Application of Technology in University Library and Users' Satisfaction: A Case of Pokhara University, Nepal

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Abstract

Introduction of technology in university libraries is essential since there is substantial number of users seeking the library services in minimum time within a short period of high quality and dedication. Prior to establishing the technology, all activities were performed manually, which was time consuming and less accurate. The study aims to examine the impact of technology on the users of central library of Pokhara University. The study was conducted among the conveniently selected three hundred respondents including students, research scholars, and faculty members. A structured questionnaire using a five-point Likert scale was used to collect the primary data. Both descriptive and inferential tools have been used to analyses the results. Out of twenty constructs, the mean value of nine constructs is average and more (3.0) eleven constructs are less than average. Training is most sought (4.08) while productivity of the staff is least sought (2.81). These constructs were categorized under five dimensions viz. Ease of Access and Usability, Technological Infrastructure, Resource Availability, Support and Assistance, and Impact on Learning and Research. Majority of respondents are expecting services at the library during the off-office hours and holidays. The findings reveal that impact of RFID system is found significant based on the respondents' sex (p=0.001) while not significant based on age (p=0.627), education (p=0.705), and different faculties (p=0.862). Learning and research are more influenced by technological infrastructure and support and assistance followed by resource availability and ease of access and usability. University authorities suggested paying more attention to technological advancement, providing more training and orientation to improve the service quality of library.

Keywords: *Library user, Information Technology, Learning and Research, RFID System, University Libraries, users' satisfaction,*

Introduction

Application of Technology and Software in Libraries

Library services are getting more efficient and more challenging in the current environment because of information technology advancements. Users are expecting more from libraries than they expected in the past. It is the need for the hours that library should extend its services from

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the boundaries of wall to open space via internet and other devices of Information Technology (IT). Organizations emphasize the need to cultivate lasting and high-quality connections with customers as a priority in today's very competitive and challenging environment (Rice, 2003). Various technologies and software are instrumental to bridge between users and library. Application of IT and software in library is essential to fulfill the information needs of the users at the right time, in the right place, for the right person (Vijayakumar & Vijayan, 2011).

Modern libraries are those which use various software, applications, and technologies in a proper way. The main purpose of library software is for automation and e-copy management as well. Besides that, modern libraries use many blogs, websites, etc. to disseminate the information. For automation of books and other reading material, library can use different types of integrated software. This software may be acquired either from open source or can be developed in-house as per the requirement. KOHA, Dspace Evergreen etc. are open-source library software whereas Mumolas, Libra etc. is in-house developed software.

With the advancement of IT, library is transformed from manual system to automated system using the Barcode, Radio Frequency Identification (RFID) System and others various technologies. Barcode and RFID are used for acquisition, cataloguing and circulation of reading materials. Library having Online Public Access Catalog (OPAC) is helpful to users to access catalogue from remote. Electronic Resource Management Systems (ERMS) manages electronic subscriptions, licenses, and access to e-resources like journals and databases. Automated Storage and Retrieval Systems (ASRS) provide books and materials in high-density shelving systems, retrieved robotically when needed. Self-Service Kiosks is software used in libraries that facilitates self-checkout and returns, including fine payments. Digital Signage displays real-time information, announcements, and event updates. Artificial Intelligence (AI) Chatbot is helpful for the instant assistance for frequently asked questions, resource guidance, and navigation.

Use of technology and software in Pokhara University Library

Pokhara University Central Library was Established in 1999 alongside the university's academic programs, the Pokhara University Central Library (PUCL) began with a modest collection of two hundred books. Over the years, it has evolved into a robust repository exceeding 40,000 volumes of books, including periodicals, theses, e-copies theses/ Dissertations, and a wide range of digital and print journals, magazines, and newspapers. PUCL operates using the Mumolas library automation software, which facilitates internal operations such as acquisition, cataloging, circulation, user account management, and support Radio Frequence Identification RIFD system. In the e-space of Mumolas, digital content like thesis/dissertation, articles are stored, users can search and download this information via intranet facility. The library also employs CCTV surveillance to ensure security.

As an academic hub, PUCL is dedicated to disseminating and preserving knowledge for students, faculty, and researchers. It serves as a vital platform for accessing diverse resources and providing research support, aligning its services with the university's educational mission.

There are ten staff working in PUCL, among them two are professionals, one is IT personnel, one is semi-professional, and the rest are non-Professional. PUCL records show that more than three hundred users visit the library daily. Among them around 280 users involve in daily transactions of books (Issue and return) and almost eight hundred volumes of books are being used in daily transactions. Students, faculties, PhD scholar, Researcher, Staff, and other community People are the users of Pokhara University Central Library.

As a research-intensive institution, PUCL prioritizes the enrichment of its academic resources, including access to online repositories. Through strategic partnerships with Nepal Library & Information Consortium the library offers a wealth of e-resources tailored to the needs of the academic community such as Jstor, Project Muse, Oxford, and Cambridge Journal. Besides that, PUCL has registered for Research4life (R4L). Via R4L, library has gotten benefits from many other journal databases like Hinari, GOALI, AGORA, ARDI, OARE.

PUCL is providing Plagiarism checking Services using Turnitin online AI plagiarism Checker. Whereas Faculty research report, master's thesis, articles, MPhil, and PhD thesis are being checked. The aim of this service is to provide quality research among students, teachers, and faculties. Library also assists with the thesis formatting services using various prescribed formatting style APA, MLA, Vancouver etc. for PhD student's research. The library service is extended from 6.30 am to 5.00 pm.

Since 2022 PUCL has adopted Radio Frequency Identification (RFID) system for more security and efficiency in service. This technology enhances the efficiency of library operations, including book check in, checkout, and inventory management. It allows for quick identification and tracking of library materials, reducing manual errors, and saving time. Additionally, RFID improves the security of the library collection by minimizing the risk of unauthorized removal of items. Some of the features of the system are still not in use.

Gradually, PUCL has been shifted from the manual system to semi automation system, and it aims to move full automation in near future. The goal of the modernization of the library is to provide the service efficient and effective manner to the user. Since user satisfaction is the prime goal of the library, we must examine satisfaction through scientific research. The objective of the study is to examine the users' level of perception towards technologies used by the library and dig out the users' intention.

The availability of these resources fosters academic innovation by enabling the university community to engage with global research outputs, thereby cultivating a research-driven academic culture.

University has formulated a strategic plan and objectives for Technological Integration. The objectives are as follows:

- Facilitate seamless access to library resources for academic and research purposes.
- Optimize library workflows through the deployment of advanced automation tools.
- Strengthen resource security while enhancing user experience through technology.
- Develop the technical expertise of library personnel to meet evolving demands.
- Build a collaborative ecosystem among academic institutions to promote shared learning and innovation.

Literature Review

Theoretical Review

The application of technology in university libraries and its impact on user satisfaction can be examined through various theoretical lenses. This section reviews five relevant theories and connects them to the study of Pokhara University Library.

Technology Acceptance Model (TAM) introduced by Davis (1989), explains how users come to accept and use technology. The model identifies two key determinants: perceived usefulness and perceived ease of use. These factors directly influence users' attitudes toward technology, leading to its adoption. In the context of Pokhara University Library, TAM provides a framework to assess how students and faculty perceive the library's technological tools, such as online catalog systems and digital resource platforms, and how these perceptions influence satisfaction.

Information Systems Success Model was DeLone and McLean (1992) proposed the Information Systems Success Model, which identifies six dimensions of success: system quality, information quality, service quality, intention to use, user satisfaction, and net benefits. This model is instrumental in evaluating how well the technological infrastructure of the university library meets user needs. By focusing on aspects like system quality (e.g., ease of accessing e-resources) and service quality (e.g., promptness in resolving technical issues), this theory helps measure user satisfaction levels.

Diffusion of Innovations Theory proposed by Rogers (1962) describes how innovations spread within a social system. It highlights factors such as relative advantages, compatibility, complexity, trialability, and observability. In the library context, this theory is relevant to understanding how new technologies like self-checkout systems or mobile library apps are adopted by users. The theory's emphasis on early adopters and laggards can guide strategies to promote effective use of technology at University Library.

Service Quality (SERVQUAL) Framework pby Parasuraman, Zeithaml, and Berry (1985) measures service quality based on five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. This framework can be applied to evaluate the quality of technology-

based services in the library, such as the reliability of Wi-Fi networks or the responsiveness of staff to technical queries. High service quality is a critical determinant of user satisfaction and can directly influence perceptions of the library's technological offerings.

Unified Theory of Acceptance and Use of Technology (UTAUT) Venkatesh et al. (2003) developed the Unified Theory of Acceptance and Use of Technology (UTAUT), which integrates constructs from several technology acceptance theories. Key factors such as performance expectancy, effort expectancy, social influence, and facilitating conditions determine technology adoption. In the Pokhara University Library context, UTAUT can provide insights into how these factors drive users' engagement with technology-enabled services, shaping their satisfaction levels.

These theories collectively provide a comprehensive framework to analyze the application of technology in university libraries and its impact on user satisfaction. By focusing on user perceptions, system performance, service quality, and adoption behaviors, this study can identify critical areas for improvement in Pokhara University Library's technological infrastructure.

Empirical review

Digital technologies encompass a broad array of tools, services, applications, and systems that rely on various hardware and software components (Rice, 2003). These technologies include devices and platforms such as personal computers, digital television, radio, mobile phones, and robots (Vuorikari et al., 2016). When integrated with learner-centered instructional approaches, digital technologies are reported to enhance learning outcomes (Motiwalla, 2007).

The integration of RFID technology in libraries has been extensively explored, revealing its transformative potential and associated challenges. Molnar and Wagner (2004) emphasize the importance of privacy and security in library RFID systems, identifying item-level tagging as a significant concern due to its potential to compromise patron privacy. Their proposed private authentication solutions effectively address security vulnerabilities while reducing computational requirements, making them applicable beyond RFID. Shahid (2005) highlights the operational advantages of RFID, including streamlined circulation, improved inventory management, and enhanced security. However, he acknowledges challenges such as high costs, lack of interoperability among vendor tags, and the need for adherence to emerging standards like ISO 18000. Similarly, Arfan (2024) examines the implementation of smart libraries using RFID, showcasing how the technology automates processes, increases transaction efficiency, and optimizes resource management in modern libraries. Despite its benefits, the scalability of RFID systems remains constrained by cost and infrastructure limitations, particularly in developing countries.

The role of emerging technologies in enhancing library services is also evident in studies on metaverse-related tools and digital competencies. Guo et al. (2024) explore the adoption

of metaverse technologies, such as 3D printing, virtual reality, and IoT, in urban libraries, emphasizing their widespread application in service delivery. The study underscores the democratization of technology, as adoption rates are unaffected by budgetary constraints, or the size of the population served. Additionally, Hamad, Al-Fadel, and Shehata (2024) examine the relationship between librarians' digital competencies and the effectiveness of smart information services in academic libraries, revealing a strong positive correlation. Their findings highlight the need for continuous professional development and capacity-building initiatives to enhance service delivery and meet the demands of the digital age. Together, these studies provide a comprehensive understanding of the opportunities and challenges posed by technological advancements in library systems.

Methodology

The study follows descriptive and quantitative research design. The study was conducted to explore the status of satisfaction among the users of Pokhara University library. Out of students, PhD research scholars, and faculty 300 respondents were conveniently selected as samples and administered the structured and five-point Likert scale questionnaire. The perception of users towards the library services after introducing the automation software and RFID system has been examined asking twenty different questions which are divided into five categories. The reliability of the questionnaire was assessed by Cronbach's Alpha value.

Table 1: Cronbach's Alpha of five dimensions

Dimensions	No. of Construct	Cronbach's Alpha
Ease of Access and Usability	4	0.75
Technological Infrastructure	4	0.79
Resource Availability	4	0.71
Support and Assistance	4	0.75
Impact on Learning and Research	4	0.76
Total	**20**	**0.79**

Source: Field Survey, 2024

All five dimensions viz. Ease of Access and Usability, Technological Infrastructure, Resource Availability, Support and Assistance and Impact on Learning and Research have the alpha value more than 0.7. The questionnaire was validated by the experts and administered. Both descriptive and inferential (Mean, percentage, Standard Deviation, Chi Square, Mann Whitney, and Kruskal Walis Test) statistics were used while analyzing the data.

4. Results and discussion

4.1 Profile of respondents

The profile of the respondents is presented in Table 2 which shows the frequency distribution of respondents based on the Sex, age, education and profession, and faculty stream.

Table 2: Profile of respondents

Factor	Attributes	Frequency	Percent
Gender	Male	181	60
	Female	119	40
Age	up to twenty-five	148	49
	26 to 30	65	22
	31 to 35	20	7
	above 35	67	22
Profession	Students	221	74
	PHD Research Scholars	20	7
	Faculty	59	20
Faculty	Social Science	69	23
	Management	72	24
	Health Science	69	23
	Science and Technology	90	30
	Total	300	100

Source: Field Survey, 2024

Table 2 shows that a diverse group of respondents have participated in the study in terms of gender, age, education, and disciplinary focus. Among the respondents, 60% (181) are male, and 40% (119) are female, indicating a higher male representation in the sample. Almost half of the respondents, 49% (148), are aged up to 25 years. Those aged 26 to 30 constitute 22% (65), while 7% (20) are aged 31 to 35. Respondents above 35 years make up 22% (67). Most participants are Bachelors-level students, representing 49% (146). Master's level respondents account for 25% (75), PhD scholars for 7% (20), and faculty members comprise 20% (59). Science and Technology have the highest representation with 30% (90), followed by Management with 24% (72). Social Science and Health Science are equally represented, each at 23% (69).

4.2 Satisfaction with the library services after RFID System

Respondents' perception towards the RFID system found a mix of three different views. The largest portion (65%) said that the system brings change in library automation while one third disagree with the view. Only 35 percent said that there are changes due to the installation of the RFID system. The Mann Whitney test shows that the view is not significantly different based on sex and similarly, based on respondents' age, profession and faculty they owned, their opinion is not significantly different as examined by Kruskal Walis test as the p value of chi square test is higher than 5 percent in all cases (Table 3).

Table 3: RFID installation and changes in services

Variables	Chi-Square	df	P value
Sex	0.205	1	0.001
Age	2.487	3	0.627
Profession	1.411	2	0.705
Faculty	1.264	3	0.862

The view has been found insignificant based on the respondents' sex, age, status, and faculty they owned since the p value of the chi square is more than 5 percent in all cases.

4.3 Library services during the off-office hours and holidays

The expectations of respondents tried to explore through a question "whether they seek library service during the off-office hours and holidays", the response is found as follows (Table 4).

Table 4: Library services during the off-office hours and holidays

Value	Looking for services in library during							
	Off-office hours				Holiday			
	Sex	age	profession	faculty	Sex	Age	profession	faculty
Chi-Square value	1.375	1.839	2.667	2.680	2.369	1.160	2.680	.277
Df	1	3	2	3	1	3	3	3
p	0.241	0.607	0.026*	0.444	0.124	0.763	0.044*	0.964

Sex, age, and faculty have been found insignificant regarding their interest on visiting library off-office hours to get the library services. The same is true in the case of their interest in getting the library services during the holiday period since p value is more than 5%. The p value is found to be less than 5 percent in the case of profession (off office hours, p=0.026 and holiday, p=0.004).

4.4 Perception and satisfaction of users after application of technology and software

Users' perception has been obtained through the 5-point Likert scale (1 strongly disagree, five strongly agree). The mean value and standard deviation of each construct is exhibited in Table 5. The significance has been examined based on the sex of the respondents with the help of Mann Whitney test (MWT) and the p value is displayed to the respective construct.

Table 5: Perception and satisfaction of users after application of technology and software

Factor	Construct	Mean	SD	p (MWT)
Ease of Access and Usability	Accessibility of library technologies	2.91	1.4	.029*
	User-friendliness	3.96	1.45	.016*
	Availability of login	3.04	1.46	0.86
	Waiting Time	3.04	1.45	0.245
	Average	**3.24**	**1.44**	
Technological Infrastructure	Availability of computers	2.99	1.48	.017*
	Internet connectivity	2.94	1.45	0.768
	maintenance	3.95	1.35	0.271
	need of human supports	3.03	1.33	0.262
	Average	**3.23**	**1.40**	
Resource Availability	eBooks and e-resources	2.97	1.41	.007*
	Past collections	2.98	1.39	0.071
	Updated resources	2.98	1.41	0.657
	Easy access	3.04	1.37	0.182
	Average	**2.99**	**1.40**	
Support and Assistance	Response queries	2.99	1.42	.013*
	Technical supports	2.91	1.34	0.834
	Training	4.08	1.43	0.313
	Smart Supports	3.07	1.34	0.896
	Average	**3.26**	**1.38**	
Impact on Learning and Research	Contribution to academia	2.89	1.5	0.522
	Satisfaction	2.82	1.36	0.971
	Productivity of staff	2.81	1.45	.018*
	Productivity of users	3.05	1.38	0.731
	Average	**2.89**	**1.42**	

The five dimensions ease of access and usability, technological infrastructure, resource availability, support and assistance, and impact on learning and research were analyzed based on their mean values, standard deviations, and the results of the Mann Whitney test (p-values).

Under the factor ease of access and usability, the mean values indicate moderate satisfaction (average 3.24). Accessibility of library technologies ($p = 0.029$) and user-friendliness ($p = 0.016$) are statistically significant constructions based on gender. The factor "technological infrastructure" has slightly more than average satisfaction (mean = 3.23). Availability of computers ($p = 0.017$) is found significant differences in perception of male and female. The construct "resource availability" shows that users are least satisfied (average mean = 2.99), but eBooks and e-resources ($p = 0.007$) are a statistically significant among the male and female users.

As far as support and assistance are sought by the users, study shows that this is the area of moderate satisfaction (mean = 3.01). Response to queries ($p = 0.013$) stands out as a significant concern, while other constructions show no notable differences. Finally, the impact on learning and research dimension has the lowest average satisfaction (mean = 2.89) indicates that still university needs to wait to see the impact in the future. The productivity of staff ($p = 0.018$) is the only statistically significant construction that is to be noticed. It is concluded that improvements are needed in e-resources, user-friendliness, and productivity support to address gaps and enhance user satisfaction.

Conclusions

The findings reflect that installation of the RFID system was a significant step toward automation. Almost two third respondents acknowledged changes due to RFID, perceptions varied, and statistical tests did not show any significant differences across gender, age, profession, or faculty regarding their views on this matter. This indicates a uniform but limited awareness of the system's benefits throughout demographics, pointing to a need for more forceful communication and education regarding its advantages. The responses to the question of library access during off-office hours and holidays showed significant differences by professional performance, with students expecting more. However, other variables such as gender, age, and faculty were not significant. This calls for targeting the library operational strategies to meet the needs of students, who are the largest user group.

Perceptions of technologies and software applications covered five dimensions: access and usability, technological infrastructure, resources, support, and assistance, and impacts on learning and researching. Total findings show that there is a decent level of satisfaction, with usability/accessibility in library technologies significant in the gender-based differences in means. This could mean disparities in male and female user experiences with the engagement of library technologies, requiring gender-sensitive design and communication improvements.

The low satisfying area was resource availability, pointing to the greatest concern relating to eBooks and e-resources. Similarly, statistically significant differences in level of satisfaction between male and female respondents showed that there is a continuing need to broaden and improve services related to fully digital resources required by users with diverse preferences.

The support and assistance were rated as average, while the response to queries was identified as the most critical area for improvement. This dimension is important in bridging the gap between users and technology; thus, queries must be responded to as quickly as possible to ensure a positive user experience.

The impact on learning and research dimensions had the lowest satisfaction, and it is also the only statistically significant factor affecting staff productivity. Although these results suggest that academic benefits of technological advancements of the library have not yet been substantial, at the same time, they highlight potential avenues for future investments in training and tools that can enhance staff and user productivity.

The critical areas identified for the improvement of library services and technological integration include. However, disparities in the availability of eResources, ease of use, and satisfaction, and equity across different user demographics remain critical issues to be addressed. Libraries need to take initiative-taking in matching their services to user expectations to provide an inclusive and effective learning environment. Continuous monitoring and targeted interventions will be crucial to achieve sustainable improvement and harness the benefits of technological advancement in academic libraries.

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