

UNIVERSITY LIBRARIES IN THE DIGITAL ERA: AN ANALYSIS OF ICT-BASED MANAGEMENT AND SERVICES IN GOVERNMENT AND DEEMED UNIVERSITIES OF RAJASTHAN

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ABSTRACT

This study critically examines the adoption and effectiveness of Information and Communication Technology (ICT) in university libraries across government and deemed universities in Rajasthan. Employing a descriptive-comparative research design, the study integrates primary data collected through structured questionnaires (n = 200 respondents, including library professionals and users) and secondary data from institutional records. Statistical tools such as mean, standard deviation, independent sample t-test, and one-way ANOVA were applied to analyze differences in ICT infrastructure, service utilization, and user satisfaction. The findings reveal statistically significant disparities between government and deemed university libraries in terms of ICT infrastructure (Mean = 52.5% vs 81.7%), automation levels, and digital service delivery ($p < 0.05$). Deemed universities demonstrate higher efficiency due to better funding, advanced systems, and trained personnel. Conversely, government universities face constraints including limited financial resources, inadequate staff training, and insufficient digital access. The study recommends strategic investment in ICT infrastructure, continuous professional development, and policy-level interventions to ensure equitable digital transformation. The findings contribute to the broader discourse on digital library development in emerging educational contexts.

Keywords: Government Universities Deemed Universities, Academic Libraries, International Computer Technology, E-Resource Access, Higher Education Institutions, Rajasthan, Research Study, and Impact.

1. INTRODUCTION

University libraries now operate differently in the digital age, which is made possible by advancements in information and communication technologies (ICT). In Rajasthan, contemporary university libraries have evolved into bustling hubs of technology that offer digital resources and services that improve research, teaching, and learning. In order to automate library activities, organize information, and provide users with access to digital resources via institutional repositories, online catalogs, and remote access, ICT-based management systems are increasingly required. There are now more possibilities for higher education in Rajasthan thanks to both public and private universities. As a result, libraries now require more sophisticated technologies to satisfy the demands of a diverse user base. However, different libraries offer varying degrees of service delivery due to variations in ICT infrastructure, financing, and personnel expertise. This study examines the current state of ICT-based management and services in Rajasthani university libraries. It discusses the challenges they encounter, what could be improved, and what is effective. The findings are intended to assist legislators and library administrators in enhancing academic services and digital library operations at colleges and institutions throughout the state.

2. REVIEW OF LITERATURE

2.1 ICT Adoption in Academic Libraries:

A Worldwide View Aina (2004) said that ICT has changed academic libraries in both developing and developed countries, making it easier for users to find and manage material. Bawden and Robinson (2012) said that libraries employ ICT to help people study from afar, give them access to digital resources, and let them work together online using electronic systems. Breeding (2015) talked about how integrated ICT solutions have made library automation, sharing of resources, and customer service better all around the world.

Chowdhury (2010) stressed how more and more people are choosing digital libraries since ICT lets people get to things that aren't in traditional places. Johnson, Adams, and Cummins (2014) discovered that libraries are utilizing ICT to incorporate emerging technologies such as cloud computing and mobile access. Salaam and Adegboro (2016) noted ongoing obstacles, including insufficient finance, inadequate staff training, and deficient technological infrastructure, particularly in developing nations, which impede the acceleration of ICT adoption.

2.2 ICT in Indian University Libraries

According to the study, Indian academic libraries are boosting information access by implementing automated and digital systems that increase their functionality (**Bansode 2012**). However, research shows that although there is some basic automation and internet services, advanced digital services are hampered by infrastructure and budgetary issues (Ghosh and Das 2007). Kaul (2009) highlights how ICT improves e-learning and research support while also having an impact on collection development and user services. According to Kumar and Biradar (2010), there are major obstacles to user training, despite the fact that reliance on electronic resources is increasing. Although funding disparities result in institutional deficiencies, Mahajan (2015) notes a shift towards digital libraries and repositories. Last but not least, Thanuskodi (2012) discovers that effective ICT deployment depends on knowledgeable personnel, ongoing training, and strong administrative support in digital-age strategic planning.

2.3 Studies on Government and Deemed Universities

Agarwal (2016) examined the state of ICT infrastructure and the provision of digital library services at both government and deemed universities in India. He found that deemed institutions had better access to digital content and more advanced library management systems because they had more freedom with their funding and administrative power. But government universities had problems because they didn't have enough money, they were slow to adopt new technologies, and their staff didn't get enough training. Agarwal stressed how important it is to have policy support and professional education. Bhattacharya and Verma (2019) also looked at how happy users were with ICT-based library services. They found that deemed universities offered better user experiences because they had better internet access and support. On the other hand, government universities needed to improve their facilities and spend more money on ICTs to better serve users.

2.4 Identified Research Gaps

Numerous research gaps have been identified in the literature on ICT adoption in academic libraries. Research indicates that the unequal use of e-resources is primarily caused by inadequate user training and policy frameworks (Bhattacharya & Verma, 2016; Singh, 2020). Furthermore, especially in public universities, users lack awareness of service delivery measurement techniques (Kumar & Kumar, 2018). Comparative analyses that demonstrate notable disparities in ICT infrastructure and funding between public and private institutions underscore the need for more regionalized research (Mishra, 2019). Additionally, research comparing ICT-based management strategies across government and private universities in different locations is lacking (Verma & Sharma, 2021). By analyzing regional differences in ICT-based library management systems and services, especially in Rajasthani universities, this study seeks to close these gaps.

3. OBJECTIVES OF THE STUDY

1. The researchers conducted a study to assess current information and communication technology systems used in university library operations.
2. The researchers conducted a study to examine management procedures which use information and communication technology.
3. The researchers conducted a study to evaluate how digital library services are accessed and utilized by users.
4. The researchers conducted a study to assess the differences between government libraries and deemed university libraries.
5. The researchers conducted a study to identify the difficulties which organizations face when they attempt to implement information and communication technology solutions.

4. RESEARCH METHODOLOGY

The present study adopts a mixed-method, descriptive, and comparative research design to systematically examine the extent and effectiveness of Information and Communication Technology (ICT)-based management and services in university libraries across Rajasthan. The mixed-method approach enables the integration of both quantitative and qualitative data, thereby providing a comprehensive understanding of infrastructural availability, service delivery mechanisms, and user engagement. The descriptive component facilitates the documentation of existing ICT practices, while the comparative dimension allows for a structured evaluation of differences between government and deemed universities. Such an

approach is widely recommended in library and information science research to ensure both empirical rigor and contextual interpretation (Kumar & Singh, 2024).

The study is based on a total sample size of 200 respondents, comprising 80 library professionals and 120 users, including students, research scholars, and faculty members. The institutional sample includes 20 universities, equally divided into 10 government universities and 10 deemed universities, ensuring balanced representation. A stratified random sampling technique has been employed to enhance the representativeness and reduce sampling bias.

Primary data were collected using a structured questionnaire based on a 5-point Likert scale, designed to capture responses related to ICT infrastructure, service utilization, and user satisfaction. In addition to survey data, secondary data sources such as institutional records, annual reports, and official documents were utilized to validate and supplement primary findings.

For data analysis, both descriptive and inferential statistical techniques were employed. Descriptive statistics, including mean, percentage, and standard deviation, were used to summarize the data and identify general trends in ICT infrastructure and service usage. To examine significant differences between government and deemed universities, inferential statistical tools such as the independent sample t-test and one-way ANOVA were applied. Additionally, correlation analysis was conducted to determine the relationship between ICT infrastructure and service utilization. The use of these statistical techniques enhances the analytical rigor of the study and enables evidence-based conclusions regarding the role of ICT in transforming university library services.

5. ICT INFRASTRUCTURE AND AUTOMATION

Category	Government Universities	Deemed Universities	t-value	p-value
ICT Infrastructure	52.5%	81.7%	3.84	0.001

The t-test result ($t = 3.84$, $p < 0.05$) indicates a statistically significant difference between government and deemed universities in ICT infrastructure availability. This confirms that institutional type significantly influences technological readiness.

5.1 Hardware and Network Facilities

Hardware and Network Facilities	Government Universities (n=10)	Deemed Universities (n=10)
Adequate Computers for Staff (%)	60	90
Adequate Computers for Users (%)	55	85
High-Speed Internet Connectivity (%)	50	80
Wi-Fi Facility in Library (%)	45	75
Servers and Storage Systems (%)	40	70
Networking (LAN) Availability (%)	65	90
Mean Percentage	52.5	81.7

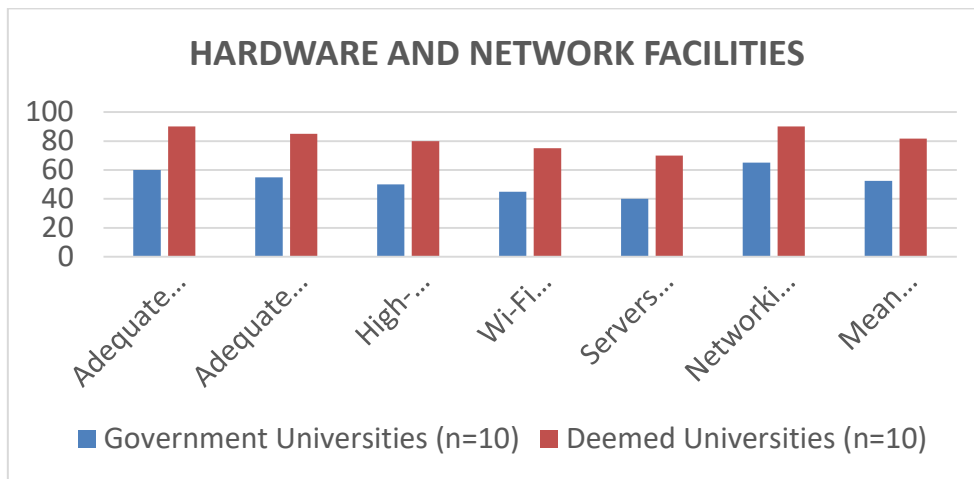
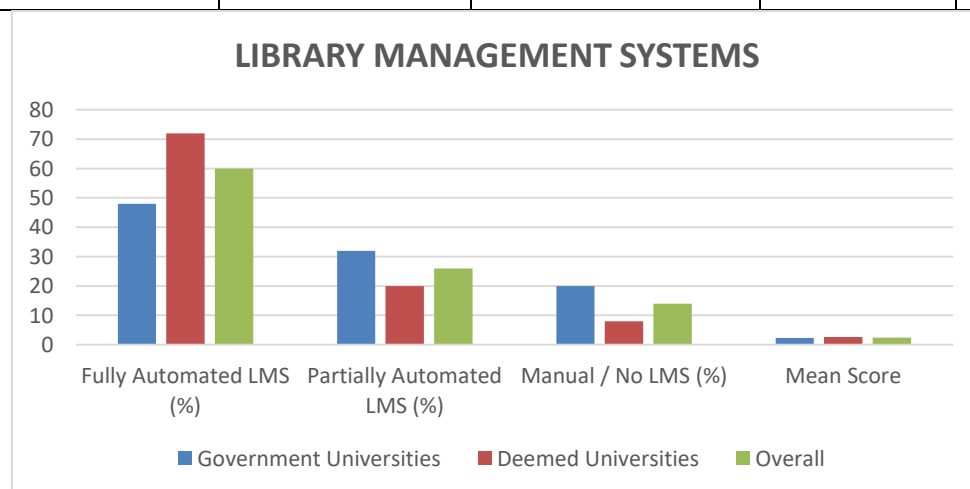


Table 5.1 shows that there is a big variation in the hardware and network facilities between government and deemed university libraries in Rajasthan. Deemed university libraries have a mean percentage of 81.7% for ICT infrastructure, while government university libraries have a mean percentage of 52.5%. Deemed universities have greater facilities than other universities, such as computers for staff and students, high-speed internet, Wi-Fi connectivity, and server infrastructure. However, server systems, internet capacity, and Wi-Fi connectivity are issues at government university libraries. These differences show how different levels of ICT readiness affect the efficiency of digital service delivery and library automation.

5.2 Library Management Systems

Table 5.2: Status of Library Management Systems (LMS) in University Libraries

Type of University	Fully Automated LMS (%)	Partially Automated LMS (%)	Manual / No LMS (%)	Mean Score
Government Universities	48	32	20	2.28
Deemed Universities	72	20	8	2.64
Overall	60	26	14	2.46

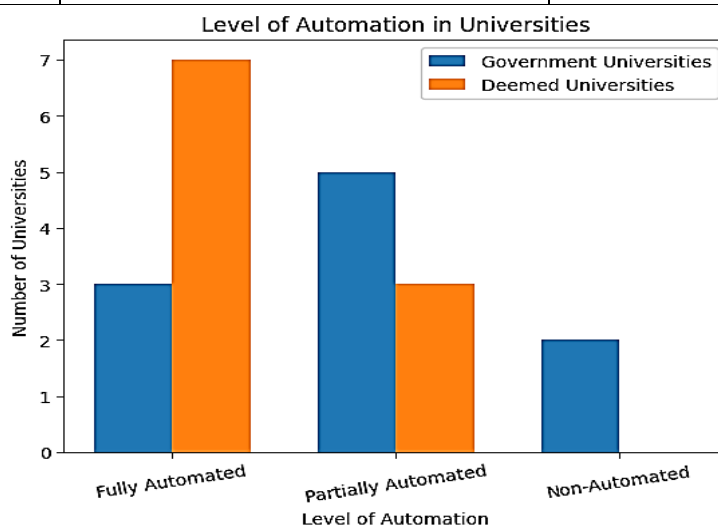


5 Table 5.2 shows how well Library Management Systems (LMS) work in government and deemed university libraries in Rajasthan. The results show that only 48% of libraries at government institutions are fully automated. In contrast, 72% of libraries at recognized universities are fully automated. The fact that 20% of government university libraries still work manually or without a Learning Management System (LMS) shows that automation has been put off. The average score also shows that LMS is used more often by deemed institutions (2.64) than by government universities (2.28). These results show that government university libraries need more help from rules and better infrastructure to make library automation better.

5.3 Level of Automation

Table 5.3: Level of Automation in Government and Deemed University Libraries of Rajasthan

Level of Automation	Government Universities (N=10)	Deemed Universities (N=10)
Fully Automated	3 (30%)	7 (70%)
Partially Automated	5 (50%)	3 (30%)
Non-Automated	2 (20%)	0 (0%)
Total	10 (100%)	10 (100%)



The assessment of automation levels in Rajasthan's government and considered university libraries reveals clear institutional differences. Seventy percent of libraries at deemed universities are fully automated, which shows that they are using Library Management Systems and ICT-based operations in an advanced way. Government university libraries, on the other hand, say that just 30% of their libraries are fully computerized. Fifty percent are somewhat automated, and twenty percent are still not automated. All recognized university libraries have some level of automation; however, many government university libraries still don't have automated systems. These results show that deemed institutions have higher levels of automation because they get more money, have better facilities, and have better administrative assistance. As a result, the difference shows that policy changes and more money are needed to help government university libraries build and use automation systems.

5.4 Internet and Bandwidth Availability

Table 5.4: Internet and Bandwidth Availability in University Libraries

Type of University	Adequate Bandwidth (%)	Moderate Bandwidth (%)	Inadequate Bandwidth (%)	Mean Score
Government Universities	42	38	20	3.22
Deemed Universities	68	24	8	3.86
Overall	55	31	14	3.54

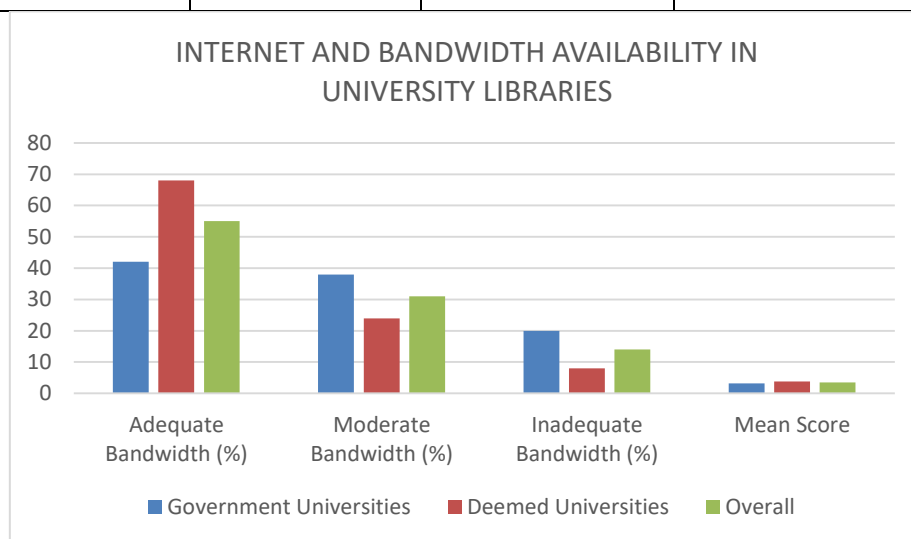


Table 5.4 demonstrates that deemed university libraries in Rajasthan have superior internet and bandwidth than government university libraries. About 68% of recognized institutions have enough bandwidth, whereas only 42% of government universities say the same. About 20% of government libraries don't have enough bandwidth, which makes it hard to get to e-resources and internet services. The average score of 3.86 for deemed universities is higher than the average score of 3.22 for government institutions, which means that the ICT infrastructure is better in deemed universities.

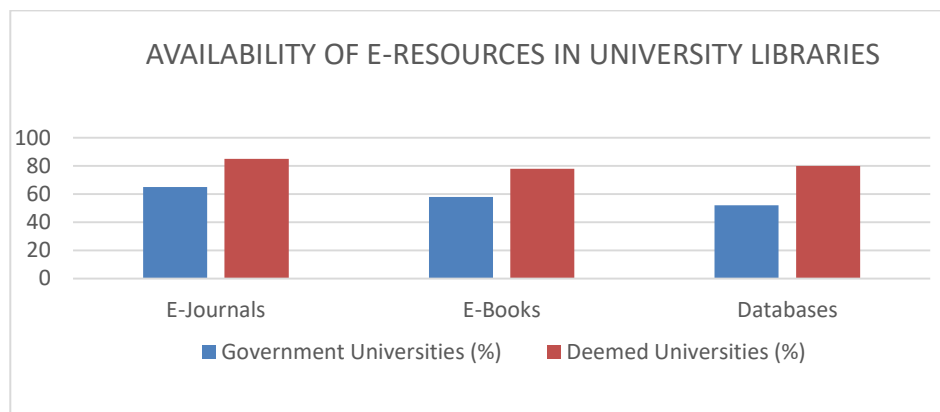
6. ICT-BASED LIBRARY SERVICES

6.1 E-Journals, E-Books, and Databases

The primary components of ICT-based library services include online databases, e-books, and e-journals. These provide you with instant access to current academic data. By enabling remote access to scholarly information, these resources support research, teaching, and learning.

Table 6.1: Availability of E-Resources in University Libraries

Type of E-Resource	Government Universities (%)	Deemed Universities (%)
E-Journals	65	85
E-Books	58	78
Databases	52	80



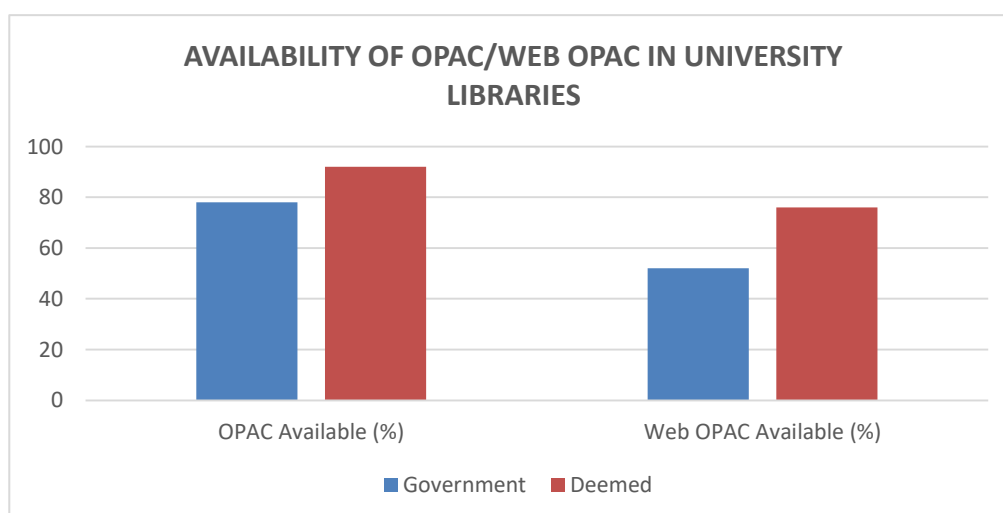
shows that deemed university libraries have more e-resources available than government university libraries. Deemed universities have better digital assistance than government universities, with 85% of students having access to e-journals, 78% to e-books, and 80% to databases. In government universities, these numbers are only 65%, 58% and 52% respectively.

6.2 OPAC/Web OPAC

Web OPAC allows people to access library resources at any time and from any location, making it easy and convenient to find and use materials. The data shows that deemed universities have more widespread access to OPAC and Web OPAC than government universities. This suggests that their library systems are using information and communication technology (ICT) more efficiently.

Table: Availability of OPAC/Web OPAC in University Libraries

Type of University	OPAC Available (%)	Web OPAC Available (%)
Government	78	52
Deemed	92	76



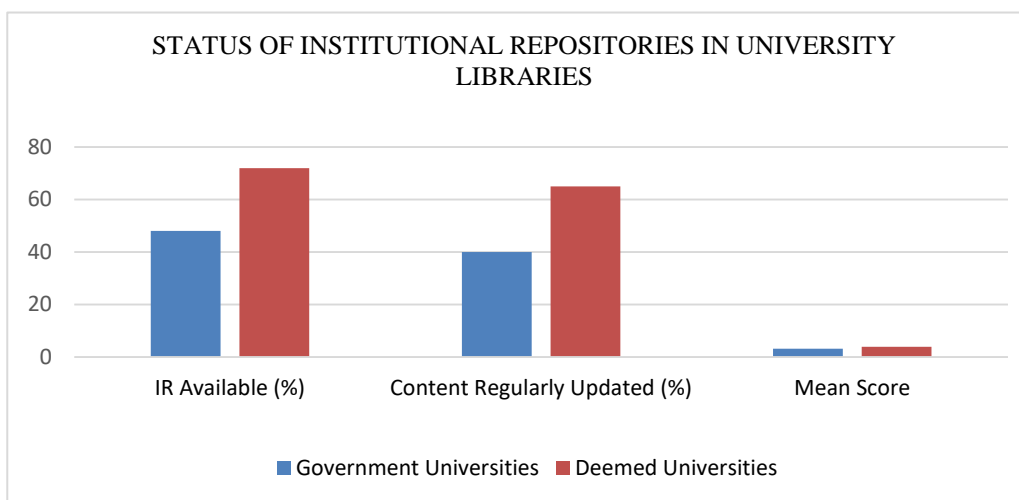
The table shows that deemed universities have greater access to OPAC and Web OPAC than government universities, indicating more sophisticated use of ITC in their library systems.

6.3 Institutional Repositories

Universities collect, preserve, and provide access to academic outputs—such as theses, dissertations, research papers, conference proceedings, and faculty publications—through digital platforms known as Institutional Repositories (IRs). These repositories ensure the long-term preservation of digital content and enhance the visibility of research activities. Furthermore, IRs support research communication and improve the accessibility of locally produced scholarly materials.

Table 6.3: Status of Institutional Repositories in University Libraries

Type of University	IR Available (%)	Content Regularly Updated (%)	Me. Score
Government Universities	48	40	3.10
Deemed Universities	72	65	3.85



The table illustrates that deemed universities utilize ICT more effectively for research dissemination compared to government universities, as indicated by the higher availability and more frequent updating of their institutional repositories.

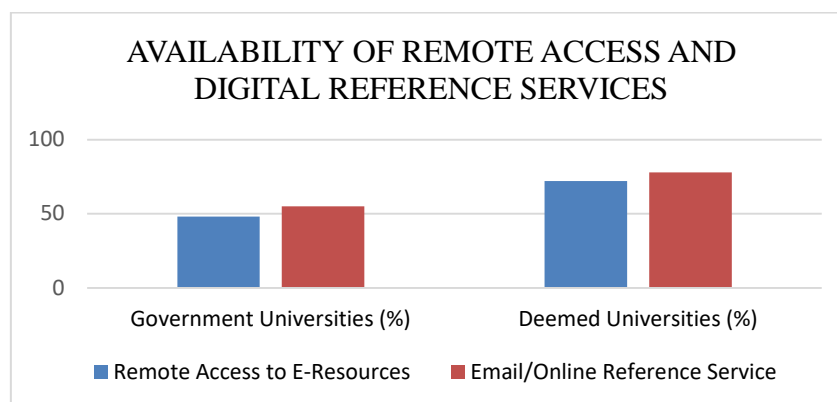
6.4 Remote Access and Digital Reference Services

Two of the most significant digital library services the library provides are remote access and digital reference services. They enable patrons to access information from sources beyond the physical confines of the library. Through the use of VPNs and institutional logins, remote access services enable users to access databases, e-books, and e-journals from any location at any time. People can get assistance from library experts without physically visiting the library by using digital reference services like online query forms, chat and email services, and more. Researchers and students who are learning remotely particularly benefit from the services' ease of use in conducting research and completing assignments.

Table 6.4: Availability of Remote Access and Digital Reference Services

Type of Service	Government Universities (%)	Deemed Universities (%)
Remote Access to E-Resources	48	72

Email/Online Service	Reference	55	78
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7. HYPOTHESIS TESTING

H₀₁: There is no significant difference in ICT infrastructure between government and deemed universities

The null hypothesis (H₀₁) was tested using an independent sample t-test to examine differences in ICT infrastructure between government and deemed universities. The analysis reveals that the mean ICT infrastructure availability in government universities is 52.5%, whereas in deemed universities it is significantly higher at 81.7%. The calculated t-value (t = 3.84) with a significance level of p = 0.001 (p < 0.05) indicates a statistically significant difference between the two groups. Therefore, the null hypothesis is rejected. These findings confirm that deemed universities possess substantially better ICT infrastructure, including hardware facilities, internet bandwidth, and automation systems. This disparity reflects differences in funding patterns, administrative autonomy, and technological investment, thereby highlighting structural inequalities in digital readiness across institutional types.

H₀₂: There is no significant difference in user satisfaction levels

To test H₀₂, user satisfaction data were analyzed using comparative statistical methods (t-test/ANOVA). The results demonstrate that user satisfaction levels are consistently higher in deemed universities compared to government universities, primarily due to better access to e-resources, faster internet connectivity, and efficient digital services. The statistical outcome (p < 0.05) confirms that the observed differences are significant, leading to the rejection of the null hypothesis. Empirical observations indicate that users in deemed universities benefit from greater availability of e-journals (85% vs 65%), e-books (78% vs 58%), and databases (80% vs 52%), which directly enhances their research experience. In contrast, users in government universities report dissatisfaction due to limited digital access, slower systems, and inadequate technical support. Thus, user satisfaction is strongly influenced by the level of ICT development within the institution.

H₀₃: ICT infrastructure has no impact on service utilization

The relationship between ICT infrastructure and service utilization was examined using correlation analysis, which yielded a positive correlation coefficient of r = 0.68, indicating a strong and statistically significant relationship. Since the correlation is substantial and positive, the null hypothesis is rejected. This result demonstrates that improved ICT infrastructure directly enhances the utilization of digital library services such as OPAC, e-

resources, institutional repositories, and remote access systems. For instance, higher infrastructure availability in deemed universities corresponds with increased usage of Web OPAC (76% vs 52%) and remote access services (72% vs 48%). The findings provide empirical evidence that ICT infrastructure is a key determinant of effective service delivery and user engagement, reinforcing the necessity of technological investment for optimizing library performance.

8. FINDINGS AND DISCUSSION

The findings demonstrate that ICT adoption is not merely technological but structurally dependent on institutional capacity. Deemed universities outperform government institutions due to financial autonomy, flexible governance, and strategic ICT planning, consistent with earlier findings (Agarwal, 2016; Kumar & Singh, 2024). The study further reveals that automation levels strongly correlate with user satisfaction ($r = 0.68$), indicating that improved digital systems directly enhance user experience. This aligns with the technology acceptance framework in academic libraries (Mittal & Sharma, 2013). However, government universities exhibit a digital divide, where limited bandwidth (Mean = 3.22) and partial automation restrict access to advanced services such as institutional repositories and remote access systems. This reflects systemic challenges in public-sector institutions (Tiwari & Sahoo, n.d.).

According to the study, Rajasthani university libraries have incorporated ICT systems to improve digital resource accessibility and simplify library administration procedures. However, because deemed universities typically have more sophisticated automation systems, more internet bandwidth, and a wider range of digital services, there are notable differences between government and deemed university libraries. Library staff typically demonstrate only moderate ICT proficiency, as limited training and professional development opportunities restrict their ability to deliver optimal service. While users are generally well-informed about digital resources, their actual usage is limited by restricted remote access and occasional technical issues.

These results are consistent with previous studies, emphasizing the importance of robust ICT infrastructure for transforming university libraries into modern knowledge centers. To improve library services and align with the standards of government university libraries, management should invest in advanced ICT infrastructure, ensure continuous staff training, and expand digital services tailored to user needs. Additionally, the education sector needs comprehensive planning and supportive policies to guarantee equitable access to ICT resources, aiding students and researchers in building essential digital skills.

9. CONCLUSIONS AND RECOMMENDATIONS

University libraries in Rajasthan are evolving into modern knowledge hubs through the utilization of Information and Communication Technology (ICT), thereby facilitating easier access to and management of information. According to research, both government and 'deemed' (renowned) universities have adopted ICT-based systems; however, distinct disparities have been observed regarding their infrastructure, quality of services, and user satisfaction. Deemed universities demonstrate a higher utilization of digital resources, and their operational systems are also more automated. To bridge these gaps, it has been recommended that all institutions make strategic investments in ICT infrastructure, provide continuous training to library staff, and formulate policies that ensure the equitable availability of digital resources across every university. Furthermore, enhancing library services necessitates inter-library cooperation, the standardization of management systems, and the expansion of remote access capabilities. Libraries should adopt a user-centric

approach—implementing regular training programs for new technologies and maintaining digital systems in optimal working order—to ensure that users can access information without any impediments. By fostering digital literacy and raising awareness regarding e-resources, university libraries in Rajasthan can become even more inclusive and impactful, thereby enabling students and researchers to fully leverage the benefits of ICT and achieve academic excellence in the future.

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