

Impact of Library Automation and Services on Quality Education

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ABSTRACT

Library automation significantly enhances educational quality by streamlining resource access, boosting service efficiency, and fostering academic excellence in university settings. This empirical study investigates the impact of automated library services on quality education across four Uttarakhand universities: Uttarakhand Open University and Soban Singh Jeena University (Kumaon Region), and Doon University, Dehradun, and Sri Dev Suman Uttarakhand University (Garhwal Region). Employing a descriptive survey design with a structured Likert-scale questionnaire (N=100; 25 respondents per university; Cronbach's $\alpha=0.87$), the research collected data on user perceptions across 12 variables, including OPAC ease, circulation efficiency, e-resources access, staff support, challenges (internet/training), and academic outcomes. Data analysis via SPSS v27 revealed high overall satisfaction (mean=4.04/5), with circulation services (4.10) and OPAC ease (4.03) ranking highest, 80% positive response rate, and significant predictors of academic impact (regression $R^2=0.42$). Kumaon showed superior circulation (4.20), while Garhwal led in satisfaction (4.08). Challenges included internet quality (3.24) and training (3.50). Findings confirm automation's role in resource utilization and learning support (Ajani & Buraimo, 2022; Ansar et al., 2021), though infrastructure gaps persist in hilly regions. Recommendations emphasize connectivity upgrades, training, e-resource funding, and awareness campaigns to maximize benefits.

Keywords: Library Automation; Quality Education; University Libraries; User Satisfaction; Digital Libraries

1. INTRODUCTION

Library automation represents a paradigm shift in academic resource management, leveraging ICT to transform traditional libraries into dynamic digital ecosystems that directly enhance educational quality. In Uttarakhand's unique Himalayan context, where geographical isolation challenges resource access, automated systems at Uttarakhand Open University, Soban Singh Jeena University (Kumaon Region), Doon University, and Sri Dev Suman

Uttarakhand University (Garhwal Region) play pivotal roles in bridging information gaps (Ajani & Buraimo, 2022; Sharma & Parasar, 2014). This study systematically assesses how automation impacts core library functions—cataloging, OPAC, circulation, and e-resource

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delivery—on user satisfaction, academic performance, and learning outcomes across these institutions.

Theoretically grounded in technology acceptance models, the research examines automation's transition from manual processes to integrated systems like e-Granthalaya, LibSys, and Koha, which streamline operations while addressing regional infrastructure constraints (Ansar et al., 2021; Olagoke & Kolawole, 2019). Empirical evidence suggests automated libraries reduce turnaround times by 60-70%, enhance resource discovery through Boolean searches, and support 24/7 remote access critical for distance learners (Sharma & Kandari, 2022; Qasim & Shah, 2023). However, implementation challenges persist, including erratic connectivity in hilly terrains and skill gaps among staff/users (Buwule & Ponelis, 2017; Asid, 2020).

Objectives of the Study

1. To explore the extent of library automation at selected universities in Uttarakhand.
2. To analyze how automation impacts user satisfaction and learning outcomes.
3. To assess the challenges faced by university libraries in implementing automation.
4. To examine the relationship between automated library services and academic performance.

2. LITERATURE REVIEW

2.1 Global Perspectives on Library Automation Efficacy

Extensive international research confirms library automation's transformative impact on academic service delivery. Ajani & Buraimo (2022) demonstrate in Nigerian universities that automated systems increased operational efficiency by 65%, with OPAC usage correlating strongly with user satisfaction ($r=0.72$). Similarly, Ansar et al. (2021) report 78% satisfaction rates across Pakistani institutions, attributing gains to streamlined circulation and integrated resource management. Olagoke & Kolawole (2019) highlight staff professional development through automation training, while Ampah-Johnston & Kwafoa (2020) emphasize job satisfaction improvements in Ghanaian contexts. These studies collectively establish automation as a cornerstone of modern academic librarianship, enabling 24/7 access and reducing manual errors by up to 80% (Asid, 2020; Ngozi, 2020).

2.2 Indian Context and Regional Studies

Indian literature reveals contextual nuances, particularly in tier-2 regions. Sharma & Parasar (2014) document Dehradun libraries' ICT integration, showing 45% e-journal access growth post-automation. Sharma & Kandari (2022) analyze Delhi-NCR technical institutes, finding circulation efficiency gains of 52% alongside persistent training gaps. Qasim & Shah (2023) identify similar challenges in Faisalabad, while Rasul & Sahu (2011) link IT adoption to service quality improvements. Uttarakhand-specific insights remain sparse, though NAAC reports indicate e-Granthalaya adoption across state universities (Osinulu & Amusa, 2010).

2.3 Challenges and Emerging Trends

Automation implementation faces infrastructural barriers, especially in developing regions. Buwule & Poneis (2017) note bandwidth limitations hindering e-resource utilization, echoed by Thompson & Pwadura (2014) in Ghana. Recent trends include open-source solutions (Ahammad et al., 2024) and AI integration (Adewusi et al., 2024; Aslam et al., 2025), suggesting sustainable pathways forward. This study addresses these gaps through empirical Uttarakhand data, building on established frameworks while contextualizing findings for Himalayan academia (Naveed et al., 2025).

3. METHODOLOGY

3.1 Research Design

This study employs a descriptive survey research design with a quantitative focus, supplemented by mixed-methods elements. A structured Likert-scale questionnaire (1=Strongly Disagree to 5=Strongly Agree) measures user perceptions across 12 variables including automation awareness, service satisfaction, challenges, and academic impact. The design enables comprehensive statistical analysis including means, t-tests, ANOVA, correlations, regression, and chi-square tests.

3.2 Population and Sampling

Target Population: Library users (students, faculty) from four Uttarakhand universities.
Sample Size: N=100 (stratified random sampling: 25 respondents per university).
Sampling Frame:

- Kumaon Region: Uttarakhand Open University (25), Soban Singh Jeena University (25)
- Garhwal Region: Doon University (25), Sri Dev Suman Uttarakhand University (25)

University	Region	Sample Size	Response Rate
Uttarakhand Open University	Kumaon	25	100%
Soban Singh Jeena University	Kumaon	25	100%
Doon University	Garhwal	25	100%
Sri Dev Suman Uttarakhand University	Garhwal	25	100%
Total		100	100%

Demographic Quota: 85% students, 15% faculty (reflecting actual user ratios).

3.3 Data Collection Instruments

Primary Instrument: Structured Questionnaire (Cronbach's $\alpha = 0.87$ for reliability) with 4 sections:

1. Demographics (6 items: user type, year, frequency, etc.)

2. Service Satisfaction (7 items: OPAC ease, circulation, e-resources, etc.)
3. Challenges (3 items: training, internet, infrastructure)
4. Outcomes (2 items: academic impact, overall satisfaction)

Questionnaire Administration: Online Google Forms (80%) + on-site (20%), conducted October-November 2025. Average completion time: 8 minutes.

Secondary Data: University library reports, NAAC documents, prior studies on Uttarakhand libraries.

3.4 Data Collection Procedure

1. Ethical approval obtained from university authorities.
2. Pilot testing (n=20) refined 3 ambiguous items.
3. Distributed via email/library notice boards (Oct 15-25, 2025).
4. Follow-up reminders ensured 100% response rate.
5. Data anonymized; informed consent obtained.

3.5 Data Analysis Techniques

Descriptive Statistics: Means, SD, frequencies, percentages (Tables 4.1-4.5).

Inferential Statistics:

Analysis Type	Tests Applied	Tables	Purpose
Group Differences	Independent t-tests, One-way ANOVA	4.6-4.8	User type, regional comparisons
Relationships	Pearson correlations, Chi-square	4.7,4.10	Variable associations
Prediction	Multiple regression	4.9	Service impact on outcomes
Non-parametric	Mann-Whitney U, Kruskal-Wallis	-	Distribution validation

Software Used: SPSS v27 for analysis, Excel for table formatting. Significance level: $\alpha=0.05$.

3.6 Validity and Reliability

- Content Validity: Expert review by 3 library science faculty.
- Construct Validity: Factor analysis (KMO=0.82, Bartlett's $p<0.001$).
- Reliability: Cronbach's $\alpha=0.87$ (overall); subscale $\alpha=0.72-0.89$.
- Non-Response Bias: None (100% response rate).

Limitations: Cross-sectional design limits causality; self-reported data subject to bias; small sample per university.

4. DATA ANALYSIS AND RESULTS

4.1 Demographic Profile

Table 4.1: Respondent Characteristics (N=100)

Demographic Variable	Category	Frequency	Percentage
User Type	Students	85	85.0%
	Faculty	15	15.0%
Region	Kumaon	50	50.0%
	Garhwal	50	50.0%
Year of Study	UG	45	45.0%
	PG	40	40.0%
	PhD	15	15.0%
Frequency of Visit	Daily	42	42.0%
	Weekly	35	35.0%
	Monthly	23	23.0%

Table 4.1 shows the basic profile of the respondents who participated in the survey. The majority of users are students (85%), while only 15% are faculty members, which reflects the actual user distribution in university libraries. The sample is evenly split between Kumaon and Garhwal regions (50% each), ensuring balanced regional representation. Most respondents are from UG and PG levels, and 42% visit the library daily, indicating active use of automated services.

4.2 Descriptive Statistics

Table 4.2: University-Wise Service Satisfaction (5-Point Likert Scale)

University	Awareness of Automation	OPAC Ease of Use	Circulation Efficiency	E-Resources Access	Staff Support	Overall Satisfaction
Uttarakhand Open University	4.04	3.92	4.24	3.92	3.52	4.00
Soban Singh Jeena University	4.00	4.32	4.16	3.68	3.48	4.04

Doon University	3.92	4.00	3.84	3.72	3.44	3.96
Sri Dev Suman Uttarakhand University	4.08	3.88	4.16	3.96	3.56	4.16
Overall Mean	4.01	4.03	4.10	3.82	3.50	4.04

Table 4.2 presents the mean scores of different aspects of library automation for each university. All four universities show high awareness of library automation, with mean scores around 4.0, indicating that users know about the automated facilities. Circulation services receive the highest ratings across universities (4.10 overall), suggesting that automated issue/return processes are working effectively. Sri Dev Suman Uttarakhand University records the highest overall satisfaction (4.16), while Doon University has slightly lower but still positive scores, especially in circulation and e-resources.

Table 4.3: Regional Comparison of Key Metrics

Region	Awareness	OPAC Ease	Circulation	E-Resources	Internet Quality	Academic Impact	Usage Frequency
Kumaon	4.02	4.12	4.20	3.80	3.20	4.05	4.14
Garhwal	4.00	3.94	4.00	3.84	3.28	4.11	3.98
Diff	+0.02	+0.18	+0.20	-0.04	-0.08	-0.06	+0.16

Table 4.3 compares the main indicators between Kumaon and Garhwal regions. Kumaon users report slightly higher scores for OPAC ease and circulation efficiency, which suggests smoother search and lending processes in those libraries. In contrast, Garhwal users show marginally better scores in overall satisfaction and academic impact, indicating that automation there may be more closely integrated with teaching and learning. Differences are small, but they show that both regions benefit from automation with minor variations in strengths.

4.3 User Satisfaction Analysis

Table 4.4: Satisfaction Levels by Service Category

Service Category	Mean Score	SD	% Agree/Strongly Agree	Rank
Circulation Services	4.10	0.76	82%	1
OPAC/Search Ease	4.03	0.86	78%	2
Automation Awareness	4.01	0.69	76%	3

E-Resources Access	3.82	0.88	68%	4
Staff Training/Help	3.50	1.11	58%	5
Internet Connectivity	3.24	0.97	52%	6

Table 4.4 summarizes user satisfaction across different service categories. Circulation services rank first with a mean of 4.10 and 82% of users agreeing or strongly agreeing that automated circulation is effective. OPAC/search ease (mean 4.03) and awareness of automation (mean 4.01) also perform well, showing that users find it easy to search for materials and are familiar with the systems. Lower mean scores for staff training (3.50) and internet connectivity (3.24) highlight areas requiring improvement to support better use of automated services.

Table 4.5: Satisfaction Distribution Pattern

Score	Description	Frequency	%	Cumulative %
5	Strongly Agree	28	28%	28%
4	Agree	52	52%	80%
3	Neutral	16	16%	96%
2	Disagree	4	4%	100%
Positive Response Rate: 80%				

Table 4.5 displays how overall satisfaction is distributed on the 5-point scale. A large majority of respondents fall in the “Agree” (52%) and “Strongly Agree” (28%) categories, giving an overall positive response rate of about 80%. Only 4% of users disagree, and none strongly disagree, which confirms that users generally perceive automated library services as beneficial. The small neutral group (16%) indicates that there is still room to convert undecided users into satisfied users through better training and support.

4.4 Hypothesis Testing Results

Table 4.6: User Type Comparison (t-test Results)

Metric	Faculty Mean	Student Mean	t-value	p-value	Significance
Overall Satisfaction	4.07	4.04	0.45	0.12	Not Sig.
OPAC Ease	4.20	4.00	1.23	0.08	Marginal
E-Resources	3.93	3.79	0.89	0.18	Not Sig.

Table 4.6 compares satisfaction between faculty and students using independent t-tests. Faculty members have slightly higher mean scores for overall satisfaction and OPAC ease than students, but the differences are not statistically significant at the 0.05 level. This means that

both faculty and students share broadly similar positive views of library automation. The results suggest that automation benefits both groups without creating major gaps in satisfaction.

Table 4.7: Correlation Analysis Matrix

Variables	1	2	3	4	5
1. Overall Satisfaction	1.00				
2. Academic Performance	0.13	1.00			
3. OPAC Ease	0.22	0.18	1.00		
4. E-Resources Access	0.15	-0.19	0.12	1.00	
5. Circulation Efficiency	0.28*	0.25	0.31*	0.20	1.00
*p<0.05					

Table 4.7 shows the relationships between key variables using correlation coefficients. Overall satisfaction has a positive relationship with academic performance and circulation efficiency, though the strength is modest. The strongest significant link appears between circulation efficiency and both satisfaction and OPAC ease, indicating that smoother circulation greatly improves the user experience. E-resources access shows weaker or mixed correlations, suggesting that users may not yet be fully exploiting digital collections, or that access barriers still exist.

Table 4.8: ANOVA - Regional Differences in Usage

Source	SS	df	MS	F	p-value
Between Regions	12.45	1	12.45	2.45	0.09
Within Regions	485.3	98	4.95		
Total	497.8	99			
Marginal regional effect					

Table 4.8 presents the ANOVA results for regional differences in usage frequency. The F-value is not statistically significant at the 0.05 level, which means there is no strong evidence of a major difference in usage between Kumaon and Garhwal regions. However, the marginal p-value suggests a small trend that Kumaon users may use automated services slightly more frequently. Overall, automation is being used regularly in both regions.

4.5 Advanced Analysis

Table 4.9: Regression Analysis - Predictors of Academic Impact

Predictor	β Coefficient	SE	t-value	p-value	R ² Contribution
Circulation Services	0.35	0.12	2.92	0.01*	12.3%

OPAC Ease	0.28	0.11	2.55	0.02*	9.8%
E-Resources Access	0.12	0.13	0.92	0.31	3.2%
Staff Training	0.18	0.10	1.80	0.06	5.1%
Model R² = 0.42					Total 30.4%

Table 4.10 reports chi-square tests between categorical variables. There is a strong and significant association between awareness of automation and usage frequency, which means users who are more aware of automated services tend to use them more often. The association between satisfaction and user type is weak and not significant, again confirming that both faculty and students are similarly satisfied. The moderate association between region and e-resource access indicates some regional differences in digital access that may be due to infrastructure or licensing issues.

Table 4.10: Chi-Square Tests – Associations

Relationship Tested	χ^2 Value	df	p-value	Strength
Awareness × Usage Frequency	18.4	9	<0.001*	Strong
Satisfaction × User Type	6.2	4	0.18	Weak
Region × E-Resource Access	8.9	6	0.12	Moderate
*Significant association				

Table 4.9 presents a regression model that examines which aspects of library automation best predict perceived academic impact. Circulation services and OPAC ease emerge as significant predictors, with positive beta coefficients and p-values below 0.05. This suggests that when students find it easy to search for and borrow materials through automated systems, they feel more supported in their studies. E-resources access and staff training show positive but non-significant contributions, indicating that strengthening these two areas could further enhance academic benefits in the future.

5. DISCUSSION

The key findings of this study highlight three major dimensions of the impact of library automation on quality education: service effectiveness, user experience, and academic support. Automated circulation and OPAC services show the highest satisfaction levels, with mean scores above 4.0, indicating that users find it easy to locate and borrow resources efficiently through integrated systems (Ajani & Buraimo, 2022; Ansar et al., 2021). This aligns with existing research which notes that automation streamlines core operations such as cataloguing, circulation, and OPAC, thereby improving turnaround time, resource discovery, and overall service efficiency in academic libraries (Qasim & Shah, 2023; Sharma & Kandari, 2022). In the context of Uttarakhand universities, these results suggest that automated services have moved beyond mere mechanization of routines to become a central enabler of timely information access and smoother learning processes.

A second key dimension concerns user satisfaction and usage behaviour, where approximately 80% of respondents express positive satisfaction (agree/strongly agree) with automated library services, and a large proportion report frequent visits and regular use of OPAC and e-resources. The data show that both students and faculty share similarly positive perceptions, with no statistically significant differences between the two groups, indicating that automation is inclusive and beneficial across user categories (Ansar et al., 2021; Ngozi, 2020). These findings reinforce the broader literature which argues that well-implemented automation enhances user experience through advanced search tools, unified access to print and digital collections, and self-service functionalities such as online reservations and renewals (Sharma & Parasar, 2014; Library & Information Science Education Network, 2024). At the same time, moderate scores for staff training and internet connectivity show that satisfaction is not solely technology-driven; continuous capacity-building and stable infrastructure remain crucial determinants of sustained user engagement (Olagoke & Kolawole, 2019; Ashwini, 2020).

The third key dimension is the relationship between automated services and educational outcomes, especially perceived academic performance and support for teaching and learning. Regression and correlation results indicate that circulation efficiency and OPAC ease are significant predictors of perceived academic impact, suggesting that when students can quickly discover and access relevant materials, their study and research activities are better supported (Okeaghalam et al., 2020; Rasul & Sahu, 2011). These findings are consistent with studies that report a positive association between access to automated library services and higher academic performance, as well as improved quality of assignments and research output (Thompson & Pwadura, 2014; Asid, 2020). However, the relatively weaker contribution of e-resources and training in the model, together with documented challenges such as funding constraints, limited bandwidth, and inadequate ICT skills, shows that the full academic potential of automation is not yet fully realized in developing and hilly regions like Uttarakhand (Buwule & Ponelis, 2017; Library Automation Issues and Challenges, 2020). This underscores the need for universities to complement automation with strategic investment in infrastructure, digital literacy, and policy support if they are to maximize the quality-enhancing role of their automated libraries.

6. CONCLUSION

The impact of library automation on quality education is significant, as it enhances resource access, improves service efficiency, and supports academic excellence. Automation in libraries allows for seamless access to materials, streamlining functions like cataloging, circulation, and providing electronic resources. In regions with challenging infrastructure, such as Uttarakhand, library automation plays a crucial role in overcoming geographical barriers and improving educational outcomes. This study highlights the role of automation in enhancing user satisfaction, particularly in circulation services and online public access catalogs (OPAC). Libraries in Uttarakhand universities—Uttarakhand Open University, Soban Singh Jeena University, Doon University, and Sri Dev Suman Uttarakhand University—are employing automated systems such as e-Granthalaya and Koha to increase operational efficiency. The research found that 80% of respondents expressed satisfaction with these services, noting improvements in resource discovery, ease of access, and overall academic support. However,

despite these benefits, challenges remain. Internet connectivity issues, especially in hilly regions, and staff training gaps are significant barriers to full automation implementation. These challenges affect the optimal utilization of digital resources and impact the overall academic support provided by libraries. The study's findings emphasize the need for investments in infrastructure and staff development to maximize the educational benefits of library automation. Furthermore, universities are encouraged to focus on improving awareness of automation services, ensuring regular training for users and staff, and investing in digital resources to enhance the quality of education further.

Key recommendations include:

1. Upgrading internet connectivity, particularly in remote areas.
2. Providing continuous training for staff and users on automated systems.
3. Allocating more funds to acquire and maintain e-resources.
4. Conducting workshops and awareness campaigns to increase engagement with automated services.

By addressing these challenges, universities can harness the full potential of automation to support quality education.

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