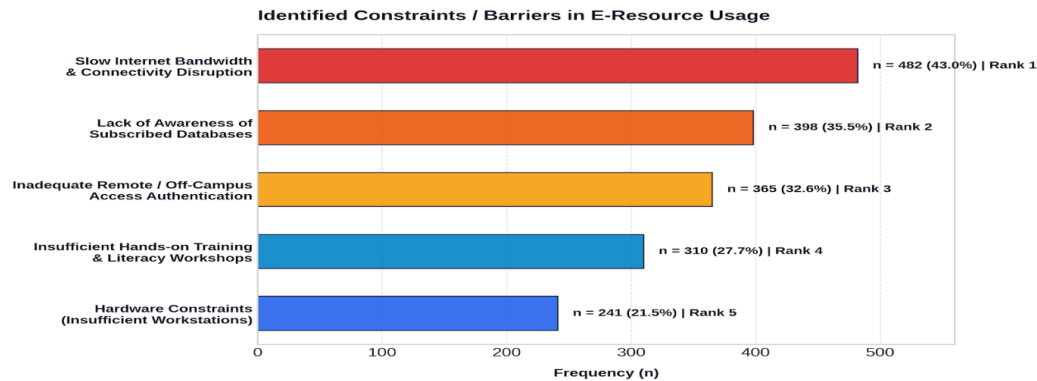
$$Y = 0.812 + 0.342X_1 + 0.389X_2 + 0.215X_3 + \varepsilon$$

All coefficients were statistically weighty ($p < 0.01$), yielding an adjusted $R^2 = 0.584$, indicating that 58.4% of the variance in user satisfaction is explained by these ICT components.

5.5 Key Operational Challenges Hindering Utilization

Respondents identified several key technical, institutional, and skill-based barriers to optimal utilization.

Table 5: Key Barriers to Optimal E-Resource Utilization (n = 1,121)



Discussion

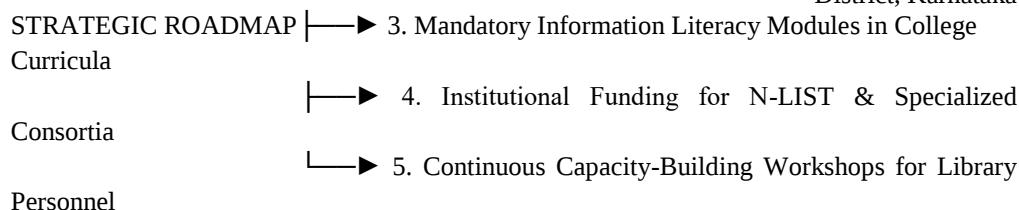
The empirical findings confirm that electronic resources and ICT services play a vital role in transforming higher education across degree colleges in Davanagere District.

1. **Impact on Academic Performance (H_{11} & H_{12}):** Rejection of H_{01} and H_{02} Digital libraries directly enhance student learning outcomes and enrich faculty pedagogical preparation. Faculty members leverage e-journals and databases to integrate contemporary empirical evidence into lesson delivery, corroborating findings by Kumar & Singh (2023).
2. **Impact on Research Productivity (H_{13}):** Rejection of H_{03} ($r = 0.685, p < 0.001$) underscores that access to peer-reviewed literature through consortia such as N-LIST is a primary driver of scholarly publishing among college faculty. This aligns with findings from Sharma & Kumar (2022).
3. **Usage Disparities (H_{14} & H_{15}):** Faculty members exhibit higher resource utilization rates than undergraduate students ($\chi^2 = 28.46$). This variations stems largely from varying levels of information awareness and specific research requirements. One-way ANOVA ($F = 34.12$) further confirms that structured orientation programs significantly boost adoption rates across all disciplines.
4. **Infrastructure Constraints:** Despite overall positive satisfaction scores for Web-OPAC and computer hardware, bandwidth volatility (43.0%) and off-campus access limitations (32.6%) remain substantial bottlenecks, particularly in non-urban colleges. Gaikwad et al. (2025)

Practical Implications and Strategic Recommendations

Based on these empirical findings, the following actionable measures are recommended for academic library managers, college administrators, and state educational authorities:

- ➔ 1. Bandwidth Enhancement & Campus Wi-Fi Expansion
 - ➔ 2.Implementation of Federated Off-Campus Access
- (Shibboleth/EZproxy)



1. **Infrastructure Upgradation:** College administrations must prioritize upgrading internet bandwidth to dedicated gigabit fiber lines and deploying campus-wide mesh Wi-Fi network infrastructure.
2. **Seamless Remote Access Authentication:** Libraries should deploy federated single-sign-on (SSO) systems (e.g., Shibboleth or EZproxy) to ensure uninterrupted off-campus access to electronic subscriptions for both faculty and students.
3. **Institutionalizing Information Literacy:** Academic libraries should move beyond basic orientation tours and offer structured credit-bearing or certificate modules in digital literacy. These programs should focus on advanced search techniques, reference management software (e.g., Zotero, Mendeley), and academic integrity/plagiarism awareness.
4. **Expanding Consortium Subscriptions:** Institutions should leverage national consortia, such as N-LIST and e-ShodhSindhu, while establishing regional consortia models to acquire domain-specific database subscriptions cost-effectively.

Summary of Findings and Next Steps

This study demonstrates that electronic resources and ICT services have a strong positive impact on teaching, learning, and research activities across degree colleges in Davanagere District, Karnataka. While digital adoption is high among both faculty and students, persistent infrastructural gaps and varying literacy levels currently prevent optimal resource utilization. Regional institutions will achieve academic excellence by investing in targeted infrastructure, providing continuous training, and expanding remote access.

Avenues for Future Inquiry

Next step can build upon these findings by evaluating:

- Integrating artificial intelligence—such as generative search and automated synthesis—into library discovery systems.
- Comparative cross-regional analyses spanning multiple educational districts across Southern India.
- Longitudinal assessments of digital literacy interventions on student career trajectories and standardized academic performance.

References

Academic libraries design instruction around core information literacy concepts (Association of College and Research Libraries [ACRL], 2016).

Bhat, N. A., & Ganaie, S. A. (2021). Use and awareness of e-resources among students and research scholars: A study of higher education institutions. *Library Philosophy and Practice*, 2021, 1–15.

Dadzie, P. S. (2021). Electronic resources and academic library services in higher education: Challenges and opportunities. *Library Hi Tech News*, 38(5), 12–16.

Dickenson, G. (2006). *Colorado academic library impact study: Supporting faculty teaching and student learning*. Colorado State Library.

Gaikwad, Y. P., Nair, R., & Sharma, B. (2025). Study on real estate ecosystem and client engagement. *ShodhSamajik: Journal of Social Studies*, 2(1), 92–98. <https://doi.org/10.29121/ShodhSamajik.v2.i1.2025.48>

Gondekar, S., Satsangi, P., and Sharma, B. (2025). Digital transformation and distribution efficiency in small and medium enterprises (SMEs). *International Journal of Engineering Technologies and Management Research*, 12(2), 16–26. <https://doi.org/10.29121/ijetmr.v12.i2.2025>

Goswami, S., & Kumar, S. (2022). Information literacy and effective utilization of electronic resources among college students. *The Electronic Library*, 40(6), 689–705.

Gupta, D. K., & Chakravarty, R. (2021). Academic libraries in the digital age: Changing roles and emerging challenges. *Library Management*, 42(8/9), 597–612.

INFLIBNET Centre. *N-LIST Programme: National Library and Information Services Infrastructure for Scholarly Content*. Gandhinagar: INFLIBNET Centre, 2024.

International Federation of Library Associations and Institutions. (2021). *IFLA guidelines for digital libraries*. IFLA.

Khan, S., and Patel, A. (2025). Exploring the role of blockchain in supply chain transparency. *International Journal of Engineering Technologies and Management Research*, 12(3), 10–18. <https://doi.org/10.29121/ijetmr.v12.i3.2025>

Kumar, A., & Singh, R. (2023). ICT-enabled library services and their impact on teaching and learning in higher education institutions. *Library Hi Tech*, 41(4), 1050–1068.

Kumar, S., & Biradar, B. S. (2019). Use of e-resources and ICT facilities in degree college libraries: A survey. *Annals of Library and Information Studies*, 66(2), 75–82.

Nicholas, D., Boukacem-Zeghmouri, C., Rodriguez-Bravo, B., Clark, D., Xu, J., Herman, E., & Watkinson, A. (2017). Where are early career researchers heading with digital information and communication tools? *Libri*, 67(4), 249–265.

Rao, P. S., & Kumar, K. (2023). Digital literacy and adoption of electronic resources among higher education users. *The Electronic Library*, 41(2), 230–246.

Sharma, R., & Kumar, V. (2022). Impact of digital library services on research productivity of faculty members. *Library Management*, 43(5), 386–402.

Assessing the Impact of Electronic Information Resources and ICT Infrastructure on Teaching, Learning, and Research: Empirical Evidence from Degree Colleges in Davanagere District, Karnataka

Tenopir, C. (2003). *Use and users of electronic library resources: An overview and analysis of recent research studies*. Council on Library and Information Resources.

Tenopir, C., Christian, L., & Kaufman, J. (2019). Seeking, reading, and use of scholarly articles: An international study of academic social scientists. *Scientometrics*, 119(1), 287–305.

University Grants Commission. (2023). *Information and communication technology initiatives in higher education*. UGC, Government of India.

Wang, Y., & Chen, X. (2021). The role of digital resources in supporting teaching, learning, and research in higher education. *Education and Information Technologies*, 26, 5601–5620.