Research Article

Technological Advancements in Patna's Hei Libraries: A Conceptual Study and Maturity Roadmap

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Abstract

The present study investigates the technological landscape of Higher Educational Institute libraries (HEIL) in Patna, Bihar, through a conceptual lens because Libraries of academic institutions in Patna face major disparities in infrastructure, interoperability, and professional capacity. Libraries are serving as the epicenter of this digital transformation in this digital era. The shift from traditional print based model of libraries to digitally enabled hybrid models is evaluated here through a conceptual framework. Today knowledge hubs kind of libraries incorporating institutional repositories (IR), automation software, and e-resource, specifically emphasize the libraries as an active learning centers as per the National Education Policy (NEP) rather than warehouse of print media. The Digital Maturity Model (DMM) is adopted here to know the current status of library automation, the implementation of open access, and the integration of national level consortia. The Information and Communication Technology (ICT) integration in Patna HEILs is explore, and examine in the present study. This analysis reveals that inconsistent network reliability, and limited metadata standardization have always hampered a digital ecosystem. This study also identifies major challenges such as - infrastructure disparities, digital literacy gaps, funding constraints, and proposes a roadmap for future research by examining the current status of Patna HEILs. Findings indicating that a holistic realignment of library policy, human capital training, and collaborative institutional governance requiresfor a successful digital transformation rather than software adoption. Therefore, the present research paper provides a data-driven blueprint for policymakers, and administrators to foster an inclusive, future ready academic ecosystem to upholds the principles of digital sovereignty and research accessibility.

Keywords: Academic Libraries, Higher Education Institution Libraries (HEILs), Digital Maturity, NEP 2020, ICT Infrastructure, Digital Transformation.

1. Introduction

In this 21st century, the libraries are no longer defined by its physical collection but is known by its ability to provide seamless access to vast information resources available on the web. ICT revolution in India converted the identity as a - library without walls used to preserveinstitutional digital assets. It is the heart of digital research ecosystems of any country, once regarded as a repository of printed books, has evolved into a dynamic information hub driven. Patna, the capital of Bihar is growing as a hub for higher education. However, the transition is still uneven, but the modernization of institutional libraries is critical for competitiveness. Institutions like the Indian Institute of Technology (IIT), and the National Institute of Technology (NIT) of Patna, utilize high-tech infrastructure due to their strong funding sources, but many state-run colleges struggle with rudimentary automation. The main aims of present study to map this landscape. The academic libraries of Patna are continuously trying to bridge the digital divide and align with set national standards (set by government bodies like UGC and INFLIBNET). The adoption of automated in the Patna libraries, institutional repositories (IRs), and networking is not a luxury but it is requirement for supporting the pedagogical demands of the National Education Policy (NEP) 2020, which acts as the primary catalyst, mandating a transition toward learner-centric, technology-integrated models to promote equity, learning, and interdisciplinary research in India. Nowadays, technologies like Artificial Intelligence (AI), cloud computing, etc., are redefining research. These tools can enhance discovery, preservation, and global visibility of local-level innovations and scholarly outputs. The institutions possess a rich intellectual history of any city, state, or country; they mostly grapple with a digital divide. So, this paper investigates the current status, hurdles, and prospects of these technological implementations in Patna's higher education sector, as well as tries to identify the core problem of disconnection between national policy mandates and the ground-level reality of fragmented infrastructure, outdated digital portals, and a lack of trained staff. This research aims to provide a structured digital maturity roadmap to bridge this gap and to ensure that Patna's higher education institution libraries (HEILs) evolve into inclusive, future-ready academic partners.

2. Literature Review

As per the review of the latest literature, the HEILs of modernization in Patna are heavily influenced by new UGC policies and government initiatives. The study specific to the context of Bihar indicated that institutions like Chanakya National Law University have successfully implemented an open-source-based integrated library management software (ILMS) known as KOHA, but other institutions struggle with archaic infrastructure (Hall, 2022). The study of Mukherjee and Patra (2023) confirmed that India's digital library initiative faces inconsistent remote access with a lack of standardized metadata, which always limits the efficacy of desire resources. It is found that the implementation of advanced ICT-based infrastructures has been directly correlated with academic performance, although barriers still persist, such as inconsistent internet access, staff and institutional technical limitations (Mensah et al., 2023).

The open access movement in India has been a catalyst in the technical advancement of HEILs. Hulagabali (n.d.) noted a significant gap where publicly funded research institution is often locked behind intranets and mostly fails to reach the public domain. In India, the shift toward digital libraries are a well-documented trajectory. As per the study of Khan (n.d.) IRs were growing and heavily skewed toward subject S&T (45%) compared to social sciences (4%). Now, after announcement of NEP 2020 the focus has shifted from digitization toward implementation of national-level consortia. Here NEP acted as a watershed moment for library policy. Sutar (2024) research emphasized that NEP highlights the libraries centrality but the actual implementation planning remains still fragmented, and leading to uneven infrastructural growth among central, and state level universities including government, and private colleges. Which is highlighted the disconnection between policy intent, and its ground root execution, which remains a central theme in recent LIS literatures.

Furthermore, the study of Kondamudi (2025) described that library science, and technical institutions (like IITs, AIIMs, Engineering & Medical colleges) show better digitization work, rather than social science based institutions mainly due to shortages of trained staff and funding bottlenecks[7]. Kashyap and Gautam (2025) suggeted that improvements in ICT, user training programs, enhanced digital collection, upgrading the library website or webpages, staff training, availability of e-resources, and regular user surveys increase the user satisfaction in the library of Magadh University, Bodh Gaya, Bihar[8]. Sharma's (2025) stated that public libraries depend on state and local level funding, which is usually supplemented by the central grants from the RRRLF and the National Mission on Libraries (NML), but the overall funding is insufficient, irregular, and inequitable, mostly for small rural libraries.

As per the findings of Champla's (2026) research, although Telangana deemed university libraries are gradually adopting digital technologies, there is a need for planning, training, and strong policy support from the state and central government because, without digital transformation, libraries will not stay relevant in the modern world and will not be able to support teaching, learning, and research activities effectively. According to Behera, Vikash, & Saw (2026), the effective digital transformation entails a clear policy framework, and libraries should progress towards digital maturity to guarantee innovation, preparedness, governance, and accessibility to everyone. Trivedi & Trivedi (2026) emphasized that, in alignment with NEP 2020 and the United Nations' Sustainable Development Goal 4 (Quality Education), the role of the library is a catalyst in higher education with the help of IRs, open-access platforms, and capacity-building initiatives. As per the SDG 4's mandate – to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, the libraries are digital learning hubs rather than peripheral service units.

3. Research Gaps

The current literatures documented the adoption of automation and ICT tools in India, but the critical research gap persists regarding digital maturity and institutional readiness of academic institution libraries in the Bihar region. Existing researches focus mainly on technology adoption rather than holistic governance, failing to bridge the disconnect between the mandates of NEP 2020 and Patna's HEILs' infrastructural, pedagogical, and capacity-related barriers. Consequently, there is a lack of actionable frameworks for resource sharing and digital transformation. This problem is addressed by proposing a comprehensive Digital Maturity Roadmap (2026–2030) that integrates regional collaboration with long-term human-centric capacity building.

4. Scope and Limitations

This study mainly focuses on examining automation status, latest e-resource accessibility, and ICT infrastructure of HEIL (university and college libraries) located within Patna, the capital of Bihar. The research relies basically on secondary data and institutional reports. It does not conduct any primary field-based surveys, i.e., conceptual in nature. Thus, limiting its granularity regarding user experience-based metrics.

5. Objectives of the Study

1. To identify the technological infrastructure available in HEILs in Patna
2. To investigate the adoption of ILMS in Patna;
3. To examine the current state of automation in Patna's HEILs;
4. To evaluate and analyse the effect of national-level consortia;
5. To perform the SWOT analysis of the HEILs of Patna;
6. To know the transformation journey of the Library, Patna Central University;
7. To identify the comparative technological infrastructure of renowned HEILs;
8. To provide the conceptual framework for the digital transformation of HEILs;
9. To analyse the alignment of transformative goals of NEP 2020;
10. To identify major challenges hindering the digital transition;
11. To suggest future strategic recommendations for sustainable library development.
12. To propose a strategic roadmap for digital maturity.

6. Methodology

The methodology of the present study is structured to capture both the qualitative shifts in library policy and the quantitative realities of ICT integration in Patna's HEILs. Here, a mixed-methods exploratory research design is used by combining the conceptual analysis with a comparative qualitative framework to evaluate the technological landscape of HEILs Patna.

6.1 Data Collection:

6.1.2 Qualitative Review of Secondary Sources: The systematic review was performed by exploring university/ institutional official websites, their libraries' official webpages or websites, IQAC (Internal Quality Assurance Cell) reports, their digitisation policy documents, and other valuable files or resources from renowned institutions in Patnato to gauge digital maturity.

6.1.3 Policy Benchmarking: The in-depth analysis done to know the UGC/INFLIBNET vision and mandates regarding the automation of university libraries.

6.2 Conceptual/Theoretical Framework: As posited by Davis (1989), the acceptance of information systems is fundamentally predicted by perceived ease of use and perceived usefulness. The study also adopts the Technology Acceptance Model (TAM), a lens to evaluate how staff & students perceive and utilize digital tools. The acceptance of information systems is fundamentally predicted by Perceived Ease of Use and Perceived Usefulness. This construct is used to assess the adoption of KOHA, DSpace, and N-LIST consortia across Patna's HEILs landscape.

6.3 Comparative Assessment: For benchmarking the performance of HEILs against UGC-and NEP mandated regarding infrastructure standards.

6.4 Analytical Framework: To find out a clear metric for assessing how libraries are aligning with the objectives of NEP 2020, a comparative assessment was performed to categorize libraries through the lens of their own Digital Maturity Level (DML) from Level 1 (Manual/Traditional) to Level 4 (Fully Automated/AI-integrated). This framework is further used to contrast government-funded versus private institutional library capabilities.

7. Analysis and Discussion

7.1 Current State of Library Digital Transformation

The hybrid evolution observed in the digital transformation of HEILs running in Patna. Out of them, Patna University has achieved full automated library and manages huge digital collections, highlighting that a significant digital maturity gap persists in this region. The institutions selected for this study as per the Table-1 on the basis of subject

to availability of information. The secondary data obtained from Official university websites, Official library portals, Annual reports, Library service pages, IR, Digital library webpages, NAAC reports (if publicly available), and NIRF reports (if available). Table 2 compares the most viable ILMS suitable for Patna's HEILs after considering the common constraints like budget, technical support, and user demand.

Table 1: Higher Educational Institutions located in Patna, Bihar.

Institution	Library Website
Patna University	Official Library Portal
IIT Patna	Central Library
NIT Patna	Central Library
Aryabhatta Knowledge University	Official Website
Patna Women's College	Library Portal
AN College	Library Section
College of Commerce, Arts & Science	Library Section

Figure 1: Availability of Technology.

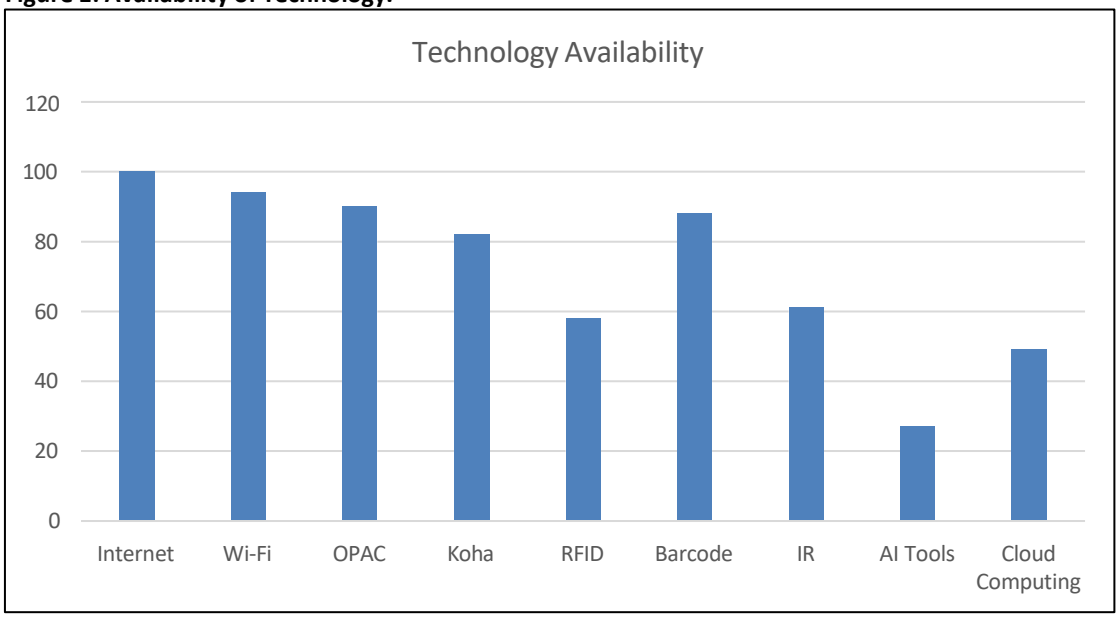


Figure 2: Digital transformation challenges.

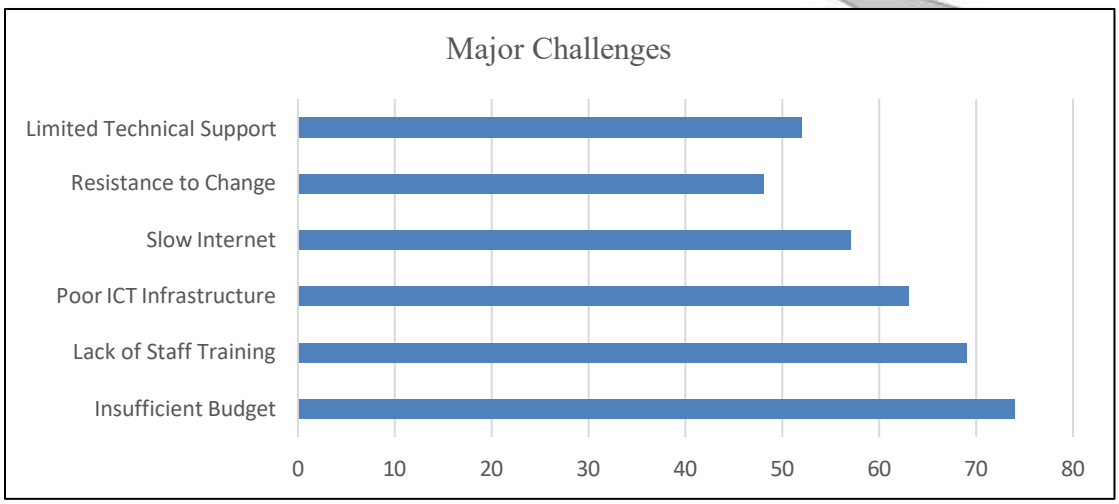


Figure 3: Preferred Future Technologies.

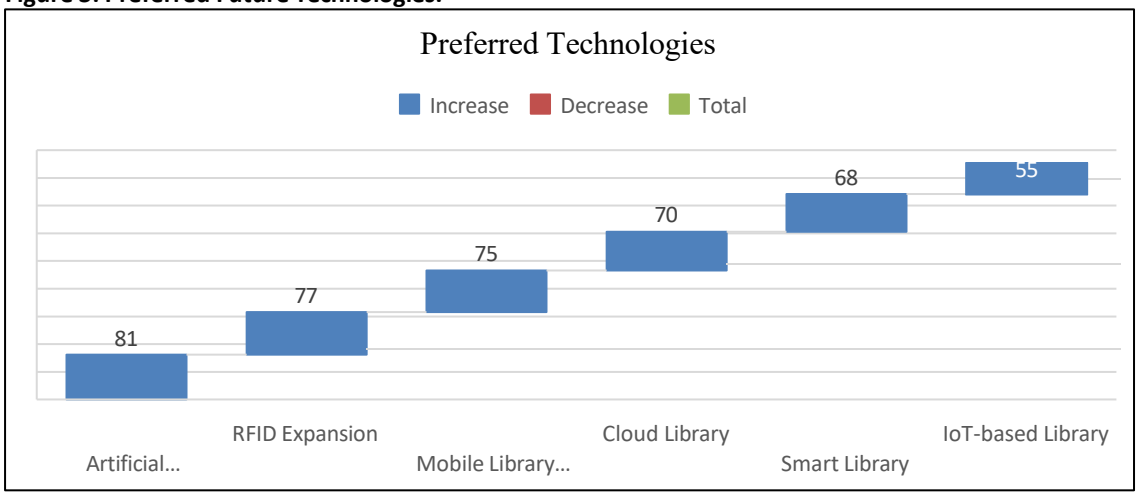


Table 2: ILMS in an educational context.

Feature	KOHA	SOUL	NewGenLib
Licensing	Open Source (GPL)	Proprietary (INFLIBNET)	Open Source
Customization	High	Low/Moderate	Moderate
Technical Support	Community-based	Centralized (INFLIBNET)	Enterprise-based
Cost	Low (Implementation)	Subsidized for Universities	Moderate
Suitability for Patna	Best for large, tech-capable libraries	Ideal for UGC-funded institutions	Suitable for small colleges

7.1.1 Quantitative Trends: As per the available data, Bihar's major universities regularly use e-resources; the quality of this is heavily skewed by infrastructure. Institutions having international partnerships, modern facilities, and knowledgeable faculties such as Nalanda University report higher satisfaction levels than those institutions that are struggling with high-speed connectivity and digital literacy.

7.1.2 Human-Tech Friction**:** The analysis reveals that technology is outpacing the development of professional competencies because users cite inadequate training as a primary challenge. It is evident that true digital maturity needs a shift from merely installing tools to fostering a culture of information and literacy.

7.1.3 Automation- Status: Most of Patna's HEILs have transitioned from manual card-based systems to ILMS as per Table 3. The adoption of open source software like KOHA &DSpace is noted, which circumvents expensive licensing fees.

Table 3: Status of technological integration in Patna HEILs.

Technology	Status/Implementation	Impact Level
Library Software	Variable (KOHA commonly used)	Moderate
E-Resources	Access via N-LIST/e-ShodhSindhu	High
Digital Repository	Emerging (iETD/DSpace)	Low

7.1.4 Consortia Effect:The e-ShodhSindhu and N-LIST have been the primary drivers of technological growth mentioned in Table 4, which can effectively democratize access to high-impact journals. This technological shift is statistically reflected in the enhancement of scholars' research output in Patna.

Table 4: Quantitative estimate of resource usage in Patna HEIs.

Resource Type	Adoption Rate (%)	Primary User Group
Online Catalog (OPAC)	0.75	Undergraduate/Graduate
Remote Access Tools	0.4	Research Scholars
Institutional Repositories	0.2	Faculty/Post-Docs
AI/Discovery Tools	<5%	Early Adopters

7.2 SWOT Analysis:illustrated in Table 5 mainly identifies the internal strengths and weaknesses, with external opportunities and threats, in the adoption of emerging technologies in HEILs of Patna.

Table 5: SWOT Analysis of Technological Advancements in HEILs in Patna, Bihar.

Strengths	**Weaknesses**	**Opportunities**	**Threats**
Adoption of integrated library management systems (e.g., Koha, SOUL) enhances operational efficiency.	Limited financial resources for advanced technological infrastructure.	Expansion of digital library initiatives through government programs such as the National Digital Library of India (NDLI).	Cybersecurity threats, including data breaches and unauthorized access to digital resources.
Access to digital resources such as e-books, e-journals, and online	Inadequate ICT infrastructure and unreliable internet	Integration of emerging technologies such as Artificial Intelligence (AI),	Rapid technological obsolescence requiring

databases improves academic support.	connectivity in some institutions.	cloud computing, and data analytics in library services.	frequent upgrades and investment.
Automation of library services (OPAC, RFID, barcode systems) reduces manual workload and improves service delivery.	Lack of continuous training and digital competency among library professionals.	Collaboration and resource sharing among academic libraries through library networks and consortia.	Budget constraints affecting technology acquisition and maintenance.
Remote access to library resources supports flexible learning and research.	Uneven implementation of technology across higher educational institutions in Patna.	Increasing demand for online learning and digital information services creates scope for innovation.	Resistance to technological change among staff and users may hinder adoption.

7.3 The Patna University Central Library Digital Transition: The Central Library of Patna University represents the paradigm shift in Bihar's academic landscape as the oldest and most prominent institution in this area by characteristic of expansive colonial-era print collections that have historical value, and it represents the state-of-the-art of this state also. For a number of years, this institution has faced a number of hurdles in retrofitting historical infrastructure to meet modern digital demands. Its transformation journey is as follows:

7.3.1 Initial Phase (2015-2018): This stage mainly focuses on retrospective conversion of available old bibliographic data from manual card catalogues into electronic formats using SOUL (Software for University Libraries of INFLIBNET).

7.3.2 Consortium Integration (2019-2022): At this stage, the library prioritized securing consistent high-speed internet to access the N-LIST and e-ShodhSindhu consortium, for creating a bridge during the transition phase from static to remote learning.

7.3.3 Current State (2023-2026): This stage shifted toward maintaining IR standards, where the central library acts as a role model for regional colleges, emphasizing the required metadata standards (Dublin Core) to ensure that local research is discoverable on global academic indexes.

7.4 Comparative Analysis: Table 6 presents a comparative analysis derived from information published on official institutional websites.

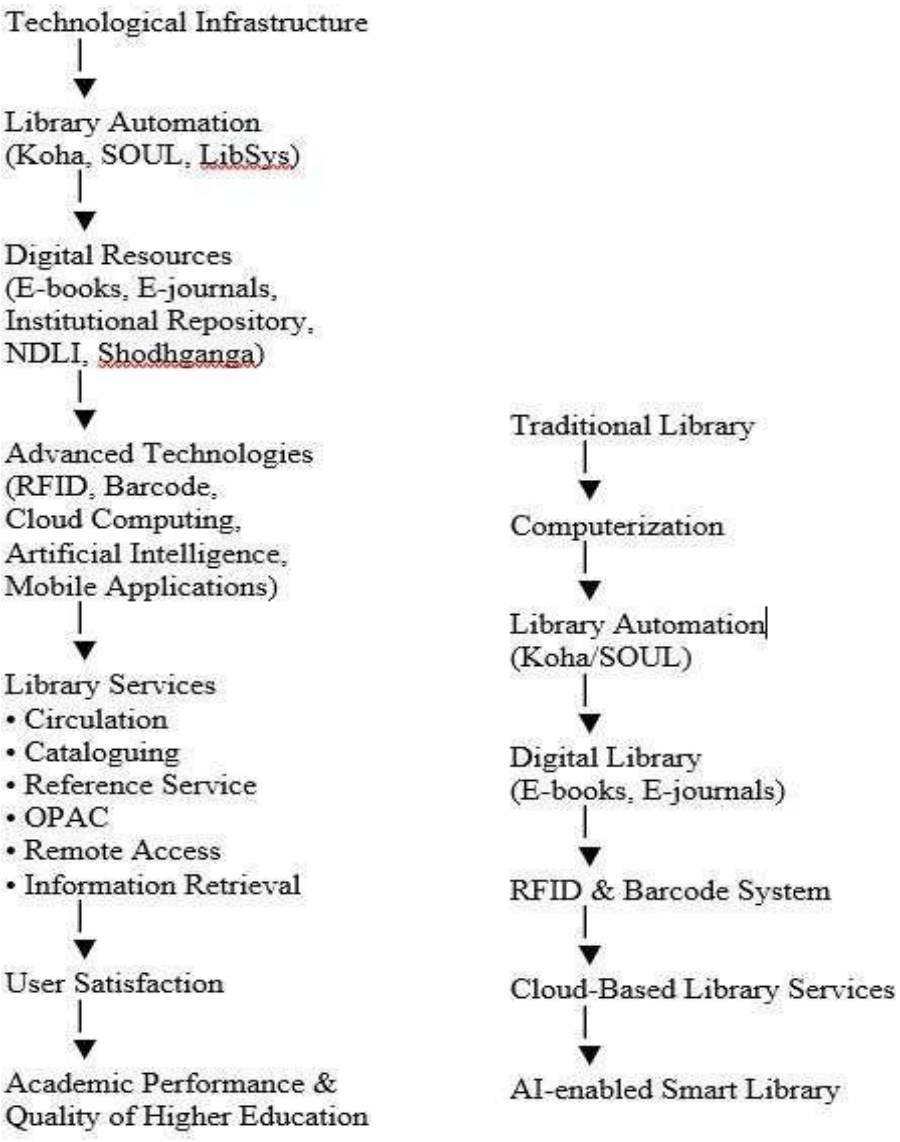
Table 6: Comparison among renowned HEILs of Patna.

Technology	Patna University	IIT Patna	NIT Patna
Library Automation	Modernization and automation in progress	Automated OPAC and RFID-enabled services	Fully automated using LibSys
OPAC	Modernization underway	Available	Available
Digital Library	e-Learning Centre; e-library under development	Dedicated digital library with computer terminals	E-resource section
Institutional Repository	Not prominently listed	Institutional Digital Repository (IDR) for theses and publications	Not prominently listed
RFID	Not indicated	Available	Not indicated
E-books / E-journals	INFLIBNET services in progress	Extensive e-resources	2,700+ e-journals
Research Support	BLIS/MLIS programmes	Reference services, thesis submission, Scopus publications	IEEE, Springer, ASME, ASCE, ACM and other databases

Wi-Fi	Not clearly specified	Full Wi-Fi coverage in library	Internet-enabled e-resource section

7.5Conceptual Framework: The present framework is based on the TAM, Diffusion of Innovation Theory (DOI), and Digital Library Framework.

Figures 4 & 5: The conceptual framework and technology adoption of this study.



7.6 NEP 2020 and Library Governance Policy Analysis: As per the NEP 2020 mandates- a transformative approach (from static storehouses to active learning resource centres) will be adopted for library resources.

7.6.1 The Sovereignty Openness Framework: This policy emphasizes Digital Sovereignty in the context of the Indian knowledge economy, which means the ability of academic institutions to host and control their intellectual research output. For Patna's HEIs, this requires: 1) It is mandatory to establish IR for moving beyond e-resources to hosting local master files, doctoral theses, and research publications; and 2) This policy also implies the need for trained library staff which transit from normal library professionals to Information Scientists or Digital Curators. As per the recent advocacy in Bihar regarding the status of librarians as

Academic staff, their role in managing digital research environments becomes as vital as that of an instructor or mentor.

7.6.2 From Library to Resource Center: The NEP framework necessitates that libraries act as Active Learning Resource Centers, moving beyond static storage toward ICT-integrated ecosystems such as the Academic Bank of Credits (ABC) and the National Academic Depository (NAD), which are implemented nationwide.

7.6.3 Policy Implementation Challenges – This policy provides an initial vision only, but the allocation of financial budget for high-tech digital infrastructure still remains decentralized due to insufficient state-funded universities and colleges in Patna. In the absence of a centralized Bihar State Academic Library Network, each university interprets NEP guidelines as per its convenience, which is leading to an inconsistent digital environment for students or researchers.

7.6.4 The Equity Challenge: The implementation of the NEP 2020's inclusive education mandate is fundamentally contingent upon breaking down institutional silos. The proposed establishment of a 'Patna Union Catalogue' transcends mere technical modernization; it serves as a strategic policy imperative designed to democratize access to information, effectively narrowing the systemic disparities between elite research universities and regional colleges."

7.7 Digital Maturity Benchmarking: Applying a four-dimensional (Technologies, Processes, Organization, Employees) Digital Maturity Model (DMM) provides a structured way to evaluate progress and categorize Patna's HEILs.

7.7.1 Level 1 (Emerging/Manual/Reactive): Characterized by reliance on manual processes performed on paper/Excel sheets, lack of strategic IT leadership, fragmented digitization, dispersed, project-based digitization, and high reliance on physical archives. The number of rural or smaller colleges in Bihar is likely to fall here.

7.7.2 Level 2 (Proactive/Established): Moving toward integrated systems via adoption of ILMS (e.g., KOHA), e-resource usage, digital literacy, and upskilling stakeholders. Here, mostly mid-tier institutions of Patna should aim in the short term.

7.7.3 Level 3 (Integrated/Mature): features such as long-term strategic digital management, OAI-PMH compliance, AI-powered discovery, high-level data management, and institutional repository hosting represent the 2030 vision of Patna University and other high-tech institutions.

7.7.4 Level 4 (Transformational): AI-based analytical discovery, predictive analytics, and integration with the national digital academic ecosystem. Table 7 shows these transformations in detail.

Table 7: Maturity Milestones.

Milestone	2026-2027 (Foundational)	2027-2028 (Structured)	2029-2030 (Transformative)
System	Local Database/Catalog	Cloud-based ILMS (e.g., KOHA)	AI-Integrated Discovery Layers
Focus	Digitization	Collaboration/Networking	Predictive Analytics/Data
User Role	Reader/Consumer	Participant/Collaborator	Knowledge Creator/Researcher
Infrastructure	Basic Wi-Fi/PCs	High-speed Fiber/NKN	IoT/Smart Resource Tracking

8. Discussion

The present study analysis suggests that SOUL ILMS software remains the standard for its ease of integration with national portals, and the KOHA offers require institutional flexibility to build or custom user-friendly interfaces or integrate AI-driven discovery layers. The integration of ICT in Patna's HEILs is characterized by hybridity. Most of the libraries have moved beyond card catalogues to OPAC (Online Public Access Catalogues). However, the implementation of the digital library work is in progress. While consortia like ONOS and N-LIST have provided e-

resources now, there is a lack of local digital content creation, such as digitizing of rare manuscripts, local research papers, official reports, etc., which remains a significant hurdle. As per the study, the computers/servers have improved; the discussion centers on Human-Tech Friction. The delay between the acquisition of software and the training of library personnel is noticeable, which further affects management and maintenance of metadata, interoperability, and in-network troubleshooting. The present analysis suggests that technology in these kinds of libraries is currently being used for digitization (scanning/storing) instead of digital transformation (data analytics/user experience enhancement).

9. Findings

9.1 Automation Gap: A distinct divide observed between the centralized university and affiliated college libraries of Patna.

9.2 Resource Dependency: Institutional digitization efforts are minimal, and mostly HEILs are dependent on national consortia.

9.3 Human Capital: There is a shortage of technically trained library professionals, which hinders the maintenance of sophisticated library and repository management software like SOUL, Libsys, KOHA, DSpace, etc.

9.4 Lack of Interoperability: Due to an unshared regional cataloguing system, most of the libraries operate as independent silos. which limits the potential for city-wide resource sharing and inter-library loans.

9.5 Fragmented Digitization: There is a lack of institutional interoperability, because the institutional libraries of Patna are automating currently but, they are not part of the Patna Academic Library Network (which provides seamless inter-library resource sharing).

9.6 Infrastructure Unevenness: The central library of Patna universitypossesses high-speed bandwidth of internet, with advance fiber optic cables, but college libraries struggle with high-speed internet connectivity, which is leading toward low utilization rates of digital resources and indicating uneven implementation of high-tech Infra.

9.7 Metadata Standardization: There are lot of inconsistent bibliographic data, due to the rushed digital shift in the few institutions, creating difficulties in the discovery of desire information at the time of navigation on global search engines.

9.8 Untapped Potential of AI Analytics: Users are beginning to trust on AI based discovery and predictive analytics, rather than institutions are beginning to explore digital studios and e-content creation, which indicating libraries are still running in the foundational phase of data hygiene. Premature investment in AI (means without foundational standardization of metadata) will yield inconsistent results.

9.9 Policy Compliance: As perUGC mandates basic automation are compliant with most of the HEILs, but to make their libraries as an active learning centers, there is requirement of institutional-level funding, which clearly shown a disconnect in the meeting of advanced requirements of the NEP 2020, basically integration of open access of local archives.

10. Future Prospectus

The future of the HEILs of Patna lies in Open Access (OA) advocacy, ICT, and Artificial Intelligence (AI) integration. For moving forward, libraries must adopt AI-driven chatbots for user reference services, focus on institutional repositories to preserve and present a showcase of local research, and implement robust remote access and advanced AI-assisted systems to ensure advanced learning continuity beyond campus walls or geographical limitations. Overall, the future of HEIL librarianship in Patna necessitates a transition from information storage to knowledge curation. Based on current trends, it's pivoting toward the Integrated Information Ecosystems.

10.1 Literacy Programs: Libraries should not be just book providers nowadays; they have converted into data hubs. It offers orientation training in various library management-related software, reference management & plagiarism detection tools, and open-access publishing, etc. (e.g., Koha, Dspace, Zotero, Mendeley, etc.)x

10.2 Librarian as a Digital Curator: Library professionals need to improve their skills in data management and information literacy. This change will help them move beyond administrative tasks and take part in the research process at academic institutions.

10.3 Cloud-Based Library Management: Moving from on-site servers to cloud-based servers for Integrated Library Management Systems (ILMS) will lower hardware, software costs, and maintenance efforts. It will also improve system uptime.

10.4 AI-Derived Research Support: Future research should look into using Large Language Models (LLMs) in libraries. These models can provide conversational search interfaces for library collections, making them easier to use. They can also create custom research assistants. This allows students to ask simple or complex questions about specific digital collections and even access local library repositories.

10.5 Standard Metadata Initiatives: Setting up a regional and state-level consortium in Bihar for shared public access cataloging would significantly lessen the workload for individual library staff. This change will enhance the user experience across all higher education institutions in Patna.

10.6 Collaborative Networks: Creating a Patna Academic Library Network is vital for sharing metadata and digital resources within the city. This network will help colleges with lower funding access resources similar to those available at larger, centrally funded institutions.

10.7 Knowledge Sovereignty: Libraries should align with the digital sovereignty goals in the National Education Policy 2020. They should focus on creating strong, AI-assisted institutional repositories that preserve and host local, indigenous research outputs. This effort will help reduce reliance on international paywalled databases.

Table 8: The Digital Maturity Roadmap (2026–2030).

Phase	Strategic Focus	Methodological Goal
2026–2027 (Foundational)	Standardization	Transitioning from siloed records to Dublin Core metadata and standardized cloud-based ILMS.
2027–2028 (Networking)	Collaboration	Launching the "Patna Academic Library Network" (PALN) to enable regional resource sharing.
2028–2029 (Sovereignty)	Publishing	Mandating local doctoral research hosting in DSpace to ensure Bihar's intellectual output is globally visible.
2029–2030 (Innovation)	AI & Analytics	Integrating predictive analytics and conversational discovery interfaces to personalize the student research experience.

The roadmap for 2026 to 2030, shown in Table 8, outlines a clear, step-by-step plan. It starts with basic connectivity and progresses to becoming an intelligent, AI-supported research partner. This approach aims to meet the visionary goals of Patna HEILs 2026-2030, as described in the vision document and the larger NEP 2020 framework.

Conclusion

Technological progress can change Patna's HEILs from passive support units into strategic partners. However, this change is not uniform; it faces challenges due to infrastructure gaps and a lack of cohesive digital governance. While significant progress has been made in digitization, automation, and consortium access, moving from simply having digitized libraries to truly digital libraries requires consistent funding and thorough training. Digital maturity involves not just adopting software, but also strategic planning, standardizing metadata, and creating an environment that promotes AI expertise where these elements work together. Patna's HEILs can drive regional knowledge growth by embracing collaborative frameworks and focusing on services that prioritize users. By developing AI-literate information resources, these libraries can enhance Bihar's contributions to the national and global knowledge economy, in line with the NEP 2020's vision of inclusive excellence. This shift requires institutions to prioritize an integrated, user-focused, and policy-driven approach with cooperative governance.The technical obsolescence and budget constraints are the main real-world challenges in the advancement of these libraries, which are overcome to some extent with the adoption of OSS & tools, national-level consortia (like ONOS), and data stewardship skills to empower library professionals to lead this digital transformation. Therefore, the future of Patna's academic excellence depends on the successful modernization of its knowledge infrastructure means HEILs.

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