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Research Article

Artificial Intelligence Adoption in IIT and IIM Libraries: A Comparative Analysis of Applications, Service Transformation, and User-Centric Innovation

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Abstract

AI transforms how academic libraries automate. This study investigates the evidence of publicly adopting AI and digital service transformation in five Indian Institutes of Technology and five Indian Institutes of Management. An audit of the libraries' official web pages, service portals, guides, and library-related institutional documents, as they existed on August 10, 2026, was performed. Remote Access, Institutional Repository, Discovery Service, Research Support, User Training, Automated/Self-Service Circulation, Virtual Help, AI Tools/Services, AI Services, and AI-Related Training were noted as present or absent. The AI Library Adoption and Innovation Index (AILAII; 0-100) positively scores the presence of each of the above services. Due to the small sample size of 10, several methods including exact Mann-Whitney U, Fisher's exact test, and exploratory Spearman correlation, were utilized. The average AILAII score for IITs was 66.67 (SD=13.61) and for IIMs 73.33 (SD=20.18). The difference was not significant (U=9.50, p=.690, rank-biserial r=-.24). Explicit evidence of AI was found in four of the five IIT libraries and in two of the five IIM libraries. The use of AI in libraries was evidenced by Fisher's exact test (OR=6.00, p=.524). The positive correlation of user-innovative services (rho=.61, p=.060) and the positive correlation of user-innovative services to the digital infrastructure of the libraries was shown in the positive correlation of rho=.61. The results of the study demonstrated a heterogeneous application of AI, as opposed to a uniform adoption of AI services in libraries. The study suggests a clearer policy and strategy on AI, a systematic staff transformation and/or up-skilling policy and a transparent documentation of AI services, and a Human-in-the-loop approach to the AI services of libraries.

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KEYWORDS: artificial intelligence; academic libraries; IIT libraries; IIM libraries; digital transformation; smart libraries; user-centric innovation; library automation.

1. INTRODUCTION

Artificial Intelligence is driving a paradigm shift in how Libraries operate, and how Users engage with Libraries. AI alters Libraries' back-end systems and the User's methods for Information discovery, evaluation, creation and engagement. The rapid development of Libraries' functionalities may employ AI in multiple domains including research assistance, analytics, metadata generation, classification, as well as natural language processing and conversational agents (Adetayo, 2023; Mahmud, 2024; Oyelude, 2024). Concurrently, the International Federation of Library Associations and Institutions (IFLA, 2020) encourage Libraries to safeguard patrons' rights to privacy and intellectual freedom when using AI. At a minimum, contemporary Libraries must incorporate a socio-technical systems perspective in the design and integration of their frameworks, service processes, staff competencies, and governance systems.

The Indian Institutes of Technology (IITs) and Indian Institutes of Management (IIMs) provide a relevant framework for comparison. Both have research-intensive Libraries with extensive digital collections. However, their disciplinary and professional domains, as well as their user communities, and service priorities are different. Libraries of IITs are focused on research and advanced studies in technologies and engineering, while Libraries of IIMs are focused on management information, business libraries, databases, market and decision support intelligence. These differences will help shape the application domains for AI and Library Services such as research support and assistance, management discovery services, and conversational as well as user assistance interfaces.

The problem is that AI-related discourse in libraries tends to move more quickly than evidence at the institutional level. International studies reveal that AI could be present in the workings of a library even if it is weakly referenced in strategy documents (Huang et al., 2023). Research also shows unprecedented bibliometric growth in the study of AI in academic libraries (Hussain & Ahmad, 2024). Nevertheless, the presence of automation, RFID, discovery systems, and proprietary databases in a library cannot be interpreted as the library's institutional adoption of AI, and neither should the presence of other technologies be interpreted as the adoption of AI. Thus, this study follows a cautious rule of public evidence, where the presence of AI is recorded only when a library's formal document mentions the presence of AI and AI-related training. The goal is to document what is verifiable, and not assume what is not documented.

2. REVIEW OF LITERATURE

2.1 AI Applications and Smart Academic Library Services

AI applications in academic libraries, as recently focused, have moved from the realm of rule-based services to smart libraries using natural language and, more recently, generative AI. For example, Panda and Chakravarty (2022) illustrated how AI chatbots can expand virtual reference services beyond the hours of staff presence. Rodriguez and Mune (2022) explained the development and assessment of a university library's natural-language processing chatbot, while Sanji et al. (2022) proposed that, given their applicability across various library functions, chatbots should be viewed as a desirable intelligent solution. Adetayo (2023) further noted that, due to the limitations of the technology, the overdependence and the inaccurate responses generated by generative AI systems such as ChatGPT, human supervision would be vital.

Artificial intelligence is disrupting the way we organize and discover knowledge. Mahmud (2024) suggests that machine learning and natural language processing have potential in automation of cataloguing, classification and metadata, while Oyelude (2024) emphasizes the variety of AI research tools, increasingly employed in the realm of scholarship. User-oriented experimentation has also sped up. Wheatley and Hervieux (2024) drew parallels between the use of generative AI systems and voice assistants in reference interactions, while Archambault et al. (2024) discussed the need of combining the use of technologies with algorithmic literacy and ethical reasoning.

Adoption, readiness and service transformation

The readiness of institutions encompasses more than the procurement of tools. Shal et al. (2024) demonstrate that the acceptance of AI by librarians is impacted by management, and Kautonen and Gasparini (2024) regard the development of AI skills as a dimension of a formalized process within an organization. Barsha and Munshi (2024) noted a number of constraints in developing countries, including inadequate infrastructure, insufficient skilled staff, high costs, privacy concerns and the digital divide. Malakar et al. (2025) specifically identified the gap between AI initiatives, user needs, infrastructure, existing skills and management in India. Taken together, these studies indicate that while digital infrastructure is necessary for the implementation of AI in practice, it is not sufficient.

User expectations are important too. Kavak (2025) studied 1,142 users of academic libraries in Turkiye, finding a strong interest in virtual assistants and natural language search and recommendation systems, as well as high concern about privacy. Haris et al. (2025) examined the perception and adoption of AI in academic libraries. The studies reveal the gap between the availability of technologies and user-centered innovations. A library may be advanced in its digital transformation, but may not have incorporated AI solutions that are visible and useful to users.

3. RESEARCH GAP, OBJECTIVES & QUESTIONS

There is some documentation of the potential positive impact of AI on services delivery. There is inadequate evidence of comparative AI use within India's top technical and management institutes at the level of specific institutions. There is a methodological gap. Sometimes, the use of basic searching and retrieving functions of a digital library is equated to the adoption of AI with no evidence to the claim. The current research aims to address this by using a conservative coding

technique for the libraries of the selected IITs and IIMs and, for the purposes of this research, differentiating digital infrastructure from evidence of AI.

The specific objectives of this research are (1) to assess the publicly available evidence of the adoption of AI and the transformation of library services to the digital realm, (2) to compare the library services of IITs and IIMs, (3) to identify the instances of adoption of AI and AI-related services and capacity-building as documented in the official record, (4) to analyze the linkage of infrastructure, readiness and the transformation of library services and innovation focused on the end-user, and (5) to identify the key areas of primary focus for the adoption of AI in a responsible manner.

The research questions are:

RQ1: Which AI-enabled applications and practices of digital services are documented?

RQ2: Do IIT and IIM libraries differ in the AILAII score and related domain scores?

RQ3: Is there a greater presence of AI in the libraries of IITs as compared to IIMs?

RQ4: How are the readiness and user-focused innovation and transformation of library services linked in the selected libraries?

4. Research Hypotheses

H01: IIT and IIM libraries are not significantly different in the AILAII overall score.

H02: IIT and IIM libraries are not significantly different in the score for the transformation of library services.

H03: There is no significant difference in the adoption of AI between IIT and IIM libraries.

H04: There is no significant relationship between digital infrastructure and user-focused innovation.

5. Conceptual Framework

Digital Infrastructure -> Institutional Readiness -> Explicit AI Adoption -> Service Transformation -> User-Centric Innovation

For this study, responsible AI governance was treated as a cross-cutting condition rather than a scored construct. The public library-level evidence was comparable across the cases for algorithmic transparency, bias controls, privacy impact assessment, and human oversight. Due to the lack of evidence, this omission is itself analytically meaningful. The public documentation of AI governance lags the tools and the services enhanced through the digital services.

6. RESEARCH METHODOLOGY

6.1 Design and sample

This study adopted a cross-sectional, comparative, quantitative content analysis design. The selected IIT libraries were Delhi, Bombay, Madras, Kanpur and Ropar. The IIM libraries included Ahmedabad, Bangalore, Calcutta, Kozhikode and Indore. These libraries were selected based on the criteria of being established libraries with documented services on the internet. The focus of the analysis was on the institution/library. No sampling instruments like questionnaires or interviews, or any other artificial data, were used.

6.2 Data sources and coding

The main data sources were the official webpages of the libraries and their service pages, as well as pages of their repositories and pages/guide of/for orientation and training. These were accessed by the researcher before August 10, 2026. The scholarly literature that framed the study was mainly restricted to the years 2020-2025. For each indicator, a score of 1 was recorded if evidence was found and 0 if no evidence was found. The absence of evidence was interpreted as no evidence was found in the sources reviewed. Explicit AI adoption was scored if the use of AI in a service was publicly stated, for example, if the use of the service was via an AI, a generative-AI research assistant, an AI-based writing tool, an AI training tool, or an AI-based training service.

Table 1. Operational definitions and coding framework

Indicator	Operational definition	Code	Evidence rule
Remote access	Off-campus access to subscribed digital resources	0/1	Official library service page
Institutional repository	Publicly documented repository/ETD or institutional archive	0/1	Official library/repository page
Discovery service	Unified/web-scale discovery or comparable integrated discovery layer	0/1	Official library service page
Research support	Dedicated research assistance/support service	0/1	Official service page
User training	Orientation, workshops or database/research training	0/1	Official event/service page
Self-service/automation	Self-check-in/out, RFID return, online circulation transaction or comparable facility	0/1	Official facility/service page
Virtual help	Chatbot, online chat, Ask Librarian/Ask Us, virtual reference desk	0/1	Official service page
AI tool/service	Tool explicitly described as AI/GenAI-enabled by the institution	0/1	Official resource/service page
AI training/guidance	AI-focused training, demonstration or awareness activity	0/1	Official event/training page

6.3 Composite measures and statistical analysis

The AILAII scores were calculated as the percentage of the nine indicators present for each institution. The scoring for each of the domains was as follows: Digital Infrastructure (0–4) took into account remote access, the digital repository, discovery, and self-service; Service Transformation (0–4) included research support, training, self-service, and virtual help; User-Centric Innovation (0–4) included remote access, discovery, training, and virtual help; Explicit AI Adoption (0–2) included the AI tool/service and AI training; and Readiness (0–7) included remote access, the repository, discovery, research support, training, self-service, and AI training. These were all

formative indices. Cronbach's alpha was not conducted as these indices did not capture varying degrees of the same construct. A desk audit was conducted with a single coder; given this, a limitation of the study was the absence of inter-coder kappa.

For IITs and IIMs, the exact Mann-Whitney U tests were used due to small sample sizes (n = 10) and tied ordinal/binary scores; to test for the presence of explicit evidence of AI, Fisher's exact test was used, and selected correlations were evaluated by Spearman's rho. A two-tailed p-value of < .05 was deemed significant. For Mann-Whitney results, a signed rank-biserial correlation was calculated, with positive values indicating support for IITs and negative values for IIMs. Due to the small sample size, no multivariable regression was conducted.

7. RESULTS AND STATISTICAL ANALYSIS

Table 2. Institutional profile and public-evidence summary

Institution	Group	AILAII %	AI score	Evidence summary
IIT Delhi	IIT	77.8	1/2	Summon discovery, research support, orientation and BibDAIL+ chatbot documented on IIT Delhi Central Library pages.
IIT Bombay	IIT	66.7	1/2	Remote access, repository, research support, user-awareness services and self-issue documented; 2025 library event addressed AI.
IIT Madras	IIT	66.7	0/2	Remote access, repository, self-check-in/out and Virtual Reference Desk documented by Central Library.
IIT Kanpur	IIT	44.4	1/2	Remote access, repository and RFID/self-service documented; official 2024 Grammarly guide describes generative AI.
IIT Ropar	IIT	77.8	2/2	Koha/RFID, repository, research support, Turnitin AI detection, AI-powered Grammarly and AI-tools training documented.
IIM Ahmedabad	IIM	77.8	0/2	Discovery, remote access, research assistance/training, RFID book-drop and online chat documented by VSL.
IIM Bangalore	IIM	66.7	0/2	Remote access, repository, research support/orientation, online renewal/reserve and Ask Us documented.
IIM Calcutta	IIM	44.4	0/2	Remote access, repository linkage, research assistance and training documented; explicit AI service not located.
IIM Kozhikode	IIM	100.0	2/2	Web-scale discovery, repository, RFID self-check, research support, Ask Librarian and AI writing/research tools documented.
IIM Indore	IIM	77.8	1/2	Remote access, discovery/research resources, self-check systems and Scopus AI/Web of Science Research Assistant documented.

Across the ten libraries, remote access and institutional repository evidence was universal (10/10), illustrating a strong common digital baseline. Research-support evidence was present in nine libraries and user-training evidence in nine. Automated/self-service circulation evidence appeared in eight libraries, and virtual-help mechanisms in five. Integrated discovery was more selective (four libraries). Explicitly AI-labelled tools/services were evidenced in five libraries, while AI-focused training/guidance was evidenced in three.

Table 3. Coded institutional dataset

Institution	RA	IR	DS	RS	UT	AS	VH	AI	AIT	AILAII
IIT Delhi	1	1	1	1	1	0	1	1	0	77.8
IIT Bombay	1	1	0	1	1	1	0	0	1	66.7
IIT Madras	1	1	0	1	1	1	1	0	0	66.7
IIT Kanpur	1	1	0	0	0	1	0	1	0	44.4
IIT Ropar	1	1	0	1	1	1	0	1	1	77.8
IIM Ahmedabad	1	1	1	1	1	1	1	0	0	77.8
IIM Bangalore	1	1	0	1	1	1	1	0	0	66.7
IIM Calcutta	1	1	0	1	1	0	0	0	0	44.4
IIM Kozhikode	1	1	1	1	1	1	1	1	1	100.0
IIM Indore	1	1	1	1	1	1	0	1	0	77.8

Abbreviations: RA=remote access; IR=institutional repository; DS=discovery service; RS=research support; UT=user training; AS=automated/self-service circulation; VH=virtual help; AI=explicit AI tool/service; AIT=AI training/guidance. Zero indicates no public evidence located under the stated audit rule.

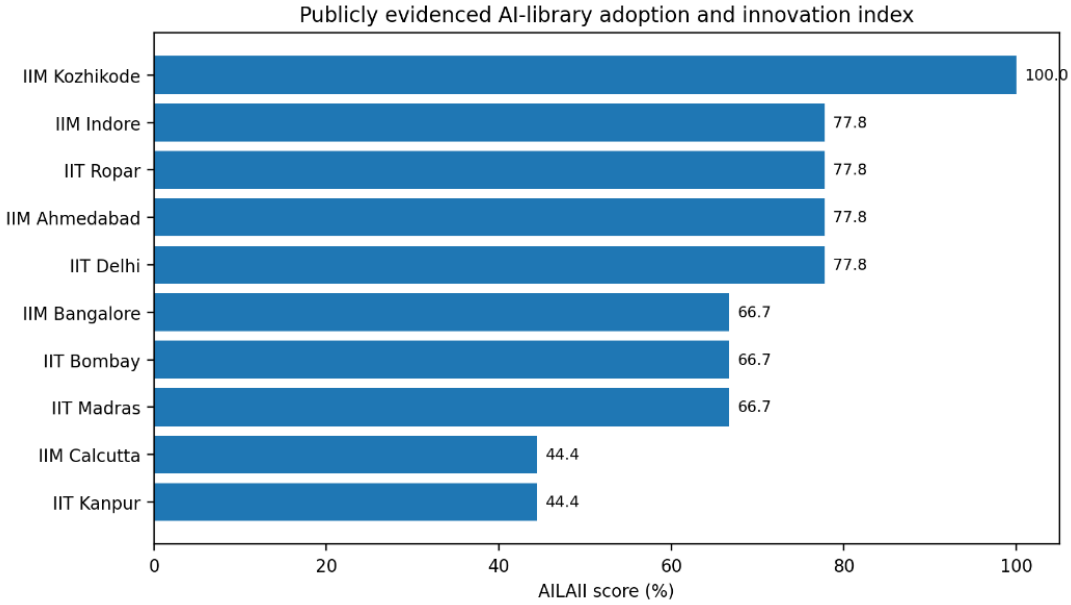

Figure 1. AILAII score by institution

Note: Scores are derived only from the nine coded public-evidence indicators. The index measures documented adoption/innovation visibility, not hidden internal capability.

Table 4. Descriptive statistics by institutional group

Measure	IIT M	IIT SD	IIT Md	IIM M	IIM SD	IIM Md
Digital infrastructure (0-4)	3.00	0.00	3.00	3.40	0.89	4.00
Service transformation (0-4)	2.80	1.10	3.00	3.40	0.89	4.00
User-centric innovation (0-4)	2.40	1.14	2.00	3.20	0.84	3.00
Explicit AI adoption (0-2)	1.00	0.71	1.00	0.60	0.89	0.00
Institutional readiness (0-7)	5.00	1.22	5.00	5.60	1.14	6.00
AILAII (0-100)	66.67	13.61	66.67	73.33	20.18	77.78

The overall AILAII mean was 66.67 (SD=13.61) among IIT libraries and 73.33 (SD=20.18) among IIM libraries. IIMs had higher mean normalized scores for digital infrastructure, service transformation, user-centric innovation and readiness, whereas IITs had a higher mean explicit-AI score (1.00 versus 0.60 on the 0-2 scale). These differences should be interpreted descriptively because the group sizes are only five each.

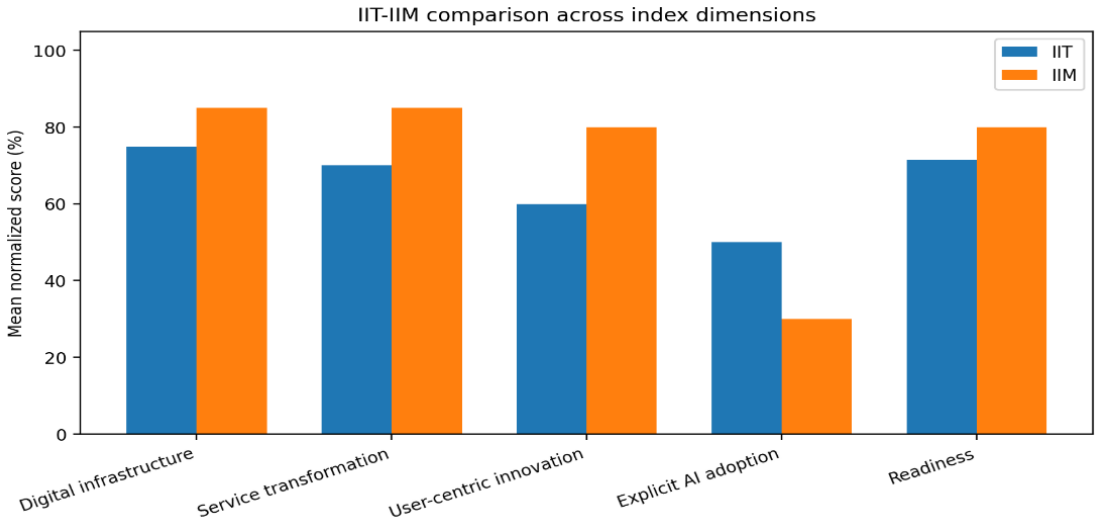

Figure 2. Mean normalised domain scores for IIT and IIM libraries

Note: Each domain mean is expressed as a percentage of its maximum possible score to permit visual comparison across scales.

Table 5. Exact Mann-Whitney U comparisons

Measure	U	p	Rank-biserial r	Decision
Digital infrastructure (0-4)	7.50	0.421	-0.40	Not significant
Service transformation (0-4)	8.00	0.421	-0.36	Not significant
User-centric innovation (0-4)	7.00	0.310	-0.44	Not significant
Explicit AI adoption (0-2)	16.50	0.548	0.32	Not significant
Institutional readiness (0-7)	9.00	0.548	-0.28	Not significant
AILAII (0-100)	9.50	0.690	-0.24	Not significant

In none of the domain comparisons involving IIT and IIM, the significance threshold of .05 was crossed. Regarding AILAII, the results are as follows: U=9.50, p=.690, rank-biserial r=-.24, so H01 is accepted. A similar result was found for service transformation; U=8.00, p=.421, r=-.36, so H02 is accepted. Looking at the effect directions, IIMs were found to be somewhat higher on the general digital/service dimensions. IITs were found to be somewhat higher on the explicit AI visibility dimension. The sample, however, does not support the evidence for making claims of that nature on the population.

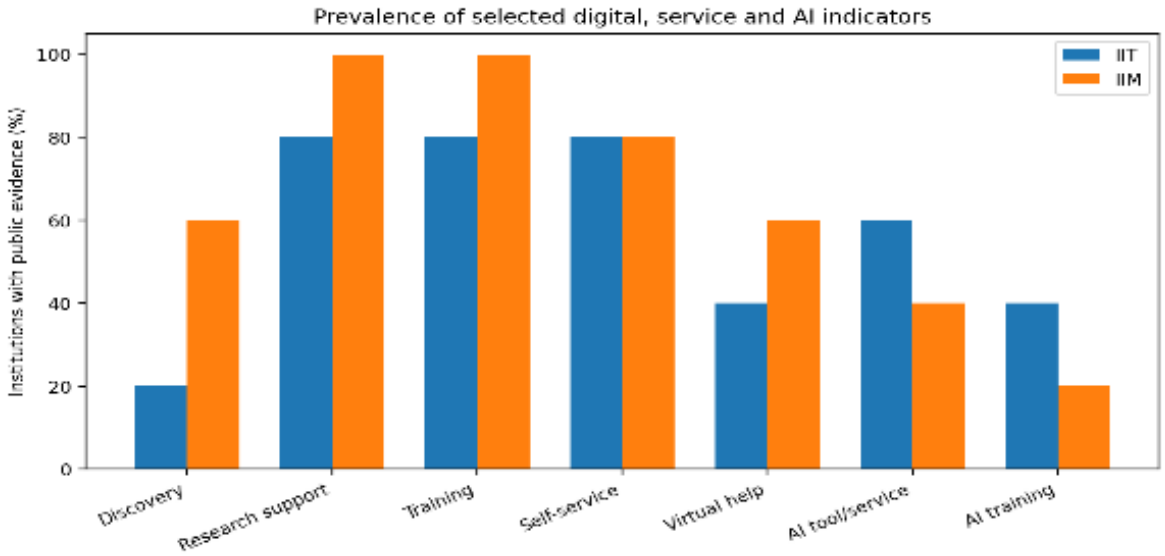

Figure 3. Public evidence of selected indicators by institutional group
Note: Percentages use five institutions per group. AI tool/service requires explicit institutional wording that identifies an AI or generative-AI capability

Relations between public 2020cases serve as a reasonable basis for drawing conclusions regarding the representation of AI in these cases. 80% and 40% of IITs and IIMs (respectively) had a public case that served as an indicator of AI. Fisher's exact test showed a nonsignificant IITs vs. IIMs case conclusion (OR=6.00, p=0.524). Examples that IITs provided that represented AI are the BibDAIL+ Chatbot of IIT Delhi, the Official Generative-AI Grammarly Guide of IIT Kanpur, and AI-labeled research/writing services and training of IIT Ropar. Examples that IIMs provided are the AI research/writing tool of IIM Kozhikode and the Scopus AI and Web of Science Research Assistants of IIM Indore. The evidence does not support the conclusion that the online chat of IIM Ahmedabad is an AI service. The official page of this chat describes it as an online reference service, and not an AI agent.

Table 6. Exploratory Spearman correlations (n=10)

Association	rho	p	Decision
Digital infrastructure - user-centric innovation	0.612	0.060	Not significant
Readiness - explicit AI adoption	0.509	0.133	Not significant
Readiness - service transformation	0.520	0.123	Not significant
AI adoption - service transformation	-0.221	0.539	Not significant

Digital infrastructure had the strongest observed association with user-centric innovation (rho=.612, p=.060). Although this fell just above the conventional significance threshold, its magnitude is practically notable in an exploratory sample; H04 is retained statistically. Readiness was moderately associated with explicit AI adoption (rho=.509, p=.133) and service

transformation (rho=.520, p=.123). Explicit AI adoption itself was not associated with service transformation (rho=-.221, p=.539), indicating that visible AI tools and broad service modernization are not interchangeable constructs.

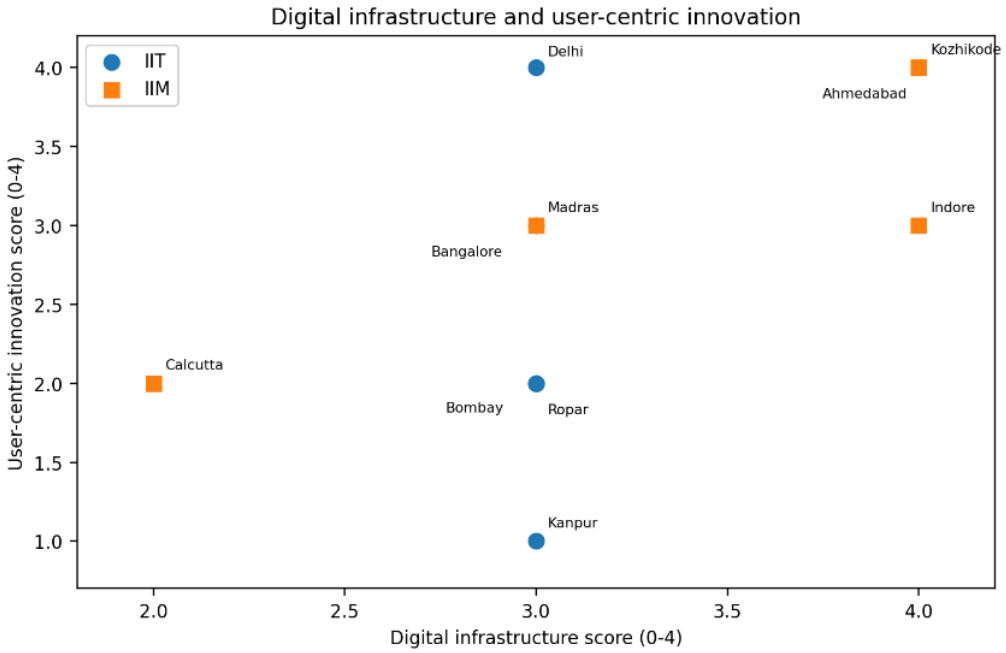

Figure 4. Digital infrastructure versus user-centric innovation

Note: The exploratory Spearman association was rho =612 (p=.060). Overlapping points reflect tied content-audit scores.

8. Hypothesis Testing Summary

Table 7. Hypothesis-testing decisions

Hypothesis	Tested proposition	Statistic	Decision at alpha=.05
H01	No IIT-IIM difference in AILAII	U=9.50, p=.690	Retained
H02	No IIT-IIM difference in service transformation	U=8.00, p=.421	Retained
H03	No association between group and any explicit AI evidence	Fisher OR=6.00, p=0.524	Retained
H04	No association between digital infrastructure and user-centric innovation	rho=.612, p=.060	Retained

9. DISCUSSION

The results illustrate that rather than completely shifting to 'AI libraries', the adoption of AI is fragmented and application-centric. Huang et al. (2023) corroborate this and demonstrate that in the instances where AI applications are present, strategic documents may trail or completely omit references to AI. In this audit, all institutions had some basic infrastructure for digital services (i.e., remote access and digital repositories); nonetheless, only half provided a service/tool that was expressly labeled with AI. This distinction is critical because although digital infrastructure provides the foundations for further services, it should not be assumed that infrastructure for digital services equates to the adoption of AI.

IIM libraries, to some extent, had higher descriptive scores for the transformation of services and user-centric infrastructure. This is arguably more appropriate for management-information environments, where services for Unified Discovery, remote access to databases, and business-information are essential. However, in the limited sample of IITs, more services had explicit references to AI. This included a library-developed AI chatbot and AI research/writing services. Here, it is suggested that the institutional technical culture may support initial visible innovative undertakings. However, since Fisher's Exact test yielded a non-significant result, the findings should not be extended to institutions outside of those audited.

The almost notably positive infrastructure-user-centric relationship is hypothesized to be of great importance. It provides a basis to theorize that some of the features identified by the authors, such as discovery platforms, remote access, and self-service, may create the operational conditions that support the development of more responsive services. This is consistent with studies focusing on the combination of infrastructure and skills as the baseline requirement for the integration of AI in the libraries of developing countries (Barsha & Munshi, 2024; Malakar et al., 2025). The weak relationship between explicit AI and service transformation demonstrates that AI should not be treated as a vanity metric. Libraries are capable of providing advanced user-centric, digitally enabled services with limited publicly showcased AI. In contrast, an AI tool, which is labeled

and promoted, may be a thin veneer over standard operating procedures.

The prudent adoption of AI requires a combination of service assessment and AI governance. User studies indicate a desire for AI-enabled discovery and digital assistants alongside a concern for the user's privacy and the maintenance of a human service (Kavak, 2025). The advocacy of ethical and algorithmic literacy in the social sciences similarly calls for intentionality, accountability, and critical appraisal (Archambault et al., 2024). In the reviewed institutional documentation, description of AI tools was more prevalent than descriptions of AI bias, transparency, data retention, human review, and auditing procedures. This gap represents a strategic documentation focus.

Major Findings

All ten libraries under review provided evidence of the capability for remote digital access and the development of an institutional digital repository.

Of the ten libraries, five had an AI tool/service that was explicitly AI labeled under the conservative coding rule.

AI-focused training/guidance was publicly evidenced in three of the ten reviewed libraries, suggesting that the development of AI-related services is less visible than the development of digital services for general users.

There was no statistically significant difference between IIT (&66.67) and IIM (&73.33) libraries AILAII.

IIT libraries had more institutions with at least one explicit AI indicator (80% vs 40%); the exact group association was statistically non-significant.

The strongest exploratory relationship (rho=.612, p=.060) was found between Digital Infrastructure and User-Centric Innovation.

The adoption of explicit AI was not equivalent to the transformation of services, thus, supporting the need for multi-dimensional assessments.

There was less evidence of Responsible-AI Governance than evidence about digital services, or named AI tools.

11. Practical Implications and Recommendations

IIT and IIM libraries should implement public AI-service registers that differentiate production services from pilots, as well as services with vendor-embedded AI and training. AI procurement should be coupled with AI-supported staff capability programs (prompt design, retrieval quality, AI hallucination, privacy, copyright, and algorithmic bias) as a form of professional ethics. AI should be assessed based on user measures (query, retrieval, ease of access, time savings vs time spent, etc.) rather than the number of adoption attempts. AI-supported reference and research services should contain human-clearing pathways and should be transparent in regards to users of automated services. Clear and reliable data and Meta data along with authentication and strategic infrastructure should be prioritized for the discovery and research repository services prior to the integration of advanced AI services. The sector would benefit from the same annual reporting framework for AI services, governance controls, and user satisfaction across IIMs and IITs.

12. Challenges and Responsible-AI Considerations

Multiple challenges exist throughout the literature discussing infrastructure inequity, a lack of skilled workers, the high cost and the need to integrate with legacy systems, data privacy, copyright, and the risk of generating inaccurate content (Adetayo, 2023; Barsha & Munshi, 2024; Mahmud, 2024). For top tier Indian institutions, the more relevant concern may be moving away from rudimentary forms of digitization towards greater focus on governance and provision of value. Generative search tools offered by vendors may employ opaque methods for ranking or summarization; similarly, writing tools may lead to concerns related to academic integrity and attribution. Libraries are in an optimal position to manage these concerns because information literacy and evaluation of sources, along with privacy of users, fall firmly in the scope of their profession (IFLA, 2020). Therefore, a human-in-the-loop approach should be adopted for research assistance offered at libraries for services with high impact. Libraries should formalize and publish on their websites their practices pertaining to data, the risks and limitations, the assurance of service offered within AI and the assurance of service offered within AI.

13. LIMITATIONS

This research looks at publicly available information and not at activities that are intentionally hidden. In addition, the documentation available on websites varies in the details that are provided. Therefore, a score of zero cannot be interpreted as evidence of non-use. This study employed a purposeful sample of 10 institutions, which limits the generalizability of this research. Because of the small sample, p-values will be presented along with effect size and descriptive statistics, as these will provide the best interpretation. This research was conducted with a single researcher, so inter-coder reliability cannot be calculated. The AILAII is a formative exploratory index, and as such, should be understood as a scale with moderately low reliability. Finally, this is a cross-sectional study and as such, cannot address the temporal progression of technology adoption or establish cause and effect relations.

Future Research Directions

Future studies should broaden this audit to cover all Indian Institutes of Technology (IITs) and Indian Institutes of Management (IIMs), in addition to Central Universities, National Institutes of Technology (NITs), and private universities. A two-coder protocol should be used, and inter-coder agreement should be established. To document previously unreported uses of AI, and to better understand the reasoning behind the decisions made by the organizations surveyed, direct observations, targeted surveys, and in-depth interviews should be conducted with librarians. Satisfaction, trust, perceived usefulness, and AI literacy should be assessed in studies conducted at the user level. Larger sample sizes may be used in a study to model the relationships among the

dimensions of infrastructure, leadership, and readiness; the adoption of AI; the quality of services; and user outcomes. Because the generative AI environments used in commercial software are developing rapidly, longitudinal studies are essential. The generative AI environments of commercial software may change the meaning of the phrase 'AI adoption' in the coming years.

14. CONCLUSION

What evidence allows us to evaluate the extent of the digitized services of the Indian Institutes of Technology (IITs) and Indian Institutes of Management (IIMs) libraries, and the adoption of AI services? Based on the results of the audit study of the ten libraries, all libraries had systems to provide remote access to their collections and services, and had developed research libraries with a repository and services. Libraries also provided research support and training. Most libraries had developed research services, and had made some level of adoption of AI services. IIM libraries had a higher mean composite score for innovation, and a greater number of libraries had at least one indicator of AI services, although both differences were small in statistical terms. The strongest positive correlation was found between the degree to which the services of the libraries were digitized and user-centric innovation, and the degree to which user services had been transformed by AI. This

The main methodological and empirical contribution of the study stems from the detachment of public evidence of AI and the Digital Library maturity level, and the consideration of the absence of public evidence with caution. The analysis provides more cautious and realistic results. The AI tools entering the leading Indian academic libraries are chatbots, AI-based research and writing tools, generative discovery assistants, and training. As governance documentation remains comparatively dispersed, this transition cannot be achieved without moving beyond tool procurement toward designing services, developing staff, and implementing transparent governance and constant user feedback. The standard of assessment for the intelligent academic libraries should be the adoption of safe, inclusive, and verified AI.

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Appendix A. Data Integrity and Reproducibility Note

The quantitative dataset in this paper is an original coding of publicly accessible institutional evidence, not a survey dataset. All statistical values and figures are calculated from Table 3. The coded dataset contains ten institutional observations and nine binary indicators. Readers wishing to replicate the analysis should apply the definitions in Table 1 to the cited official pages and record the audit date, because institutional webpages and licensed-resource descriptions may change over time.

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