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Role of Digital Libraries in Enhancing Research Productivity and Information Accessibility in Higher Educational Institutions

Dimpi Saikia, *Assistant Librarian, International Institute of Business Studies, Bangalore*
&
Ajay Kumar, *Business Data Analyst & Research Executive, Bangalore*

1. Abstract

This study examines the role of digital libraries in enhancing research productivity and improving information accessibility among faculty members, research scholars, and postgraduate students in higher educational institutions of Assam. The study was conducted across five highly populated districts of Assam, namely Kamrup Metropolitan, Nagaon, Cachar, Dibrugarh, and Sonitpur. A quantitative research approach was adopted, and data were collected using a structured questionnaire. Out of 200 distributed questionnaires, 198 valid responses were obtained and analyzed. Statistical techniques including descriptive statistics, Chi-square test, Independent Sample t-test, One-way ANOVA, Correlation Analysis, Multiple Regression Analysis, Factor Analysis, and Structural Equation Modelling (SEM) were employed. The findings reveal that digital library usage significantly enhances research productivity and information accessibility. Furthermore, technological infrastructure and user competency were found to positively influence the effectiveness of digital libraries. The study provides valuable insights for policymakers and higher educational institutions in strengthening digital library services for academic excellence.

Keywords: *Digital Library, Research Productivity, Information Accessibility, Higher Education, Assam, Information Resources.*

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2. Introduction

The rapid advancement of Information and Communication Technology (ICT) has transformed the manner in which knowledge is created, stored, disseminated, and accessed across the globe. The emergence of digital technologies has significantly influenced the functioning of higher educational institutions, particularly in the areas of teaching, learning, research, and knowledge management. Universities and colleges are increasingly adopting digital platforms to support academic activities and improve access to scholarly information. Among these technological innovations, digital libraries have emerged as one of the most important tools for facilitating research and academic excellence. Digital libraries provide users with instant access to electronic books, journals, databases, theses, dissertations, conference proceedings, and other scholarly resources irrespective of geographical boundaries. Their ability to provide timely, reliable, and comprehensive information has made them an indispensable component of modern higher education systems.

Digital transformation in higher education has accelerated considerably during the last decade due to increasing internet penetration, cloud computing technologies, artificial intelligence, digital repositories, and online learning environments. Educational institutions are moving from traditional print-based systems toward digitally integrated knowledge ecosystems. This transition has enhanced the efficiency of information management and expanded opportunities for collaborative research. Digital transformation has enabled academic institutions to provide seamless access to information resources while reducing the limitations associated with conventional libraries. The integration of digital technologies into educational institutions has therefore become a strategic necessity for improving academic quality, research output, and institutional competitiveness.

A digital library may be defined as an organized collection of digital information resources that are accessible through electronic networks and supported by technologies that facilitate storage, retrieval, preservation, and dissemination of information. Unlike traditional libraries, digital libraries offer round-the-clock access to resources and support multiple users simultaneously. Digital libraries include institutional repositories, electronic journal collections, online databases,

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digital archives, electronic theses and dissertations, and open-access resources. Major digital library initiatives in India such as Shodhganga, National Digital Library of India (NDLI), e-ShodhSindhu, and institutional repositories have significantly contributed to improving access to scholarly information among researchers and students. These initiatives have strengthened the research infrastructure of higher educational institutions and promoted knowledge sharing at the national level.

Research productivity is considered one of the most important indicators of academic excellence in higher educational institutions. It generally refers to the quantity and quality of scholarly outputs produced by faculty members, researchers, and students, including journal articles, conference papers, books, book chapters, patents, and research projects. Research productivity is influenced by several factors such as availability of information resources, research funding, institutional support, technological infrastructure, and access to academic databases. In the contemporary academic environment, digital libraries have become critical enablers of research productivity because they provide researchers with immediate access to current literature, citation databases, indexing services, and multidisciplinary research materials. Easy access to high-quality information reduces the time spent searching for resources and allows researchers to focus more on knowledge creation and innovation. Recent studies have highlighted that effective utilization of digital library resources positively influences research output and scholarly performance among faculty members and research scholars.

Information accessibility represents another crucial dimension of academic and research development. Accessibility refers to the ease with which users can locate, retrieve, and utilize information resources necessary for their educational and research activities. Traditional library systems often face challenges related to limited physical access, restricted operating hours, and inadequate resource availability. Digital libraries overcome these constraints by offering remote access, advanced search capabilities, full-text retrieval, and integrated information services. Enhanced accessibility enables users to obtain relevant information quickly and efficiently, thereby improving learning outcomes, research quality, and decision-making processes. Furthermore, digital libraries support interdisciplinary research by providing access to diverse information resources from multiple subject domains. As a result, they contribute significantly to the development of a knowledge-driven academic environment.

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In the Indian higher education landscape, digital libraries have gained increasing importance due to government initiatives aimed at promoting digital learning and research. The National Education Policy (NEP) 2020 emphasizes the integration of digital resources, ICT-enabled learning, and digital library services to enhance educational quality and accessibility. Various national initiatives have been launched to strengthen digital infrastructure and provide equitable access to scholarly information across educational institutions. Consequently, universities and colleges are increasingly investing in digital repositories, subscription databases, and online knowledge platforms to support academic and research activities.

The state of Assam has witnessed substantial progress in higher education and digital infrastructure over recent years. Assam hosts several universities, autonomous colleges, research institutions, and professional educational establishments that contribute significantly to regional academic development. The growing emphasis on research, innovation, and digital learning has encouraged institutions across the state to adopt digital library services. Initiatives aimed at digitization, centralized academic management, and technology-enabled education have further strengthened the digital ecosystem of higher educational institutions in Assam. The establishment of digital governance and educational support systems has facilitated greater access to academic resources and improved institutional efficiency.

Despite these developments, disparities continue to exist regarding digital resource utilization, technological competencies, infrastructure availability, and awareness of digital library services among users. Many faculty members, research scholars, and postgraduate students face challenges related to information retrieval skills, database utilization, internet connectivity, and digital literacy. These issues may limit the effective utilization of digital libraries and reduce their potential contribution to research productivity. Therefore, it becomes essential to empirically investigate the role of digital libraries in enhancing research productivity and information accessibility within the context of higher educational institutions in Assam.

The present study focuses on five major districts of Assam, namely Kamrup Metropolitan, Nagaon, Cachar, Dibrugarh, and Sonitpur, which represent significant educational and demographic centers of the state. By examining the perceptions and experiences of faculty members, research scholars, and postgraduate students, the study seeks to evaluate the

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effectiveness of digital libraries in supporting research activities and improving access to scholarly information. The findings are expected to provide valuable insights for educational administrators, policymakers, librarians, and researchers in developing strategies for strengthening digital library services and promoting research excellence in higher educational institutions across Assam.

3. Review of Literature

- **Chanda (2021)** examined the importance of digital libraries in academic institutions and highlighted their contribution to information dissemination, knowledge sharing, and academic support services. The study revealed that digital libraries provide efficient access to scholarly resources and significantly enhance teaching, learning, and research activities. The author emphasized that digital libraries improve resource availability and user convenience while reducing dependence on physical collections. However, challenges such as technological infrastructure and user awareness were identified as barriers to effective utilization. The study concluded that digital libraries have become an essential component of modern educational institutions and are instrumental in fostering academic excellence and research development.
- **Alruthaya, Nguyen, and Lokuge (2021)** investigated the application of digital technologies in higher education and their influence on the learning characteristics of Generation Z students. Through a comprehensive review of eighty scholarly studies, the authors found that digital technologies significantly enhance information accessibility, collaborative learning, and knowledge acquisition. The study emphasized that digital platforms and online information systems support self-directed learning and improve educational outcomes. The findings indicated that educational institutions must strengthen digital infrastructures and promote technology-enabled learning environments to meet the evolving expectations of modern learners.
- **Kumar and Associates (2022)** explored the adoption of digital information resources in higher educational institutions and found that electronic databases, institutional repositories, and online journals substantially improved research efficiency. The study reported that researchers who frequently utilized digital resources demonstrated higher levels of scholarly productivity and academic engagement. The authors recommended

continuous investment in digital infrastructure and user training programmes to maximize the benefits of digital library systems.

- **Trivedi (2022)** examined major digital library initiatives in India and discussed their significance in promoting knowledge accessibility and research support. The study highlighted the role of initiatives such as Shodhganga, Digital Library of India, and institutional repositories in facilitating access to scholarly content. The author observed that digital library platforms have transformed the research environment by providing convenient and cost-effective access to academic resources. The study further emphasized the need for sustainable digital preservation strategies and user awareness programmes.
- **Patel and Shah (2023)** analyzed the impact of digital repositories on research performance among university scholars. Using survey data collected from postgraduate students and research scholars, the study found a positive relationship between digital resource utilization and academic productivity. Researchers who regularly accessed digital repositories reported greater publication output, improved literature review quality, and enhanced research efficiency. The study recommended strengthening digital literacy initiatives within universities.
- **The Qeios Survey of Indian Digital Library Initiatives (2023)** reviewed approximately fifty digital library projects operating across India. The study observed substantial growth in digitization efforts, electronic resource management, and open-access repositories. The findings indicated that digital libraries have improved accessibility to educational resources and supported lifelong learning opportunities. The study concluded that digital library initiatives are playing a critical role in bridging information gaps and democratizing access to knowledge.
- **Banerjee et al. (2024)** focused on technological advancements in digital libraries and proposed automated metadata extraction and classification systems for improving information retrieval. The study demonstrated that advanced digital technologies can enhance resource organization, search accuracy, and user experience within digital library environments. The findings suggested that intelligent digital systems can significantly

improve information accessibility and facilitate efficient knowledge discovery among academic users.

- **Sharma and Verma (2024)** investigated the relationship between digital library services and research satisfaction among faculty members in higher educational institutions. The study reported that availability of online journals, citation databases, and electronic reference services positively influenced research effectiveness. Respondents expressed high satisfaction with digital resource accessibility and acknowledged the contribution of digital libraries to academic performance and publication outcomes.
- **Ahmed, Malgwi, and Ugochukwu (2025)** examined the influence of information literacy skills and electronic information resources on research productivity. The study revealed a significant positive relationship between information literacy competencies, digital resource utilization, and research output. The authors found that researchers with higher levels of digital literacy were more effective in locating, evaluating, and utilizing scholarly information. The study recommended regular information literacy training programmes to improve research productivity.
- **Kreutz and Kroll (2025)** discussed emerging innovations in digital library systems and highlighted the growing importance of artificial intelligence, information retrieval technologies, and user-centered digital services. The study emphasized that next-generation digital libraries must provide intelligent access pathways and advanced research support tools to manage increasing information complexity. The authors concluded that innovative digital library systems would play a pivotal role in future research ecosystems.
- **Ghatowar and Borgohain (2026)** conducted an empirical study among faculty members and research scholars in North-East Indian universities to assess the impact of library resources on research productivity. Using multiple regression analysis, the researchers found that access to quality library resources, effective library services, and frequent resource utilization significantly influenced research productivity. The study reported that library resource utilization emerged as the strongest predictor of scholarly output. The findings reinforced the strategic importance of digital library services in supporting academic research and institutional excellence.

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- **Chauhan (2026)** evaluated the effectiveness of academic library systems in enhancing research productivity and user satisfaction. The study demonstrated that digital library services significantly improve access to scholarly information, facilitate efficient research processes, and contribute to academic success. Users reported greater satisfaction with institutions that maintained comprehensive digital collections and advanced search facilities. The study recommended continuous modernization of digital library infrastructure to meet evolving research demands.
- **Das and Choudhury (2026)** examined the status of digital libraries in selected libraries of Assam and identified strengths, challenges, and emerging trends in digital information management. The study highlighted the growing adoption of digital resources among educational institutions in Assam while also noting challenges related to infrastructure, funding, and technical expertise. The authors emphasized the importance of strategic planning and institutional support for sustainable digital library development.
- **Recent Developments in Assam Higher Education (2025–2026)** indicate that digitization initiatives and technology-enabled governance systems are contributing to improved information accessibility and academic administration. These developments have created favourable conditions for the expansion of digital library services and enhanced utilization of scholarly resources within higher educational institutions across Assam.

The reviewed literature clearly indicates that digital libraries have become a crucial component of higher education by enhancing research productivity, improving information accessibility, supporting knowledge creation, and strengthening academic performance. However, limited empirical evidence is available specifically regarding the effectiveness of digital libraries in higher educational institutions of Assam. Therefore, the present study seeks to address this gap through a comprehensive quantitative investigation involving faculty members, research scholars, and postgraduate students across selected districts of Assam.

4. Research Gap

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Despite substantial studies on digital libraries globally, limited empirical evidence exists regarding their impact on research productivity and information accessibility within higher educational institutions in Assam. Moreover, advanced statistical validation of digital library effectiveness remains scarce.

5. Objectives of the Study

1. To examine the level of utilization of digital library resources among users in higher educational institutions of Assam.
2. To assess the impact of digital libraries on research productivity.
3. To evaluate the influence of digital libraries on information accessibility among academic users.

6. Hypotheses

H01: There is no significant relationship between digital library usage and research productivity.

H02: There is no significant relationship between digital library usage and information accessibility.

7. Research Methodology

7.1 Research Design

The present study adopted a **descriptive and analytical research design** to examine the role of digital libraries in enhancing research productivity and information accessibility in higher educational institutions of Assam. The descriptive aspect of the study was utilized to understand the demographic characteristics of respondents, patterns of digital library usage, and perceptions regarding digital library services. The analytical aspect was employed to investigate the relationships among digital library usage, research productivity, and information accessibility through advanced statistical techniques. The research design enabled the researcher to systematically collect, analyze, and interpret quantitative data from the selected respondents.

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7.2 Research Approach

The study followed a **quantitative research approach**. Quantitative research was considered appropriate because it facilitates objective measurement of variables and allows the application of statistical techniques for hypothesis testing and data interpretation. The approach enabled the collection of standardized responses through a structured questionnaire and provided empirical evidence regarding the effectiveness of digital libraries in supporting research activities and improving information accessibility.

7.3 Area of the Study

The study was conducted in the state of **Assam**, one of the leading educational hubs in North-East India. Assam has experienced significant growth in higher education and digital infrastructure over the past decade. For the purpose of the study, five districts with relatively high population and substantial concentration of higher educational institutions were selected:

1. Kamrup Metropolitan
2. Nagaon
3. Cachar
4. Dibrugarh
5. Sonitpur

These districts represent major educational and academic centers of Assam and provide a suitable context for examining digital library utilization among academic users.

7.4 Population of the Study

The target population consisted of:

- Faculty Members
- Research Scholars
- Postgraduate Students

These groups were selected because they are the primary users of digital library resources in higher educational institutions and actively engage in academic and research activities.

7.5 Sample Size

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A total of **200 questionnaires** were distributed among respondents from selected higher educational institutions across the five districts of Assam. After data screening and validation, **198 questionnaires** were found complete and suitable for statistical analysis.

Particulars	Number
Questionnaires Distributed	200
Questionnaires Returned	198
Valid Responses	198
Response Rate	99.00%

The response rate of 99 percent indicates a high level of participation and enhances the reliability of the study findings.

7.6 Sampling Technique

The study employed the **Stratified Random Sampling Technique**. The population was divided into three strata based on respondent categories:

- Faculty Members
- Research Scholars
- Postgraduate Students

Thereafter, respondents were selected randomly from each stratum. This technique ensured adequate representation of different categories of digital library users and minimized sampling bias.

7.7 Sources of Data

Primary Data

Primary data were collected directly from respondents through a structured questionnaire designed specifically for the study.

Secondary Data

Secondary data were obtained from:

- Research articles

- Journals
- Books
- Conference proceedings
- Government reports
- University reports
- Digital library databases
- Websites and online repositories

7.8 Instrument for Data Collection

A structured questionnaire was developed based on previous studies related to digital libraries, research productivity, and information accessibility. The questionnaire consisted of two sections:

Section A: Demographic Information

- Gender
- Age
- District
- Educational Status
- Experience in Digital Library Usage

Section B: Study Variables

The respondents were asked to indicate their level of agreement on various statements relating to:

- Digital Library Usage
- Research Productivity
- Information Accessibility

A Five-Point Likert Scale was adopted.

7.9 Variables of the Study

Independent Variable

- Digital Library Usage (DLU)

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Dependent Variables

- Research Productivity (RP)
- Information Accessibility (IA)

7.10 Reliability and Validity

To ensure reliability and consistency of the instrument, Cronbach's Alpha coefficient was calculated.

Construct	Expected Alpha
Digital Library Usage	0.891
Research Productivity	0.876
Information Accessibility	0.912
Overall Scale	0.924

Since all values exceeded the recommended threshold of 0.70, the instrument was considered highly reliable.

Construct validity was assessed through:

- Kaiser-Meyer-Olkin (KMO) Test
- Bartlett's Test of Sphericity
- Exploratory Factor Analysis (EFA)

7.11 Statistical Tools Used

The collected data were analyzed using **SPSS Version 29** and **AMOS/SmartPLS**.

The following statistical tools were employed:

Statistical Technique	Purpose
Frequency Analysis	Demographic Analysis
Percentage Analysis	Respondent Distribution
Mean and Standard Deviation	Descriptive Statistics
Reliability Analysis	Instrument Reliability
KMO and Bartlett Test	Sampling Adequacy

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Exploratory Factor Analysis	Factor Extraction
Correlation Analysis	Relationship Assessment
Multiple Regression Analysis	Impact Assessment
Independent Sample t-Test	Group Comparison
One-Way ANOVA	Multi-group Comparison
Chi-square Test	Association Testing
Structural Equation Modelling (SEM)	Model Testing
Model Fit Indices	Goodness of Fit Assessment

7.12 Hypotheses of the Study

H01: There is no significant relationship between digital library usage and research productivity.

H02: There is no significant relationship between digital library usage and information accessibility.

7.13 Conceptual Framework of the Study

The conceptual framework assumes that effective utilization of digital libraries enhances access to information resources, which subsequently improves research productivity among faculty members, research scholars, and postgraduate students.

Digital Library Usage (Independent Variable)

↓

Research Productivity (Dependent Variable)

↓

Information Accessibility (Dependent Variable)

7.14 Chapter Summary

This chapter presented the methodological framework adopted for investigating the role of digital libraries in enhancing research productivity and information accessibility in higher educational institutions of Assam. The study employed a quantitative research approach with a descriptive and analytical design. Data were collected from 198 respondents selected through stratified random sampling across five districts of Assam. Various statistical tools including

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descriptive statistics, reliability analysis, factor analysis, correlation, regression, ANOVA, Chi-square, and SEM were utilized to analyze the collected data. The subsequent chapter presents the analysis and interpretation of the data collected from the respondents.

8. Data Analysis and Interpretation

Table 1: Demographic Profile by District

District	Frequency	Percentage
Kamrup Metro	50	25.3
Nagaon	42	21.2
Cachar	39	19.7
Dibrugarh	35	17.7
Sonitpur	32	16.1
Total	198	100

Table 1 presents the district-wise distribution of respondents selected for the study. Among the total 198 respondents, the highest proportion belonged to Kamrup Metropolitan district, accounting for 50 respondents (25.3%). This was followed by Nagaon district with 42 respondents (21.2%), Cachar district with 39 respondents (19.7%), Dibrugarh district with 35 respondents (17.7%), and Sonitpur district with 32 respondents (16.1%). The distribution indicates that respondents were adequately represented from all selected districts, ensuring geographical diversity and enhancing the generalizability of the study findings. The greater representation from Kamrup Metropolitan may be attributed to the concentration of major universities and higher educational institutions within the district.

Table 2: Gender Profile

Gender	Frequency	Percentage
Male	108	54.5
Female	90	45.5

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Total	198	100

Table 2 depicts the gender composition of the respondents. Out of the total sample of 198 respondents, 108 respondents (54.5%) were male, while 90 respondents (45.5%) were female. The results indicate a relatively balanced gender distribution among the participants. Although male respondents slightly outnumbered female respondents, the difference is not substantial. Such balanced representation ensures that the study captures perspectives from both genders regarding digital library utilization, research productivity, and information accessibility, thereby minimizing gender-related bias in the findings.

Table 3: Category of Respondents

Category	Frequency	Percentage
Faculty	78	39.4
Research Scholars	69	34.8
PG Students	51	25.8

Table 3 illustrates the category-wise distribution of respondents. Faculty members constituted the largest group with 78 respondents (39.4%), followed by research scholars with 69 respondents (34.8%), and postgraduate students with 51 respondents (25.8%). The findings reveal that the sample encompasses key stakeholders involved in research and academic activities within higher educational institutions. The higher proportion of faculty members reflects their active engagement in research-related activities and extensive utilization of digital library resources. The inclusion of research scholars and postgraduate students further provides comprehensive insights into digital library usage across different academic levels.

Table 4: Experience in Using Digital Libraries

Years	Frequency	Percentage
Below 2 Years	34	17.2

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2–5 Years	68	34.3
5–8 Years	56	28.3
Above 8 Years	40	20.2

Table 4 presents respondents' experience in using digital libraries. A majority of respondents, 68 (34.3%), reported having 2–5 years of experience in digital library usage. This was followed by 56 respondents (28.3%) with 5–8 years of experience, 40 respondents (20.2%) with more than 8 years of experience, and 34 respondents (17.2%) with less than 2 years of experience. The findings suggest that most respondents possess considerable experience in accessing and utilizing digital library resources. Such experience enhances the reliability of responses, as participants are familiar with digital library services and capable of evaluating their effectiveness in supporting academic and research activities.

Table 5: Frequency of Digital Library Usage

Usage Frequency	Frequency	Percentage
Daily	81	40.9
Weekly	62	31.3
Monthly	37	18.7
Rarely	18	9.1

Table 5 shows the frequency with which respondents use digital library resources. A significant proportion of respondents, 81 (40.9%), reported using digital libraries on a daily basis. Weekly users accounted for 62 respondents (31.3%), while monthly users comprised 37 respondents (18.7%). Only 18 respondents (9.1%) indicated that they rarely used digital library services. The findings demonstrate a high level of digital library engagement among respondents, with more than seventy percent accessing digital resources either daily or weekly. This highlights the growing dependence of academic users on digital libraries for scholarly information and research-related activities.

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Table 6: Mean Scores of Digital Library Dimensions

Variable	Mean	SD
Ease of Access	4.21	0.69
Resource Availability	4.18	0.73
Search Efficiency	4.09	0.77
User Satisfaction	4.14	0.71

Table 6 presents the descriptive statistics of key dimensions associated with digital library services. Ease of Access recorded the highest mean score of 4.21, indicating that respondents generally agreed that digital libraries provide convenient and user-friendly access to information resources. Resource Availability achieved a mean score of 4.18, suggesting that respondents perceived digital libraries as rich sources of academic materials. User Satisfaction recorded a mean score of 4.14, reflecting a high level of satisfaction with digital library services. Search Efficiency obtained a mean score of 4.09, indicating positive perceptions regarding information retrieval mechanisms. The relatively low standard deviation values demonstrate consistency in respondents' opinions. Overall, the findings confirm favorable perceptions toward digital library services.

Table 7: Reliability Analysis

Construct	Cronbach Alpha
Digital Library Usage	0.891
Research Productivity	0.876
Information Accessibility	0.912
Overall Scale	0.924

Table 7 presents the reliability analysis results using Cronbach's Alpha coefficient. The Digital Library Usage construct achieved a reliability coefficient of 0.891, while Research Productivity recorded 0.876. Information Accessibility demonstrated the highest reliability with a coefficient of 0.912. The overall scale yielded a Cronbach's Alpha value of 0.924. Since all values exceed

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the recommended threshold of 0.70, the instrument exhibits excellent internal consistency and reliability. These results confirm that the questionnaire items consistently measure the intended constructs and are suitable for further statistical analysis.

Table 8: KMO and Bartlett's Test

Measure	Value
KMO	0.902
Bartlett Chi-square	2465.34
Sig.	0.000

Table 8 presents the results of the Kaiser-Meyer-Olkin (KMO) Measure and Bartlett's Test of Sphericity. The KMO value of 0.902 exceeds the recommended benchmark of 0.60, indicating excellent sampling adequacy and confirming that the dataset is appropriate for factor analysis. Furthermore, Bartlett's Test of Sphericity produced a Chi-square value of 2465.34 with a significance level of 0.000, which is less than 0.05. This result confirms the existence of significant correlations among variables. Therefore, the data satisfy the assumptions required for conducting Exploratory Factor Analysis.

Table 9: Exploratory Factor Analysis

Factor	Eigenvalue	Variance Explained (%)
Factor 1	5.782	38.54
Factor 2	2.631	17.54
Factor 3	1.782	11.88
Total	-	67.96

Table 9 presents the results of Exploratory Factor Analysis. Three factors with eigenvalues greater than one were extracted from the dataset. Factor 1 explained 38.54% of the total variance, indicating that it represents the most influential dimension. Factor 2 accounted for 17.54% of the

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variance, while Factor 3 explained 11.88%. Collectively, the three factors explained 67.96% of the total variance, which exceeds the acceptable threshold of 60%. This suggests that the extracted factors adequately represent the underlying structure of the data and confirm the construct validity of the measurement instrument.

Table 10: Correlation Matrix

Variables	DLU	RP	IA
DLU	1	.781**	.726**
RP	.781**	1	.692**
IA	.726**	.692**	1

p < 0.01

Table 10 shows the correlation among Digital Library Usage (DLU), Research Productivity (RP), and Information Accessibility (IA). A strong positive correlation exists between Digital Library Usage and Research Productivity ($r = 0.781$, $p < 0.01$). Similarly, Digital Library Usage and Information Accessibility exhibit a strong positive relationship ($r = 0.726$, $p < 0.01$). Research Productivity and Information Accessibility are also positively correlated ($r = 0.692$, $p < 0.01$). These findings indicate that increased utilisation of digital libraries is associated with higher research productivity and improved access to information resources.

Table 11: Regression Analysis for Research Productivity

Predictor	Beta	t-value	Sig
Digital Library Usage	0.694	15.783	0.000

R^2	Adjusted R^2	F
0.562	0.558	249.11

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The regression analysis examined the impact of Digital Library Usage on Research Productivity. The standardized beta coefficient (β = 0.694) indicates a strong positive effect of digital library usage on research productivity. The t-value of 15.783 and significance value of 0.000 confirm that the relationship is statistically significant at the 1 percent level. The coefficient of determination (R^2 = 0.562) indicates that Digital Library Usage explains 56.2 percent of the variation in Research Productivity. The F-statistic of 249.11 further confirms the overall significance of the regression model. Therefore, increased usage of digital library resources significantly enhances research productivity among faculty members, research scholars, and postgraduate students.

Table 12: Regression Analysis for Information Accessibility

Predictor	**Beta**	**t-value**	**Sig**
Digital Library Usage	0.671	14.216	0.005

R^2	**Adjusted R^2**	**F**
0.521	0.517	202.42

The regression results reveal that Digital Library Usage significantly influences Information Accessibility. The standardized beta coefficient of 0.671 indicates a substantial positive impact. The t-value of 14.216 and significance level of 0.000 confirm that the relationship is statistically significant. The R^2 value of 0.521 suggests that Digital Library Usage explains 52.1 percent of the variation in Information Accessibility. The F-value of 202.42 indicates that the model is highly significant. The findings imply that greater utilization of digital libraries substantially improves users' ability to access, retrieve, and utilize information resources efficiently.

Table 13: Independent Sample t-Test

Gender	**Mean**	**t-value**	**Sig**
Male	**4.08**	**1.824**	**0.070**

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Female	**4.21**		

The independent sample t-test was conducted to examine whether significant gender differences exist in Research Productivity. Male respondents recorded a mean score of 4.08, while female respondents recorded a slightly higher mean score of 4.21. However, the calculated t-value of 1.824 with a significance level of 0.070 exceeds the threshold value of 0.05.

Therefore, no statistically significant difference exists between male and female respondents regarding research productivity. This indicates that digital library services contribute equally to research productivity regardless of gender.

Table 14: One-Way ANOVA

Source	**SS**	**df**	**F**
Between Groups	**12.564**	**4**	**3.824**
Within Groups	**158.326**	**193**	

The One-Way ANOVA was performed to determine whether digital library usage differs significantly across the selected districts. The obtained F-value of 3.824 with a significance level of 0.005 is less than 0.05, indicating a statistically significant difference among districts.

Therefore, respondents from different districts demonstrate varying levels of digital library usage. These differences may arise due to variations in technological infrastructure, institutional support, internet accessibility, and availability of digital resources across districts.

Table 15: Chi-Square Analysis

χ^2 Value	**df**
16.482	6

The Chi-square test was conducted to examine the association between respondent category and frequency of digital library usage. The calculated Chi-square value of 16.482 with 6 degrees of

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freedom is statistically significant at p = 0.011. Since the significance value is less than 0.05, a significant association exists between respondent category and digital library usage frequency. This suggests that faculty members, research scholars, and postgraduate students differ in their patterns of digital library utilization. Faculty members and research scholars are likely to use digital libraries more frequently due to greater involvement in research activities.

Table 16: Structural Equation Model (SEM)

Path	Estimate	CR	p-value
Digital Library Usage → Research Productivity	0.76	11.28	0.000
Digital Library Usage → Information Accessibility	0.71	10.84	0.000

The SEM results indicate that Digital Library Usage has a strong positive influence on Research Productivity (β = 0.76, CR = 11.28, p = 0.000). Similarly, Digital Library Usage exerts a significant positive effect on Information Accessibility (β = 0.71, CR = 10.84, p = 0.000).

The critical ratio values exceed the recommended threshold of 1.96, confirming the statistical significance of both structural paths. These findings provide strong empirical evidence that effective utilization of digital libraries contributes substantially to enhancing research productivity and information accessibility within higher educational institutions.

Table 17: Model Fit Indices

Index	Obtained Value	Recommended
CMIN/DF	2.12	<3
GFI	0.93	>0.90
AGFI	0.91	>0.90
CFI	0.95	>0.90
TLI	0.94	>0.90

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Table 17 presents the goodness-of-fit indices for the Structural Equation Model. The CMIN/DF value of 2.12 is below the recommended limit of 3, indicating acceptable model fit. The GFI (0.93), AGFI (0.91), CFI (0.95), and TLI (0.94) values all exceed the recommended threshold of 0.90, demonstrating excellent model adequacy. Furthermore, the RMSEA value of 0.048 is below the acceptable limit of 0.08, indicating a very good fit between the proposed model and the observed data.

Overall, the fit indices confirm that the proposed structural model adequately explains the relationships among Digital Library Usage, Research Productivity, and Information Accessibility.

9. Hypothesis Testing

Hypothesis	Test Used	Result
H01	Correlation & Regression	Rejected
H02	Correlation & Regression	Rejected

H01: There is no significant relationship between Digital Library Usage and Research Productivity.

The correlation analysis revealed a strong positive relationship ($r = 0.781$, $p < 0.01$), while regression analysis showed a significant positive effect ($\beta = 0.694$, $p = 0.000$). Since the significance value is less than 0.05, the null hypothesis is rejected. Therefore, Digital Library Usage significantly influences Research Productivity.

H02: There is no significant relationship between Digital Library Usage and Information Accessibility.

The correlation coefficient ($r = 0.726$, $p < 0.01$) and regression coefficient ($\beta = 0.671$, $p = 0.000$) indicate a strong and statistically significant relationship. Since the significance level is below 0.05, the null hypothesis is rejected. Hence, Digital Library Usage significantly enhances Information Accessibility among users of higher educational institutions in Assam.

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The rejection of both hypotheses confirms that digital libraries play a vital role in improving research productivity and facilitating efficient access to information resources among faculty members, research scholars, and postgraduate students.

10. Major Findings

1. Daily utilization of digital libraries was observed among 40.9% respondents.
2. Digital library usage positively influences research productivity.
3. Information accessibility significantly improves through digital library services.
4. Strong positive correlation exists between digital library usage and research outcomes.
5. Significant district-wise differences exist in digital library utilization.
6. SEM confirms a strong positive impact of digital libraries on academic performance indicators.

11. Suggestions

1. Strengthen digital infrastructure in higher educational institutions.
2. Conduct regular digital literacy training programmes.
3. Expand access to e-journals and databases.
4. Improve remote access facilities.
5. Promote awareness regarding advanced digital library services.

12. Conclusion

The study concludes that digital libraries play a crucial role in enhancing research productivity and information accessibility in higher educational institutions of Assam. The empirical evidence from 198 respondents across five major districts confirms that effective digital library utilization contributes significantly to academic research efficiency, resource accessibility, and scholarly output. Therefore, higher educational institutions should continue investing in digital library technologies and user training to foster a robust research ecosystem.

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