

# Assessing the Efficiency of Remote Access Systems for E-Resource Management in Delhi's Academic Libraries

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## ABSTRACT

*The rapid advancement of information technology has significantly impacted academic libraries by enabling remote access systems. This study evaluates the efficiency of remote access systems in managing electronic resources in Delhi's academic libraries. A mixed-methods strategy, incorporating quantitative data from surveys and qualitative insights from secondary sources, is employed for comprehensive analysis. The findings reveal that remote access systems improve the management and accessibility of electronic resources, leading to higher user satisfaction compared to traditional methods. However, system performance variations are attributed to infrastructure technology issues, limited user skills, and integration with library services. The study underscores the importance of robust, user-friendly remote access systems in supporting academic endeavors and identifies areas for optimizing digital resource management. Despite limitations such as geographical focus and potential response biases, the findings offer valuable insights into remote access systems' efficacy and suggest further investigations are warranted given their long-term impacts and technological advancements.*

**KEYWORDS:** Remote Access Systems, E-Resource Management, Academic Libraries, Electronic Resources & Library Management Systems (LMS).

## 1. INTRODUCTION

The academic library landscape has experienced significant transformation due to the rapid advancement of information technology. The implementation of remote access systems has enabled libraries to extend beyond their physical confines. This allows users to access a variety of electronic resources from any location. Accessing e-resources, including databases, e-books, e-journals, and other digital content, is essential for students to conduct research efficiently (Rahman, 2021)<sup>1</sup>. By implementing remote access systems, academic institutions can continue to serve their students without interruption, thereby improving the overall quality of education.

Academic libraries are vital for fostering teaching, learning, and research activities in contemporary society, especially in light of the global digital revolution (Hindagolla, 2021)<sup>2</sup>. In addition to traditional physical resources

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like books and periodicals, there is an increasing number of electronic resources available today. The aforementioned electronic resources are commonly referred to as "e-resources" and are accessible through various networks and systems. Some examples of e-resources include online public access catalogs (OPACs), compact discs (CD-ROMs), online databases, electronic journals, e-books, internet resources, print-on-demand publications, electronic mail (e-mail) publishing, wireless publishing, electronic connections, and web publishing (Haridasan & Khan, 2009)<sup>3</sup>.

Technologies such as virtual private networks (VPNs), proxy servers, and federated identity solutions like Shibboleth are commonly utilized in remote access systems. The library employs these technologies to grant access to its licensed electronic resources. Effective management of electronic resources encompasses not only access but also their organization, administration, and evaluation in digital repositories. This includes acquisition, categorization, and user assistance services that ensure resources are readily available and accessible. The availability of electronic resources in academic libraries has significantly transformed how information is accessed, saved, or shared (Kwafoa et al., 2019)<sup>4</sup>. Presently, libraries can broaden access, sharing, and publishing through academic activities, as well as possess an additional cache of digital materials.

Reassessing the efficiency of remote access services is of paramount importance for several reasons. The COVID-19 pandemic, which has resulted in the closure of physical libraries, has led to an unparalleled demand for remote access to academic resources. This transition has highlighted the need for dependable remote access mechanisms to maintain normal academic operations (Huang, 2023)<sup>5</sup>. Additionally, Delhi, an important education hub in India, is home to many academic institutions that heavily rely on e-resources for their research and teaching activities. The efficiency of these systems determines the accessibility and usefulness of electronic sources. Inefficient systems can negatively impact academic productivity, reduce resource utilization rates, and lead to user frustration (Adegoke, 2023)<sup>6</sup>. To enhance library services and ensure their continued relevance to patrons, it is essential to understand how these systems operate in Delhi's academic libraries.

The investigation of remote access systems' functionality may reveal administrative and technological obstacles that could impede optimal performance, which could negatively impact the user experience. For instance, limited bandwidth, poor user assistance, and authentication issues are some of the problems that can arise. Libraries must recognize these challenges to make their remote access systems dependable and user-friendly (Isinkaye & Fred-Yusuff, 2022)<sup>7</sup>. Considering the rapid growth of digital transformation in higher education, this research is particularly relevant. As more academic resources become available in digital formats, the utilization of remote access systems will continue to increase. Therefore, maximizing the value of a library's digital resources and supporting the educational community effectively depends on how well these systems are functioning and operating. The purpose of this study is to assess the effectiveness of electronic resources in academic libraries in Delhi through remote access systems. This research will also examine the advantages and disadvantages of these systems, and suggest ways for improvement. The evaluation will focus on key factors such as user satisfaction, system reliability, and the efficiency of resource management processes. This paper aims to analyze the effectiveness of remote access systems used in academic libraries of Delhi for managing electronic resources. The introduction section will provide background information and the objective of this study is of paramount importance. In the literature review section,

a comprehensive summary of prior research will be provided, emphasizing the limitations that this study seeks to rectify. The methodology section will detail the techniques utilized for data accumulation and the analytical procedures employed. The results section will showcase the findings in the form of charts and tables, which will be interpreted about the research questions and hypotheses posited. Lastly, the conclusion section will provide a concise summary of the principal findings, discuss their implications, recognize any constraints, and propose potential avenues for future investigation.

## **LITERATURE REVIEW**

In reviewing the literature on electronic resources and collection development in academic libraries, it is evident that various challenges and strategies are common across different institutions.

2.1 Sharma (2024)<sup>8</sup> conducted a study on the electronic resources and collection development policies in Delhi University libraries. The primary resources used were databases and e-journals, with some libraries also having CD-DVDs and movies. These resources were typically subscribed to directly, with links to them provided on the library homepages. The selection criteria were based on student input and suggestions from subject matter experts, with a focus on language, subject, and information quality. However, it was noted that both the administration and staff lacked knowledge in handling and preserving e-resources. Additionally, there was a need for improvement in understanding de-selection procedures.

2.2 Siddiqui (2023)<sup>9</sup> conducted a study on the collection development and access management of e-resources in three prominent colleges in Delhi: Jamia Millia Islamiya, Jawaharlal Nehru University, and the University of Delhi. The study's purpose was to determine the budget allocated for print and electronic resources and the criteria used to select these materials. The researcher used questionnaires, interviews, and observations to collect data. The findings revealed that print publications were struggling to maintain readership, while electronic papers were dominating current library purchase trends in India. The study also highlighted issues such as inadequate funding for libraries managing electronic materials and problems with publishers regarding dispute settlement. This research is based on a doctoral thesis by an academic scholar and provides unique insights into the challenges of academic access in major institutions in Delhi, with practical implications for budgeting and governance.

2.3 Verma and Nair (2023)<sup>10</sup> emphasized the substantial financial investments made by academic institutions in electronic resources such as e-journals, databases, and eBooks, and examined the growing proportion of these resources in library subscriptions. The study highlighted that managing electronic resources is more challenging than managing print resources due to the significant differences in their operations. Even after more than twenty years of the existence of electronic resources, librarians were still seeking the best ways to organize their collections. Sharma (source not provided) noted that the majority of standalone systems used are incompatible and that Library Management Systems (LMS) and Library Services Platforms (LSPs) are inadequate for managing workflows involving electronic resources. The study focused on the deployment of the open-source Electronic Resource Management System (ERMS) CORAL at the Central Library of IIT Delhi. The implementation steps, problems, and characteristics of CORAL were described in detail in the study. The

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conclusion of the study noted improvements in electronic resource management following the deployment of CORAL, providing valuable information to institutions considering using CORAL for their ERM needs.

2.4 Hiremath et al. (2023)<sup>11</sup> conducted a comprehensive analysis of the electronic resources (ER) of academic libraries with a particular focus on electronic resource management (ERM), which has become increasingly critical due to the growing reliance on these resources by libraries. Despite the integration of digital resources in libraries for over two decades, managing them remains a challenging task. Sharma (2023) has described the life cycle of e-resources, starting from resource identification and discovery, moving on to trial access, selection, and acquisition, and finally ending with tracking user access and usage. This life cycle involves time-consuming processes such as reviewing license agreements and maintaining records, which highlights the need for effective systems to streamline these processes. The study examined the background and current state of ERMS to explore how these systems may reduce the costs associated with managing ER in academic libraries. The researchers emphasized the significance of ERMS for optimal processing and efficient administration of electronic resources in academic libraries.

2.5 Patra's (2017)<sup>12</sup> study investigated the status of Enterprise Risk Management (ERM) across Indian business and management schools in comparison to other libraries. The study aimed to determine how variables impact the standards and procedures used in managing ERM systems and the lifespan of resources. A questionnaire was administered to library in-charges and librarians through convenience sampling while SPSS software was used for analysis. Statistical tools such as mean, standard deviation, and ANOVA were employed. The findings revealed that several libraries did not follow the license, renewal/cancellation, procurement, evaluation, and selection processes for ERM, which are crucial for effective delivery of e-resources. The ratio of non-professionals to professionals and the availability of IT infrastructure were identified as factors that influence the effective management of e-resources. The study was limited to 38 leading business schools in India and focused on IT infrastructure, e-resource collection development, and ERM tools and technologies. It provides valuable insights into how Indian business school libraries manage their electronic content materials.

2.6 In a study conducted by Tyagi (2015)<sup>13</sup>, the evolving character of electronic resources and their acquisition processes in management libraries within the National Capital Region (NCR) of Delhi were explored. By employing a survey methodology and structured questionnaires, the research aimed to better comprehend the current state of affairs and secure funding for future initiatives, including projects, promotion techniques, and government policies. The findings indicated that databases were highly favored electronic resources, mostly due to user demand and the benefits they offered in terms of conserving space. The study showed that while cost was considered less significant, the timeliness and relevance of information were given precedence in the development of collections. When selecting e-resources, careful consideration was necessary to address geographical constraints and remote accessibility. The research further emphasized contemporary approaches to choosing e-materials, which facilitated the efficient expansion of e-resource collections in the libraries studied.

### **3. OBJECTIVES OF THE STUDY**

- ✓ The primary objective of this study is to identify the critical factors that influence the efficiency of Remote Access Systems.
- ✓ Another objective is to assess the level of user satisfaction with remote access to electronic resources.
- ✓ The third objective is to evaluate the efficiency of remote access systems in managing electronic resources in Delhi's academic libraries.

### **4. HYPOTHESIS OF THE STUDY**

H1: Remote access systems significantly enhance the management and accessibility of electronic resources in academic libraries in Delhi compared to traditional access methods.

H2: Users of remote access systems report higher satisfaction levels regarding the availability and usability of e-resources compared to users of non-remote access systems.

### **5. RESEARCH METHODOLOGY**

The present study adopted a mixed-methods approach to assess the effectiveness of remote access systems for e-resource management in university libraries in Delhi. Both quantitative and qualitative data were collected to attain the objectives of identifying the determinants of system efficiency, measuring customer satisfaction, and evaluating overall system performance. Standardized questionnaires were administered to customers and staff at selected colleges, which gathered quantitative information regarding user satisfaction, system performance, and usability, as well as qualitative feedback on the user experience. Additionally, the study examined statistics and performance indicators to compare the effectiveness of remote access systems with conventional methods.

The qualitative aspect involved an extensive review of secondary sources, such as books, journals, magazines, website articles, reports, and research papers. This review aimed to contextualize the quantitative findings and provide support by considering diverse viewpoints on the effectiveness of remote access systems. The data analysis utilized statistical and descriptive methods. Descriptive statistics were applied to analyze the survey responses of the quantitative section, summarizing levels of user satisfaction and system performance indicators. Inferential statistical methods were used to test hypotheses and determine whether there is a significant improvement in the management and accessibility of e-resources through remote access systems, as well as whether users report increased satisfaction compared to traditional means of accessing information.

The qualitative data from secondary sources were analyzed descriptively to identify key factors influencing system efficiency and user satisfaction. This mixed-methods approach ensured a comprehensive evaluation by integrating robust statistical analysis with relevant literature-based insights.

### **RESULTS**

The results section provides an overview of the demographic characteristics of the respondents, highlighting key factors such as gender, age, education level, funding sources, and institutional types. The data shows a preference for remote access systems over traditional ones among participants, indicating its effectiveness in managing electronic

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resources. These findings support the subsequent analysis of access systems' impact on user satisfaction and resource management in academic libraries.

**Table 1:** Demographic Characteristics of the Respondents

<b>Sr. no.</b>	<b>Demographic characteristics</b>	<b>category</b>	<b>N</b>	<b>%</b>
1.	Gender	Male	144	72.0%
		Female	56	28.0%
2.	Age	25-30 Years	53	26.5%
		31-35 Years	63	31.5%
		36-40 Years	50	25.0%
		Above 40 Years	34	17.0%
3.	Educational Background	High School	25	12.5%
		Intermediate	40	20.0%
		Bachelor's Degree	59	29.5%
		Master's Degree	49	24.5%
		PhD	27	13.5%
4.	Funding and Resources	Government Grants	33	16.5%
		Private Donations	63	31.5%
		Tuition Fees	61	30.5%
		Others	43	21.5%
5.	Type of institution	Private	116	58.0%
		Public	84	42.0%
6.	Which Type of System do you access	Remote Access System	121	60.5%
		Traditional Access System	79	39.5%



Figure 1: Gender of the Respondents

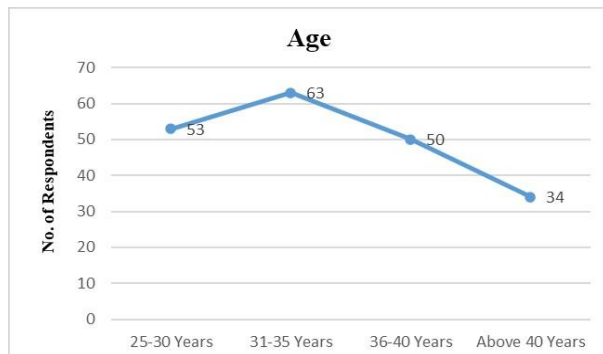


Figure 2: Age of the Respondents

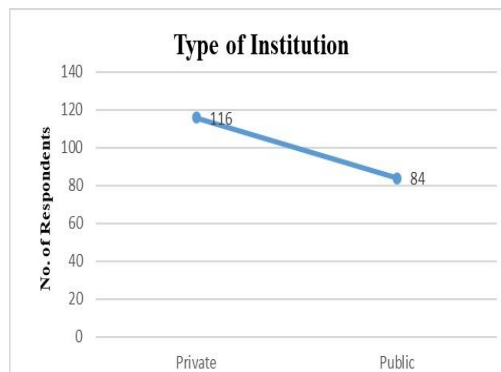


Figure 3: Type of Institutions

Table 1 and Figures 1, 2, and 3 depict the Demographic Attributes of the participants in regard to their Gender, Age group, educational background, Funding and Resources of the institution, Type of institution, and Type of system access by respondents. According to the table, out of the two hundred participants who took part in this survey, 72.0% were males, whereas 28.0% were females; 26.5% were aged between 25-30 years, while 31.5% were aged between 31-35 years; another 25% fell under the category of those whose ages ranged from 36 up until 40 years, but still, others (constituting about 17% of the total) exceeded or turned out to be above forty-one years old as well. Among the selected individuals, 12.5% indicated they had only completed high school level education, 20% said they had completed intermediate level studies, but the majority (accounting for 29.5%) had pursued bachelor's degrees, followed closely by master's degree holders at 24.5%, and Ph.D. holders at 13.5%, respectively. 16.5% received government grants, 31.5% received private donations, tuition fees contributed 30.5%, and others accounted for 21.5% of the total. 58% attended private institutions, while 42% attended public ones; among these, 60.5% used remote access systems as compared to traditional access systems, where only 39.5% used traditional access systems.

**H1: Remote access systems significantly improve the management and accessibility of electronic resources in academic libraries in Delhi compared to traditional access methods.**

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**Table 2:** Paired Sample T-Test Analysis

Pair	Measure	Mean	Std. Deviation	Correlation	Sig. (Correlation)	95% Confidence Interval of the Difference (Lower)	95% Confidence Interval of the Difference (Upper)	t-value	Sig. (2-tailed)
1	Which type of system do you access	1.3950	0.49008	0.142	0.044	-13.19461	-12.50539	-73.530	0.000
	The management and accessibility of electronic resources	14.2450	2.49320						

Table 2 provides substantial evidence to suggest that the use of remote access systems results in significantly improved management and accessibility of electronic resources in academic libraries in Delhi. The results of the investigation reveal a substantial difference between the two methods, with a mean difference of -12.85000 and a p-value of 0.000, which is extremely low. This indicates that remote access systems are more effective at managing and providing electronic resources than traditional access methods, as they scored higher in the evaluation. Additionally, a weak but significant correlation (0.142,  $p = 0.044$ ) was observed, suggesting that the average population parameters are significantly greater than zero beyond the confidence interval. This implies that the implementation of remote access systems can lead to significant improvements in resource management in academic libraries in New Delhi. Considering the prevalence of educational institutions in the region that offer a range of library services, including wifi connections, it is reasonable to conclude that remote access systems should be integrated into library systems to achieve better resource management. Therefore, the hypothesis that remote access systems are superior to traditional methods for managing and accessing electronic resources in academic libraries in Delhi is supported by the data analysis conducted.

**H2: Users of remote access systems report higher satisfaction levels regarding the availability and usability of e-resources compared to users of non-remote access systems**

**Table 3:** Paired Sample T-test Analysis

Pair	Measure	Mean	Std. Deviation	Correlation	Sig. (Correlation)	95% Confidence Interval of the Difference (Lower)	95% Confidence Interval of the Difference (Upper)	t-value	Sig. (2-tailed)



1	Which type of system do you access	1.3950	0.49008	0.149	0.035	-9.37291	-8.73709	-56.168	0.000
	Satisfaction levels regarding the availability and usability of e-resources	10.4500	2.30086						

Table 3 shows data that supports the hypothesis that individuals who use remote access have greater satisfaction with the availability and usability of electronic resources than those who do not use remote access. The paired sample statistics indicate an average of 1.3950 for the system accessed and a mean satisfaction level of 10.4500 (SD = 2.30086). There is a significant positive correlation between the types of systems accessed and levels of satisfaction, with a correlation coefficient of  $r = .149$  and a p-value of  $.035$ . The paired sample test reveals a highly significant difference in satisfaction levels, with a t-value of  $-56.168$  and a p-value of  $< .001$ . The confidence interval for the difference ranges from  $-9.37291$  to  $-8.73709$ . These findings strongly support the idea that remote access users are more satisfied with the availability and usability of electronic resources than non-remote access users, and thus confirm the hypothesis based on the available evidence.

## **DISCUSSION**

Several factors have an impact on the efficiency of the Remote Access System (RAS). One of the most significant factors is the design of the system architecture, where many RAS implementations incorporate direct mimic user interfaces for personalized experiential learning through kinesthetics (Maiti et al., 2013)<sup>14</sup>. The conversion of traditional labs into remote access mode depends on factors such as the type of experiment and the learning objectives (Anwar et al., 2011)<sup>15</sup>. Additionally, security is a critical factor, and speaker identification systems based on coded speech signals have shown promise for providing efficient and secure remote access (Shawky et al., 2019)<sup>16</sup>.

Furthermore, understanding mobile work patterns is essential for developing appropriate technologies. Key aspects related to mobile work include planning, utilizing "dead time," accessing remote resources, and monitoring the activities of colleagues who are remotely located (Perry et al., 2001)<sup>17</sup>. These factors collectively contribute to enhancing the effectiveness of RAS, which allows for flexible and accessible learning while addressing concerns about safety and meeting the needs of mobile users.

A recent study on the satisfaction of individuals accessing electronic resources remotely reported positive attitudes and moderate levels of satisfaction. A university library study utilizing the technology acceptance model showed that remote access to electronic resources was moderately adopted (Sharma et al., 2023)<sup>18</sup>. Another study conducted in Nigerian federal universities found that user satisfaction with electronic services was generally low, with internet connectivity and remote access being identified as key factors (Kudirat Abiola et al., 2023)<sup>19</sup>. For example, at a

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medical institute in Sri Lanka, most users were satisfied with internet access and electronic journal subscriptions; however, there was no provision for remote access in this case (Sritharan, 2018)<sup>20</sup>. Moreover, high satisfaction levels were reported for E-Abstract Databases and E-Journals among agricultural libraries in Northern India, while surprisingly good levels of satisfaction were reported for E-books and E-Theses despite limited availability (Bhat & Ganai, 2017)<sup>21</sup>. These studies highlight the importance of remote accessibility and adequate provision of electronic resources when measuring user satisfaction.

During the pandemic, remote access systems have emerged as a crucial tool for managing electronic resources in academic libraries (Singh & Kumar, 2022)<sup>22</sup>. These systems enable users to access electronic resources from any location and at any time, thereby enhancing research capabilities. Research indicates that the most frequently utilized category of library resources is e-journals, with the majority of postgraduate students relying on remote access facilities to access them. In India, library management is actively building its collections of e-resources, with budgetary allocations increasing continuously for their acquisition (Kaur & Walia, 2016)<sup>23</sup>. However, research is confronted with challenges such as the sufficiency of digital collections and the adoption of new research methodologies (Gupta & Tyagi, 2023)<sup>24</sup>. To address these challenges, libraries have begun utilizing various remote access solutions, such as EZproxy and RemoteXs, to allow users to access electronic resources at any time. As a result, these systems have significantly impacted library usage patterns, leading to a decline in print journals and an increase in online ones (Bhat, 2019)<sup>25</sup>.

## **CONCLUSION**

This study focuses on the evaluation of remote access systems for managing electronic resources in academic libraries across Delhi. The main finding indicates that these systems greatly enhance the availability of digital materials, but there are varying levels of efficiency among different institutions. The key factors contributing to these disparities include the quality of the technology infrastructure, the level of user training, and the seamless integration of such technologies with library services. The implications of this research are significant in promoting the digital transformation of academic libraries. It is crucial to have remote access systems that are efficient to support online learning and research, given the increased reliance on digital content following the COVID-19 pandemic. Libraries that invest in robust, user-friendly systems can better serve their users, leading to improved educational outcomes and more productive research. The study in question has certain limitations that must be taken into account. For one, the research was conducted only in Delhi, making it difficult to generalize the results to other regions. Additionally, the study relied on user surveys, which may have been subject to response biases. Given the rapid pace of technological change, the findings may become outdated over time as new systems and upgrades are introduced. To gain a broader perspective on the effectiveness of remote access systems, similar assessments could be carried out in other areas or countries. Future studies could also examine the long-term impact of these systems on academic performance and research output. Moreover, it would be valuable to explore how user training and support affect system efficiency, as well as to conduct a longitudinal study to track changes over time as technology evolves.

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