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Evaluating The Utilization Of Web-Based Library Resources In Premier Indian Institutions: A Comparative Study Of Iits And Iims

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In the digital age, academic libraries are rapidly transitioning from traditional print collections to dynamic, web-based resources. This shift has redefined how knowledge is accessed, managed, and disseminated in higher education institutions. This study investigates the utilization of web-based library resources in premier Indian institutions, specifically the Indian Institutes of Technology (IITs) and Indian Institutes of Management (IIMs). With the increasing integration of digital tools in higher education, e-resources have become essential components of academic libraries. The research adopts a mixed-methods approach, combining quantitative surveys and qualitative interviews to assess user behavior, satisfaction levels, technological infrastructure, and the challenges associated with e-resource implementation. A total of 385 respondents, including students, faculty, researchers, and library professionals, participated from selected IITs and IIMs. Key findings reveal that while both institutions exhibit strong adoption of e-resources, IITs demonstrate slightly higher levels of usage and satisfaction. Critical factors such as infrastructure, funding, administrative support, and staff training significantly influence the success of digital library services. The study also highlights organizational gaps, such as inconsistent metadata practices and limited user feedback integration. These findings underscore the need for a more user-centered, policy-aligned approach to digital resource management. By providing a comparative assessment, this research offers valuable insights for enhancing digital library strategies in Indian higher education and contributes to the global discourse on digital transformation in academic libraries.

Keywords: Web-based resources; Academic libraries; IITs and IIMs; User satisfaction

1. Introduction:

The 21st century has seen a significant transformation in how information is produced, disseminated, and accessed, largely driven by the proliferation of electronic resources (e-resources) and the widespread adoption of Information and Communication Technologies (ICT). Such digital transformation has essentially reformed academic environments and put e-resources as a vital component in education and research. Once considered as luxury has now become an absolute necessity for modern libraries, advancing their operational models and

services. **(reference).** The consistent demand of e-resources as a key element of modern librarianship, rather than a temporary demand, indicates an irreversible and fundamental change. Such evolution confirms that libraries continuously innovate and adapt.

The incorporation of e-resources into library collections has been instrumental in enhancing the efficiency and effectiveness of information dissemination. Digital resources offer several advantages over traditional print materials, including remote access, simultaneous usage by multiple users, and the ability to integrate multimedia elements that enrich the learning experience (Jotangia, 2020).

For instance, a study by Spjeldnæs and Karlsen, 2024 highlights how e-books have revolutionized library services by facilitating group study and research through unlimited access, supporting librarians as key players in research and education, and providing data that helps libraries support their users and the wider institution (Spjeldnæs and Karlsen, 2024). Moreover, the utilization of e-resources has been pivotal during unprecedented events such as the COVID-19 pandemic.

In India, premier institutions such as the Indian Institutes of Technology (IITs) and Indian Institutes of Management (IIMs) have been at the forefront of adopting and integrating e-resources into their academics. These institutions, known for their excellence worldwide and rely heavily on digital resources to support research, teaching, and learning. Understanding how these institutions utilize e-resources provides valuable insights into best practices, challenges, and the future direction of digital library services in higher education institutions (Jha and Babel, 2022; Sharma and Gupta, 2022).

Libraries worldwide faced the challenge of maintaining access to resources amidst lockdowns and social distancing measures (Alajmi and Albudaiwi, 2021). An example is Stellenbosch University, which recorded a 71% increase in the usage of content supplied by key vendors during the first three months of the lockdown compared to the same period in the previous year (CHELSA, 2021).

The future of e-resources in libraries is poised for increased integration of AI, machine learning, and data analytics to personalize user experiences and optimize resource management through features like personalized recommendations and seamless multi-device access. Moreover, initiatives aimed at expanding access to e-resources in developing countries are gaining momentum. Projects like HINARI and AGORA, supported by publishers like Elsevier, aim to bridge the information divide by providing public institutions in developing countries with online access to major journals in biomedical and agricultural sciences, respectively (Katikireddi, 2004; Juez-Hernandez et al., 2023).

While several studies have examined the use of e-resources in academic settings globally, there is a notable gap in comparative analyses focused specifically on leading Indian institutions like IITs and IIMs. The objective of the research is to comprehensively examine the utilization of web-based library resources in premier Indian academic institutions, specifically the Indian

Institutes of Technology (IITs) and Indian Institutes of Management (IIMs). The study aims to evaluate patterns of usage, user satisfaction, technological infrastructure, and the challenges associated with implementing and managing e-resources in these institutions. By employing a mixed-methods approach, the research seeks to highlight both the commonalities and differences in digital library practices between the two institutional categories, offering insights into best practices and areas for strategic improvement in digital resource management and user engagement.

2. Methods:

This study adopts a mixed-methods research approach that combines quantitative and qualitative techniques to comprehensively evaluate the utilization of web-based library resources in selected IITs and IIMs. The primary objective is to assess the usage patterns, user satisfaction, technological infrastructure, and challenges related to the adoption of e-resources in these premier institutions.

2.1. Research Design

The research is structured as a descriptive and comparative study. The descriptive design enables the investigation of current trends in e-resource usage, while the comparative element highlights differences and similarities between IIT and IIM libraries. A cross-sectional survey method was employed to gather data from various stakeholders, including students, faculty members, research scholars, and library professionals, at the selected institutions. This method allows for an in-depth understanding of user behavior and institutional practices within a defined timeframe.

2.2. Population and Sampling

The target population includes users of library resources in five IITs and five IIMs across India. A purposive sampling technique was adopted to select institutions that are geographically and academically diverse. The participant sample comprises users who have had regular access to and interaction with web-based resources. Stratified sampling was further employed within each institution to ensure balanced representation from various user groups such as students (undergraduate and postgraduate), faculty, and library staff. In total, 300 respondents participated in the survey — 150 from IITs and 150 from IIMs.

2.3. Data Collection Tools

A structured questionnaire was designed as the primary data collection instrument. The questionnaire was divided into four sections:

1. Demographic profile of the respondents (institution, role, gender, age group).
2. Types and frequency of web-based resource usage (e-books, e-journals, databases, institutional repositories).
3. User satisfaction and perceived effectiveness of e-resources.
4. Challenges and barriers faced during usage, including access issues, training needs, and technological limitations.

The questionnaire was administered both online and offline, depending on institutional access and respondent preference. To supplement the quantitative data, semi-structured interviews were conducted with library professionals to gain insights into policy decisions, resource management strategies, and infrastructural capabilities.

2.4. Data Analysis Techniques

The collected quantitative data were analyzed using descriptive and inferential statistics. Tools such as Mean, Standard Deviation, Independent Samples t-Test, ANOVA, and Regression Analysis were applied to determine significant patterns and relationships. For example, the t-Test was used to compare user satisfaction between IITs and IIMs, while ANOVA helped identify whether user roles influenced the frequency or type of resource usage.

The qualitative data from interviews were analyzed using thematic coding, which allowed the researcher to identify recurring themes such as digital literacy, institutional support, and technical constraints. These insights helped contextualize the statistical findings and add depth to the interpretation.

2.5. Ethical Considerations

Ethical standards were strictly followed throughout the research. Participants were informed of the purpose of the study and provided with informed consent forms. Anonymity and confidentiality were assured, and participation was entirely voluntary. The research also adhered to institutional ethical guidelines concerning data collection and storage.

2.6. Limitations of the Methodology

While the study attempts to provide a comprehensive view, a few limitations are acknowledged. The sample size may not fully represent all IITs and IIMs. Additionally, response bias could exist due to self-reporting in surveys. Despite these limitations, the mixed-methods approach offers a balanced and robust framework for understanding e-resource usage across India's leading academic institutions.

3. Results:

The study based on the analysis of data collected from 385 respondents across selected IITs and IIMs. The study explores demographic profiles, differences in availability and usage of web-based resources, factors influencing implementation and organization, and perceptions of services provided by libraries. The results are categorized under demographic analysis, hypothesis testing, and item-wise user responses.

3.1. Demographic profile of respondents

The demographic characteristics of the 385 participants reflect a diverse and academically relevant group. Gender distribution shows a near balance, with 207 male respondents (53.8%) and 178 female respondents (46.2%). Institutional representation is similarly balanced, with 199 respondents (51.7%) from IIMs and 186 (48.3%) from IITs, shown in Figure 1. In the

population chosen for the study, 207 are male, i.e. 53.8%; and the remaining 178 are female, i.e. 46.2%.

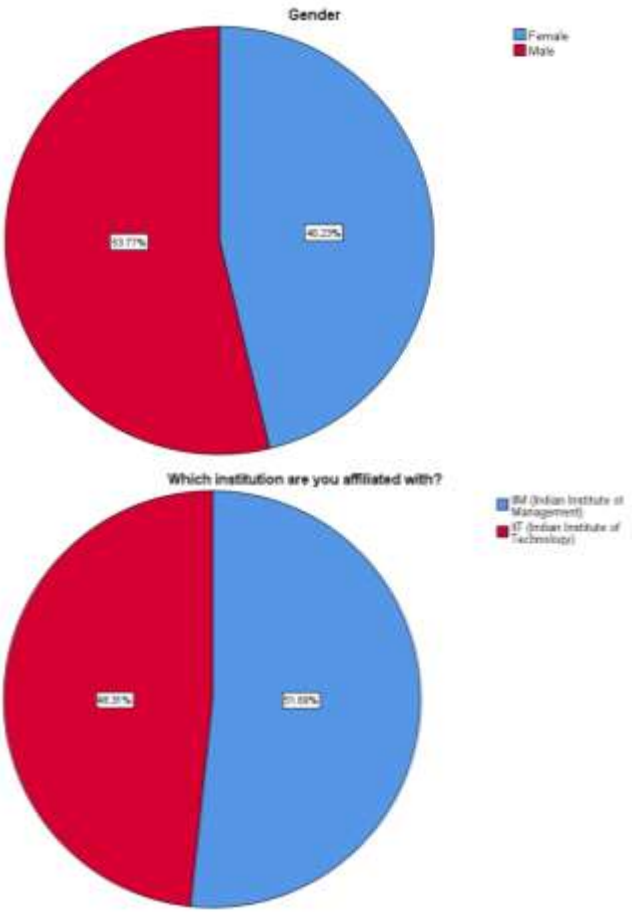

Figure 1: Distribution of Respondents by Gender (left) and Institutional Affiliation (right)

The academic status of respondents comprises undergraduate students (46.2%), postgraduate students (25.5%), faculty (17.9%), and research scholars (10.4%). The age range is also broad, from under 20 years to over 35 years, ensuring perspectives from a wide academic spectrum (Figure 2).

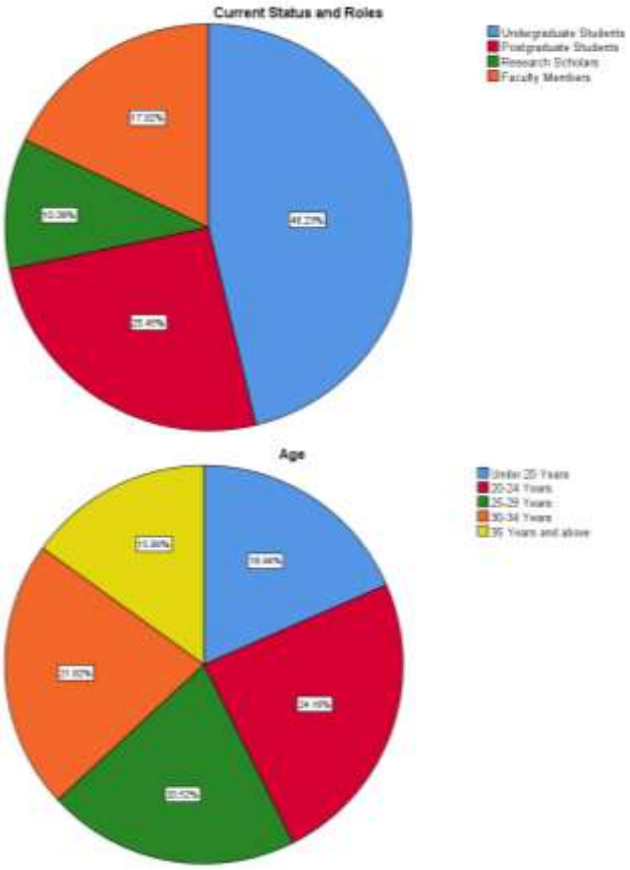

Figure 2: Distribution of Respondents by Academic Status and Age Group. The academic status of respondents, including undergraduate students, postgraduate students, faculty members, and research scholars (left). The age-wise distribution of respondents, ranging from under 20 years to above 35 years. This combined visualization highlights the demographic diversity of the study sample across both academic and age dimensions (right)

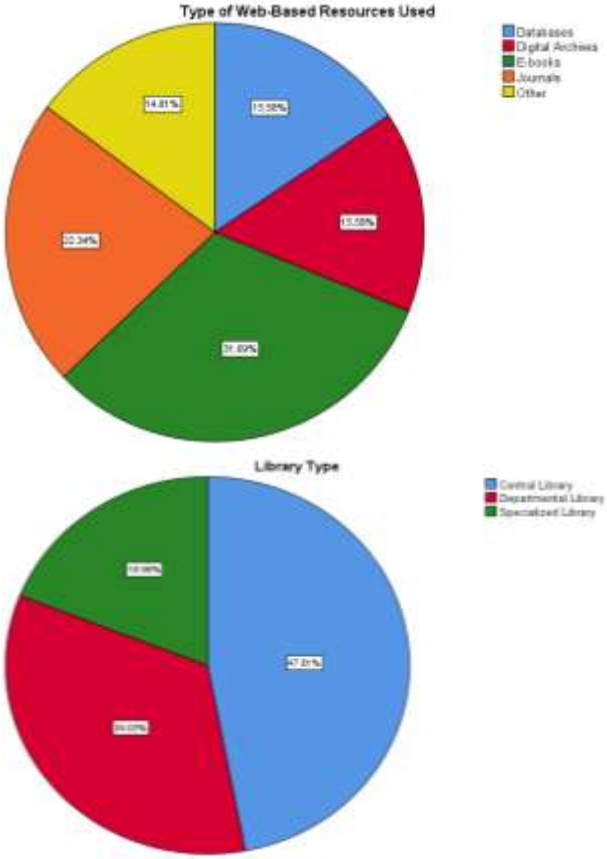

Figure 3: Types of Web-Based Resources Accessed and Library Facilities Used by Respondents. The distribution of responses regarding the types of web-based resources accessed, including e-books, e-journals, databases, digital archives, and others (left); The type of library facilities most frequently used by respondents—central libraries, departmental libraries, and specialized libraries. Together, these charts provide insight into user preferences for digital content and physical access points within institutional settings (right).

When evaluating the types of web-based resources most frequently accessed, e-books were the most popular, followed by journals, databases, and digital archives. Regarding library usage types, nearly half of the respondents used central libraries, followed by departmental and specialized libraries. The breakdown is presented in Figure 2 and Figure 3. These demographic indicators provided the foundation for the subsequent hypothesis testing and behavioral analysis.

3.2. Hypothesis Testing and Institutional Comparison

To assess the core hypothesis regarding differences in the usage of web-based resources between IITs and IIMs, an independent samples t-test was conducted. The results show that

the mean availability and usage score for IITs (M = 28.77) was significantly higher than for IIMs (M = 27.41), with a t-value of 2.947 and a p-value of 0.003. This confirms a statistically significant difference between the two institutional types, validating the alternative hypothesis.

Further analysis was carried out using regression techniques to determine the influence of key factors—such as infrastructure, funding, training, and institutional support—on the implementation of web-based resources. The model summary in Table 1, ANOVA output in Table 2, and coefficient estimates in Table 3 collectively show that these variables significantly impact implementation, with an R^2 value of 0.218 and a highly significant F-statistic ($p = 0.000$). This supports the hypothesis that institutional and logistical factors play a crucial role in the success of web-based library services.

Table 1: Model summary showing the predictive strength of factors influencing the implementation of web-based resources.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.467a	.218	.216	4.47942
a. Predictors: (Constant), Factors Affecting Implementation				

The ANOVA results demonstrated that the factors influencing the implementation of web-based resources in IIT and IIM libraries have a statistically significant impact on the actual implementation. The regression model showed an F-value of 106.579 with a p-value of 0.000, well below the 0.05 significance threshold. This confirms that the model explains a significant portion of variance in the dependent variable. The sum of squares for regression was 2138.527, compared to 7684.979 for residuals, indicating that while there is substantial variability within groups, the predictors still significantly explain the differences in implementation. These findings affirm the relevance of technical infrastructure, funding, staff training, and administrative support as key contributors to successful web-based resource implementation (table 2).

Table 2: ANOVA results assessing the significance of the regression model predicting implementation of web-based resources in IIT and IIM libraries. The model was statistically significant ($F = 106.579$, $p < 0.001$), indicating that the combined influence of factors such as infrastructure, funding, staff support, and administration meaningfully contributes to the variance in implementation outcomes.

ANOVAa					
Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**

1	Regression	2138.527	1	2138.527	106.579	.000b
	Residual	7684.979	383	20.065		
	Total	9823.506	384			
a. Dependent Variable: Implementation of Web-Based Resources						
b. Predictors: (Constant), Factors Affecting Implementation						

The model summary examining the predictors of web-based resource implementation in IIT and IIM libraries indicates a moderate but significant relationship. The correlation coefficient (R = 0.467) suggests a modest positive association between the identified influencing factors—such as infrastructure, funding, administrative support, and staff training—and the actual implementation of web-based resources. The R Square value of 0.218 reveals that approximately 21.8% of the variance in implementation can be explained by these variables, indicating that while these factors are relevant, other unexplored variables may also play a role. The Adjusted R Square value of 0.216 supports the consistency and generalizability of the model when accounting for the number of predictors. The standard error of the estimate was 0.42614, reflecting the average deviation of observed values from the predicted values in the regression model. Overall, the model demonstrates a statistically meaningful, though not exhaustive, explanation of the implementation dynamics of web-based resources in academic libraries.

Table 3: Coefficients of Regression Model Indicating the Influence of Institutional Factors (Infrastructure, Funding, Administrative Support, and Staff Training) on the Implementation of Web-Based Library Resources in IIT and IIM Libraries

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.507	1.410		9.580	.000
	Factors Affecting Implementation	.506	.049	.467	10.324	.000
a. Dependent Variable: Implementation of Web-Based Resources						

3.3. Analysis of User Responses

User feedback was collected on multiple aspects of web-based resource usage, including accessibility, effectiveness, and satisfaction. The availability and utility of resources received generally positive evaluations, with mean ratings for most items ranging between 3.5 and 3.9 on a 5-point scale. The most highly rated items included alignment with academic needs and ease of website navigation. The same has been represented in Figure 4. Despite overall positive feedback, two items—frequency of using web-based resources for

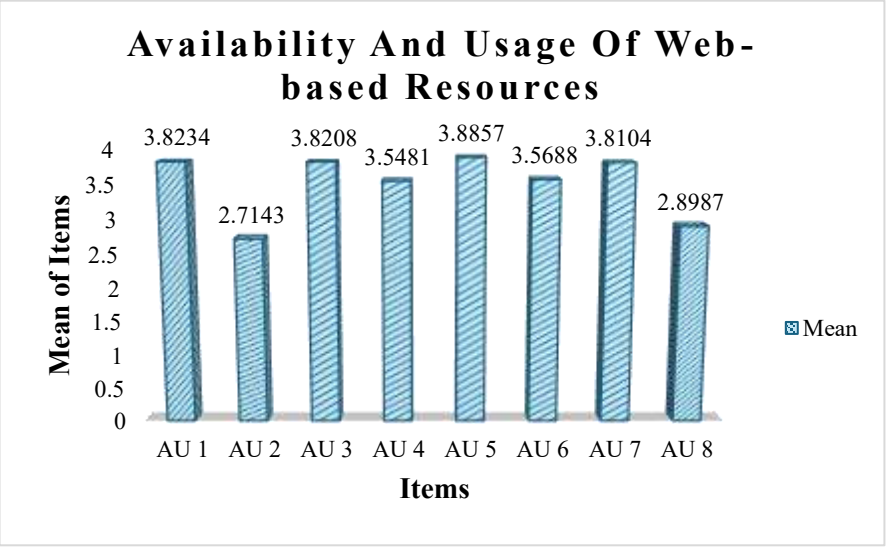

Figure 4: User Satisfaction Regarding Availability and Usage of Web-Based Resources illustrates respondents' perceptions of various aspects of web-based resource availability and usage in selected IIT and IIM libraries. Parameters include the adequacy of resource availability, relevance to academic needs, user-friendliness, website navigation, and support provided by library staff. Overall satisfaction levels are shown using mean response scores on a 5-point Likert scale.

research and likelihood of recommending them—scored below the general trend, with mean scores of 2.71 and 2.90, respectively. These lower scores suggest that while resources are available, their integration into academic practice and peer sharing could be improved.

3.4. Implementation of Web-Based Resources

The study investigated the implementation of web-based resources in the libraries of selected IITs and IIMs by analyzing user perceptions across several indicators. The findings reveal a generally positive evaluation of implementation practices, particularly in areas related to staff support and organizational structure. The highest-rated item was "Library staff effectively support me in using web-based resources", which achieved a mean score of 3.7714, with 75.43% of respondents agreeing. This indicates a strong presence of well-trained and responsive staff to assist users in accessing digital resources. Similarly, the statement "The implementation of web-based resources is well-organized and meets my needs" received a

mean score of 3.7688 (75.38%), further confirming that the systems in place are perceived as user-friendly and effectively structured.

Administrative engagement in promoting digital resources was also rated favorably. The item "The administration actively promotes the use of web-based resources" had a mean score of 3.7299 (74.60%), suggesting that institutional leadership is playing a supportive role in the digital transition. The perceived quality of the resources themselves was reflected in the statement "The quality of web-based resources available in the library is satisfactory", which garnered a mean score of 3.5818 (71.64%), indicating general contentment with the breadth and relevance of available digital materials. However, the data also highlighted some areas for improvement. Funding for the development of web-based resources showed moderate satisfaction levels, with "Adequate funding is available for the development of web-based resources" receiving a mean of 3.4026 (68.05%) (Figure 5). Likewise, technical infrastructure—while functional—did not receive top ratings, as evidenced by a mean of 3.3351 (66.70%) for the item "The technical infrastructure supports the implementation of web-based resources."

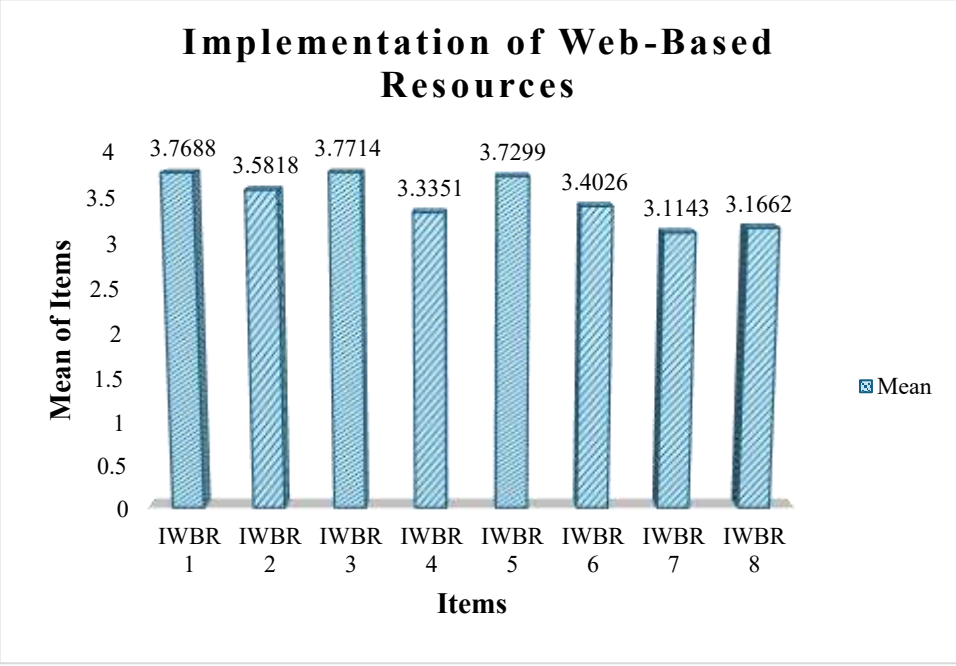

Figure 5: Detailed evaluation of implementation practices for web-based resources in selected IIT and IIM libraries, highlighting areas such as infrastructure deployment, integration with library systems, policy frameworks, and user accessibility provisions.

The lowest-rated items pointed to challenges in internal collaboration and user feedback mechanisms. The item "Collaboration among library staff enhances implementation" received a mean score of 3.1143 (62.29%), suggesting that teamwork among staff could be strengthened. Additionally, "User feedback is considered for improving web-based resource

services" was rated at 3.1662 (63.32%), indicating a need for more systematic inclusion of user input in the continuous improvement process.

3.5. Factors Affecting Implementation of E-Resources

Understanding the factors that influence the implementation of web-based resources is critical for evaluating the sustainability and scalability of digital library services in academic institutions. Respondents were asked to assess various institutional and operational elements that affect the integration of e-resources into regular academic functions. The results has been illustrated in Figure 6, reveal nuanced patterns of strength and concern.

Among the most highly rated factors was technological adequacy, with a mean score of 3.75. This suggests that the majority of participating institutions have the necessary hardware, software, and internet infrastructure to support digital library services. Adequate funding, another critical factor, received a slightly higher mean score of 3.78, indicating that institutional budgets are generally sufficient to cover licenses, subscriptions, and digital access tools. These positive scores reflect that IITs and IIMs—being elite institutions—are relatively well-equipped in terms of the baseline infrastructure required for digital resource provision. However, the findings also reveal areas of

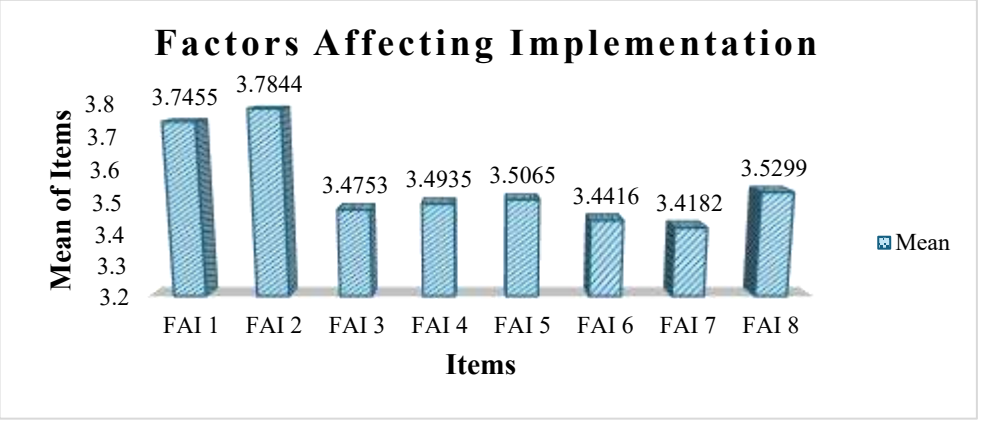

Figure 6: Analysis of key factors influencing the implementation of web-based resources in IIT and IIM libraries, including technological infrastructure, staff competency, user training, administrative support, and financial resources.

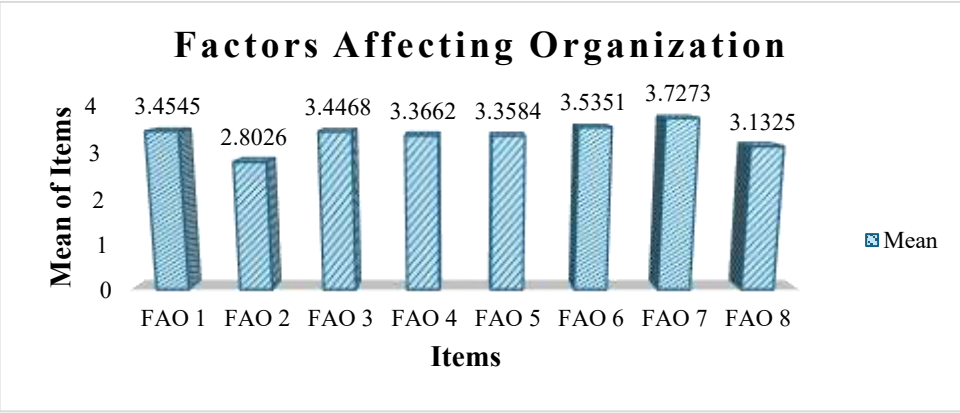

Figure 7: Evaluation of key factors influencing the organization of web-based resources in IIT and IIM libraries, including metadata standards, classification practices, system integration, user accessibility, and content management protocols. The figure reflects users' perceptions of how effectively digital resources are structured, categorized, and made accessible for academic and research use.

weakness that could hinder effective implementation. Staff training, for instance, received a mean score of 3.47, pointing to a notable deficiency in professional development. Despite having access to robust technologies, library staff may lack the skills or continuous training needed to manage evolving digital tools or to assist users effectively. Similarly, the alignment of planning with actual user needs scored 3.49. This indicates that while strategic frameworks may exist, they often do not reflect user expectations or behaviors, leading to underutilized services or mismatched priorities.

These findings underscore the need for a more human-centered approach in the implementation process. Infrastructure and funding are necessary but not sufficient conditions for success. Without regular training programs, needs assessment exercises, and user feedback loops, even the most resource-rich libraries may fall short of their potential. Institutions must prioritize capacity-building measures for library professionals and align their planning with emerging user trends such as mobile-first access, remote research support, and interdisciplinary data integration.

Moreover, policy-level engagement is required to ensure that institutional goals reflect library development as a core component of academic growth. Both IITs and IIMs often focus heavily on research productivity, and embedding library support systems into faculty and student workflows would strengthen the academic ecosystem. Establishing cross-functional digital library committees and user advisory panels can also facilitate more responsive and inclusive planning. Therefore, this section highlights not just the physical but also the procedural and cultural dimensions that influence the successful deployment of web-based resources.

3.6. Organization of Web-Based Resources

The organization of digital resources plays a pivotal role in determining their accessibility and usability. Even if resources are abundant and current, their effectiveness is compromised if users cannot easily locate, navigate, and retrieve them. Respondents were surveyed on their perceptions of how well web-based resources were structured, categorized, and maintained by their respective libraries. The findings are visualized in Figure 7 and 8.

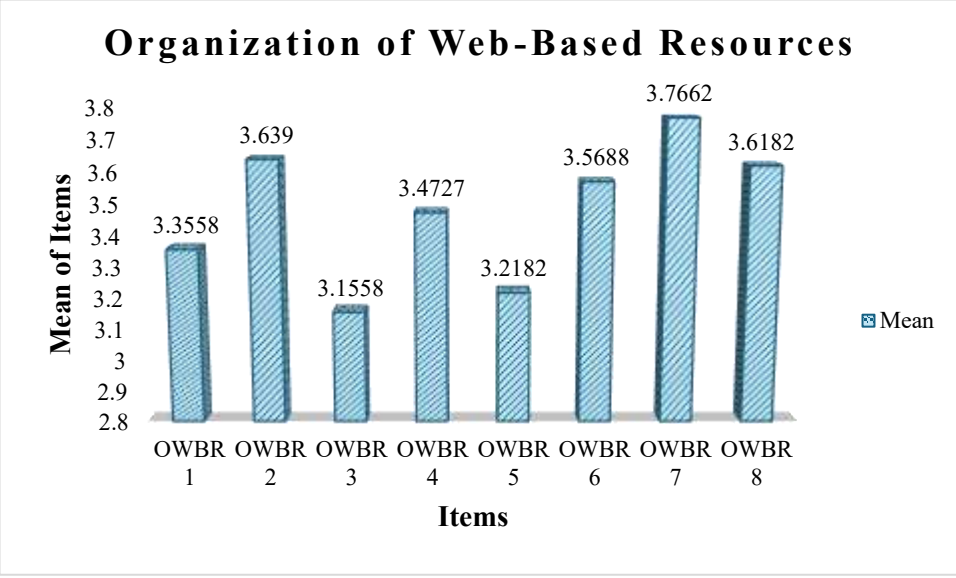

Figure 8: User perceptions of the implementation practices for organizing web-based resources in IIT and IIM libraries, including systematic updating of content, ease of navigation, metadata consistency, classification accuracy, and responsiveness to user needs. The figure reflects the extent to which organizational strategies are effectively applied in digital library environments.

The analysis of user responses on the organization of web-based resources in IIT and IIM libraries reveals a generally positive perception of structural and procedural aspects. Users rated the systematic arrangement of resources for easy access highest, with a mean score of 3.76 (75.30%), followed closely by adherence to proper classification and cataloging standards at 3.72 (74.55%), suggesting that core organizational practices are well established. The presence of standardized metadata and effective system integration also received favorable responses, indicating that the technical backend supports efficient resource discovery. However, the incorporation of user feedback into organizational improvements was less positively rated, with a mean score of 3.31 (66.23%), highlighting a gap in participatory approaches. In terms of implementation, regular updating of resources to maintain relevance was viewed as the strongest aspect (mean 3.74; 74.81%), demonstrating a commitment to currency and accuracy. While user navigation and searchability were moderately rated at 3.58 (71.69%), the findings suggest opportunities to enhance user-centered design and interaction features within digital library platforms.

The users expressed moderate satisfaction with the organization of digital content, with most item ratings falling within the range of 3.40 to 3.65. Users acknowledged the existence of robust library portals that allow access to e-journals, databases, and institutional repositories. However, there were consistent suggestions—implied through mean scores just below 3.70—that the user experience could be improved. Issues highlighted include inadequate metadata tagging, outdated catalog structures, and complex navigation pathways, especially when transitioning between different resource platforms.

A significant concern emerged around consistency. Several users indicated that different types of resources—such as theses, case studies, and technical papers—were inconsistently classified, making it difficult to retrieve cross-disciplinary materials. Additionally, a lack of integration between institutional repositories and international databases was reported, which hinders the ability of users to conduct holistic literature reviews. IITs, in particular, fared better in terms of organizational coherence, likely due to their longer history of managing technical documentation and centralized digital archives. In contrast, some IIMs were found to have more fragmented systems, with resources scattered across departmental sub-portals, reducing discoverability.

To address these challenges, libraries need to invest in improved cataloging practices, implement federated search mechanisms, and adopt user-friendly interfaces that support multi-language, multi-format, and multi-device compatibility. Libraries could also benefit from integrating AI-driven recommendation systems and predictive search tools that personalize content based on past user behavior. Furthermore, the adoption of standardized metadata protocols such as Dublin Core and MARC21 across institutions can enhance interoperability and ease of search.

In summary, while web-based resources are available and maintained, the user experience is suboptimal in many cases due to insufficient attention to digital resource organization. Enhancing these backend systems will directly impact user satisfaction and frequency of use, thereby improving the overall efficacy of library services in premier institutions.

3.7. Comparative Assessment of Library Services

In addition to resource availability and organization, the quality of services provided by libraries profoundly affects user engagement and overall academic productivity. To assess this, the study compared perceptions of library service quality between IIT and IIM libraries. This comparative evaluation, supported by Figure 9, focused on service accessibility, support responsiveness, user assistance mechanisms, and technological enhancements such as virtual help desks and live chat features.

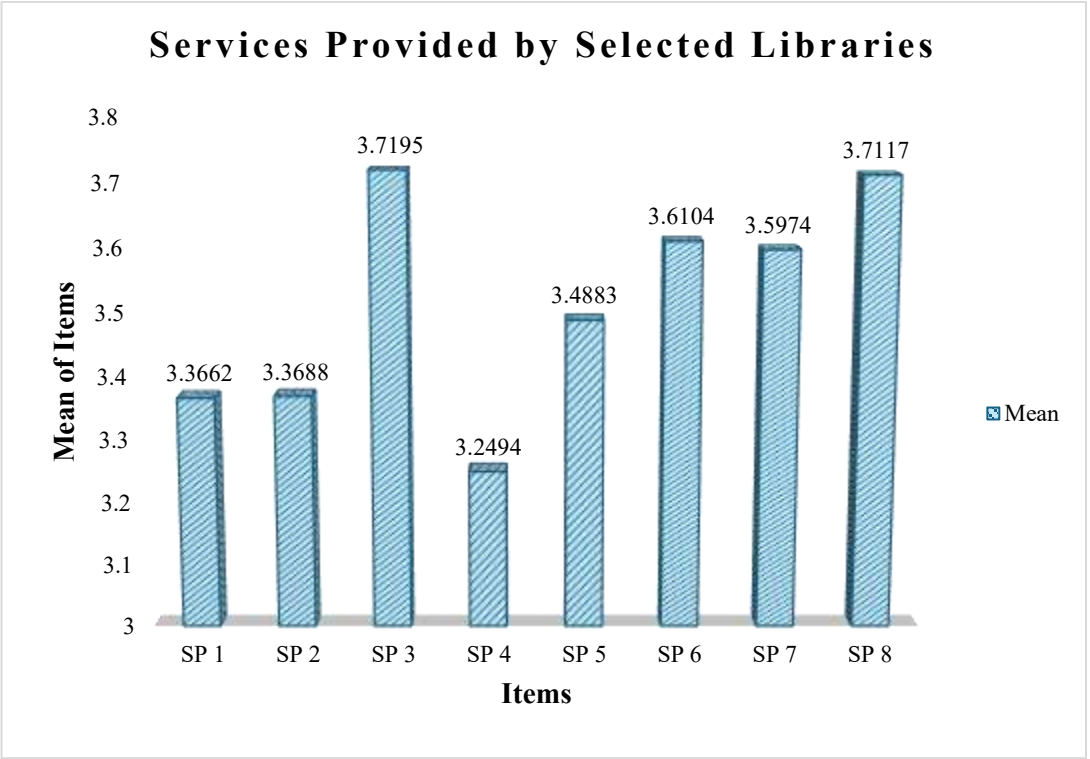

Figure 9: User perceptions of library services in selected IIT and IIM libraries, focusing on the adequacy of digital resources, responsiveness of staff, information services, interlibrary loan services, and infrastructure for group study. The figure illustrates varying levels of satisfaction, with high approval for digital resource availability (mean = 3.7195; 74.39%) and lower satisfaction with interlibrary loan services (mean = 3.2494; 64.99%), highlighting strengths and areas for service improvement

The data revealed that IIT libraries were rated more favorably across nearly all service parameters. These institutions have historically invested in robust library infrastructures, often integrating their digital offerings with academic calendars, research timelines, and course syllabi. IIT users reported greater satisfaction with the responsiveness of help desk services, availability of digital tutorials, and the efficiency of issue resolution. The presence of institutional repositories, coupled with automated document delivery systems, also contributed to this positive perception.

In contrast, while IIM libraries demonstrated competence in service provision, users expressed relatively lower satisfaction with real-time assistance and personalized user engagement. The discrepancy in perceived quality is statistically significant, as indicated by ANOVA results ($F = 6.230$, $p = 0.013$). This suggests that the difference is not incidental but reflects structural and operational distinctions between the two categories of institutions.

One possible explanation for this variance is the difference in institutional focus. IITs, with their technological orientation, have prioritized digitization and automation as essential to their academic identity. IIMs, on the other hand, may emphasize case-based learning and business simulations, which are often conducted through physical media or proprietary platforms, thereby limiting library integration.

Nevertheless, the trend toward hybrid learning environments and global digital collaboration makes it imperative for IIMs to scale up their digital service offerings. Enhancing staff capabilities in digital reference management, improving the visibility of library services through social media and LMS platforms, and deploying mobile-accessible portals can help bridge the gap.

Overall, this comparative analysis highlights the critical role of service design and delivery in determining how effectively digital resources are utilized. Institutions that align their library services with the evolving needs of users—particularly through responsiveness, accessibility, and personalization—are more likely to foster sustained engagement with e-resources. This section suggests that beyond access and content, the human and technological interactions provided by the library staff are central to the user experience.

4. Discussion:

The evolution of academic libraries in the digital age has been marked by a shift from traditional print-based systems to the widespread adoption of electronic resources, or e-resources. This transformation is not merely technological—it reflects a fundamental change in how knowledge is accessed, shared, and applied in educational and research environments. Scholars across the globe have attempted to map this transformation, with early works establishing a foundation for understanding the role of digital resources in scholarly communication.

Among the earliest and most cited works, Tenopir and King (2002) emphasized that e-journals significantly enhance research productivity by providing timely and convenient access to scientific literature. Their findings underscored how digital formats had begun to redefine the reading habits of academics, allowing for broader dissemination of knowledge and faster integration of new findings into ongoing research. Building on this, Dadzie (2005) argued that e-resources, especially in academic settings, offer undeniable advantages over print materials, including simultaneous multi-user access, remote availability, and integration with various media formats that enrich learning outcomes.

In the Indian academic context, the adoption of e-resources gained momentum with policy-level support and the formation of national consortia. Sinha (2004) noted that initiatives like INDEST and UGC-INFONET played a pivotal role in expanding digital access to higher education institutions, especially those with limited individual purchasing power. These efforts were complemented by case-based research from Indian university libraries. For instance, Kavitha and Venkata (2006) highlighted the growing presence of e-journals and databases in

Indian institutions and reported a steady increase in their usage by students and faculty, although the degree of adoption varied.

The literature also reflects a persistent concern over the disparity in user engagement with e-resources. While availability has improved, studies such as those by Chandran (2000) **and** Thanuskodi (2012) noted that utilization levels remain uneven. Faculty members and research scholars were found to be more consistent users of e-resources compared to undergraduate students, who often lacked orientation or training in navigating digital collections effectively. This discrepancy pointed toward the need for more structured user education and support systems within libraries.

In this regard, Ahmed (2013) observed that user satisfaction with e-resources is not determined solely by access, but by a combination of factors: the intuitiveness of digital platforms, the relevance and quality of available content, and the availability of trained library professionals to provide guidance. Echoing this, Ravi (2006) argued that despite an increase in digital subscriptions and infrastructural investments, the effectiveness of e-resource services is often constrained by gaps in user awareness and a lack of institutional policies promoting their academic integration.

Barriers to optimal utilization have also been examined extensively. Khan and Shafique (2011) reported that the absence of consistent digital literacy among users and librarians alike continues to undermine the potential benefits of e-resources. Further, Barik and Kar (2020) pointed out infrastructural limitations, such as low bandwidth, lack of user-specific customization, and underutilized consortia memberships, as recurring issues—especially in institutions located in semi-urban or rural areas. Across these studies, there emerges a strong consensus that while technological capability has advanced rapidly, human and institutional factors play a determining role in the actual impact of e-resources. Training, policy alignment, and user engagement are recurrent themes in the literature, emphasizing that libraries must go beyond acquisition to ensure meaningful usage.

However, amid this rich body of work, a distinct research gap remains. None of the reviewed studies engage directly with a comparative assessment **of** e-resource utilization across India's premier institutions**,** namely the Indian Institutes of Technology (IITs) and Indian Institutes of Management (IIMs). These institutions represent the apex of technical and management education in the country, yet there is a lack of empirical investigation into how their libraries differ or align in their use of digital resources. This absence highlights the novelty and relevance of the present study, which aims not only to fill this void but also to set a benchmark for future institutional comparisons in the Indian digital library landscape.

In the rapidly evolving landscape of academic libraries, recent literature reveals a significant shift toward intelligent, user-centered digital services. A growing body of work highlights the integration of artificial intelligence (AI)**,** the refinement of e-resource management, and the

importance of digital literacy strategies extending the foundational insights from earlier studies by Tenopir and King (2002), Dadzie (2005), and Ahmed (2013).

Closer to the Indian context, emerging research (Jha, 2023; Li & Coates, 2024; Panda & Chakravarty, 2022) emphasizes the rise of AI-powered chatbots**,** offering 24/7 support, guiding users through databases, and handling multiple queries simultaneously. In a study by Kalbande et al., 2024, elaborated the the implementation of recommendation systems in academic libraries. These systems analyze user behavior to suggest relevant resources, enhancing both engagement and discovery (Kalbande et al., 2024). Ethical considerations are equally foregrounded. In Africa, Zimbabwean libraries are developing policies addressing data privacy, algorithmic bias, and equitable access, reinforcing that AI integration must align with librarianship's long-standing ethical commitment. Such advances reflect a global trend: libraries are shifting from static digital repositories to dynamic, data-aware systems that anticipate user needs, promote sustainability and embed responsible frameworks (Monyela & Tella, 2024).

Recent Indian studies complement the global AI trend by revisiting core issues: access, awareness, and management. A 2023 study focusing on IIT Kanpur's PK Kelkar Library revealed that while 55% of users preferred ScienceDirect journals and about 74% expressed satisfaction with digital infrastructure, they often still prioritized print formats. The study highlights that despite infrastructure readiness, digital engagement remains partial and influenced by discipline and academic standing (Tyagi, 2012). Mukherjee and Patra's 2023 survey of 50 Indian digital library initiatives—ranging from institutional repositories to virtual catalogs highlights the infancy of metadata practices and remote-access capabilities within Indian libraries. Many systems still rely on redirects to third-party platforms, creating inconsistent user experiences that hinder sustained engagement. E-book usage studies from Karnataka (2023) provide insight into shifting preferences. Study found a significant leaning toward e-books during lockdowns, with 75% of users favoring them "due to convenience," though it cautions that print retains efficacy for retention, emphasizing the need for pedagogically balanced digital strategies (Vidyarani, and Harish, 2023).

Indian research emphasises familiar challenges: while infrastructure investments, consortium memberships, and national digital platforms offer potential, inconsistent metadata standards, insufficient training, and misaligned user engagement strategies hinder real impact. Notably, faculty-initiated digital transformations remain uneven, particularly among undergraduates and vocational users. This evidence collectively signals both maturation and opportunity. The core of effective digital transformation lies not just in technology but in sustainable strategies that foster continuous learning, ethical stewardship, and community integration. Integrating AI must therefore be guided by a vision that is both strategic and humane aligning technology with trust, skill development, and inclusive outreach.

It is within this rich and evolving theoretical and empirical landscape that the current study emerges—not as a repetition of past inquiries but as a focused lens on how India's premier

technical and management institutions leverage digital libraries. With the groundwork laid and an evidence-based framework established, this comparative study of IITs and IIMs contributes meaningfully both to scholarly literature and institutional practice.

Conclusion:

In an era where digital transformation is reshaping the academic landscape, web-based library resources have become indispensable to higher education institutions. Their role in enhancing teaching, learning, and research is increasingly recognized, especially in technologically advanced and globally competitive environments like those of IITs and IIMs. This study provides a comprehensive comparative analysis of the utilization, implementation, and organization of web-based library resources in premier Indian institutions, specifically IITs and IIMs. The findings reveal that both categories of institutions have made significant strides in integrating e-resources into their academic ecosystems. However, IITs exhibit a marginally higher degree of resource usage, user satisfaction, and technological infrastructure, which can be attributed to their long-standing emphasis on digital innovation and research-oriented environments.

Key factors such as adequate funding, administrative support, technical infrastructure, and staff training emerged as critical determinants of successful e-resource implementation. While users generally expressed satisfaction with the availability and quality of digital resources, certain gaps were noted—particularly in areas like user feedback mechanisms, staff collaboration, and metadata consistency. These findings indicate that while technological readiness is crucial, equally important are institutional policies and human-centered strategies that align library services with user expectations.

The study underscores the need for continuous professional development for library staff, regular user needs assessments, and more responsive digital interfaces. It also highlights the importance of integrating user feedback into planning and decision-making processes to ensure the library services remain relevant and effective.

By focusing on India's most reputed technical and management institutions, this research offers practical insights for other universities aiming to strengthen their digital library services. It also contributes to the broader understanding of how e-resources can be leveraged to enhance learning and research outcomes. Future efforts should aim to bridge existing gaps through policy alignment, cross-institutional collaboration, and the adoption of advanced digital tools such as AI-driven recommendation systems.

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