SUṢAMĀ : Multidisciplinary Research Journal ISSN: 3107-4529
(International Peer-Reviewed & Refereed Journal)
Vol. 1, Special Issue, (December) 2025

Reforming Indian Knowledge Systems for the Digital Age: Repository Models and Resource Mapping Techniques

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Abstract: This research paper provides an overview of the structural and technical transformation of Indian Knowledge Systems (IKS) within the context of the Digital Age. It argues that the digitization of IKS is not merely an archival necessity but a strategic imperative to transition from static preservation to dynamic Vedic Intelligence. The paper analyzes existing Repository Models, comparing the federated architecture of the *National Digital Library of India* (NDLI) with the defensive mechanisms of the *Traditional Knowledge Digital Library* (TKDL) and the community-centric approach of the *Muktabodha Indological Research Institute*. The document provides detailed explanations of Resource Mapping Techniques, which include Dublin Core Application Profiles (DCAP) for manuscript management, and domain-specific ontology development for Ayurveda, and Geospatial Information Systems (GIS) integration with tangible heritage. The research demonstrates that effective IKS transformation demands a combined *"Phygital"* system which unites traditional knowledge with Semantic Web technologies (Web 3.0) to create interoperable and searchable indigenous knowledge systems for worldwide application.

Keywords: Indian Knowledge Systems (IKS), Repository Models, IKS-Core Metadata, Resource Mapping, Semantic Web.

1. Introduction

The preservation, documentation, and dissemination of knowledge are foundational pillars of societal advancement. The Indian Knowledge Systems (IKS) consist of a vast traditional wisdom which evolved through numerous centuries of intellectual and philosophical and scientific and artistic development. The collection contains texts from multiple fields which include Ayurveda and astronomy and mathematics and linguistics and architecture *(Vastu Shastra)* and the performing arts. The large number of documents along with their linguistic variety which includes Sanskrit and Tamil and Pali and regional dialects and their dispersed arrangement throughout multiple manuscripts and private collections and institutional archives creates major obstacles for contemporary researchers to access and analyze these materials.

The digital revolution brings two essential elements which protect our heritage while creating new chances for its defense. The process of converting manuscripts into digital format proves insufficient because proper preservation and usage demand complete organizational and technical framework transformations to handle this knowledge effectively. Current digital efforts face multiple issues because they lack standardization and interoperability and complete resource mapping which results in separate data silos that block research collaborations across fields and worldwide data sharing (Rohith, 2025). Without robust digital structures, this invaluable heritage risks continued obscurity or, worse, degradation.

This research paper addresses the critical need for a structured and scalable digital framework to realize the potential of IKS in the 21st century. The main achievement of this research involves creating new Repository Models which serve as customized solutions for IKS systems that handle intricate dependencies and track commentary history and support multiple languages through detailed metadata. Furthermore, the paper describes complex Resource Mapping Techniques which serve to connect separated collections while creating uniform cataloging methods throughout different institutions and enabling advanced discovery methods that go past basic keyword searches.

The paper will continue with the following structure: Section 2 reviews the current state of digital IKS projects and identifies the structural and operational weaknesses that exist. Section 3 presents a metadata standard together with three interoperable repository architectures which include Hierarchical, Federated and Semantic Web-based models. Section 4 presents the resource mapping methodology through its two main components which consist of ontology development and cross-lingual indexing. Finally, Section 5 discusses implementation challenges and outlines a roadmap for institutional collaboration, concluding with the broader societal implications of successfully digitizing and reforming Indian Knowledge Systems for global academic and public consumption.

2. Review of Existing Digital IKS Initiatives

The dedication to digitizing Indian Knowledge Systems (IKS) has brought about various successful large-scale projects but a thorough examination of the current environment exposes major structural and scoping problems (Pandit, 2025). These limitations generate barriers which prevent systems from working together while they restrict research capabilities and block IKS from reaching its maximum capability in the worldwide digital ecosystem.

The digital world has reached numerous accomplishments yet it exists in a fragmented state. The government along with institutional organizations have developed fundamental digital IKS assets through their major projects (Ministry of Culture 2018). Notable initiatives include:

The Digital Library of India (DLI): This project has digitized millions of pages from various sources (Govt. of India 2022). Its strength lies in sheer volume and scale, capturing vast amounts of printed matter and manuscripts.

The National Mission for Manuscripts (NMM): The NMM is dedicated to cataloging and digitizing India's extensive manuscript wealth (Govt. of India 2022). It has made invaluable strides in documenting unique, rare, and often fragile source materials.

Institutional and University Repositories: Traditional academic institutions together with *pathashalas* (schools) operate individual digital repositories that concentrate on particular academic subjects including Vedanta schools and Ayurveda and regional literature.

The present educational system shows a fragmented state which produces multiple digital silos instead of creating a unified knowledge graph (Vallabhaneni).

Deficiencies in Structure and Standardization

The most pronounced weaknesses in existing IKS digital initiatives stem from fundamental structural and technical inconsistencies. Initiatives don't commonly accept one single, universally acknowledged metadata schema. For example, a few projects may go for a simple Dublin Core while others could be using a custom, institution-specific schema which is often based on MARC formats. This results in:

- **Inconsistent Descriptors:** The same concept, such as the author or the date of a text, may be cataloged differently across repositories (e.g., using different dating systems or spelling variations for names).
- **Missing IKS-Specific Fields:** Crucial contextual information unique to IKS—such as *paramparā* (scholarly lineage), *grantha-parimana* (extent in lines/words), and links to multiple commentaries—is often omitted, making it impossible to reconstruct the full intellectual history of a work digitally (Pandit, 2025).

Most of the digitized IKS content exists in the form of basic raster images which include JPEG and TIFF formats that reproduce the original handwritten documents or printed materials. High-quality Optical Character Recognition (OCR) technology functions as a necessary component which enables users to search entire text content instead of relying on metadata fields when working with non-Latin scripts such as *Devanagari*. The lack of sufficient data access methods restricts researchers from conducting thorough analytical studies (Buoy, Rina et al.). Few initiatives utilize standardized structured text formats like XML/TEI (Text Encoding Initiative), which would allow scholars to analyze linguistic features, textual variants, and rhetorical structure through computational methods.

Many early digitization projects were built on outdated technology stacks. The systems become vulnerable to maintenance problems after their initial project funding ends which leads to broken links and non-functional search features and security weaknesses. This lack of a sustainable, long-term technological roadmap undermines the principle of perpetual preservation (Vallabhaneni).

Limitations in Scope and Depth

Beyond structural deficiencies, the scope and quality of content and documentation are frequently limited. The selection process shows a clear preference for Sanskrit texts which mainly focus on philosophical and religious subjects. The dominant knowledge systems have pushed regional knowledge systems to the edge of existence. The extensive knowledge bases which exist in regional languages such as Kannada and Tamil and Malayalam and Bengali about local medicinal practices and architecture and agricultural science have received insufficient documentation (Ghosh, 2024). The digital archives show limited representation of Prakrit and Pali languages which serve as essential tools for studying early Indian history and Buddhist and Jain religious traditions. IKS includes all aspects of performance and oral and visual heritage through its holistic nature (e.g., classical music, dance, temple architecture, yoga asanas). Existing digital repositories are almost exclusively focused on textual and manuscript data, leaving critical non-textual components poorly mapped and documented. Capturing these forms requires advanced multimedia metadata, which is currently absent (Kumar, 2024). One of the most complex yet essential aspects of IKS is the *guru-śishyaparampara* (teacher-student tradition) and the layered tradition of commentary (*bhashya*). Current repositories fail to provide semantic linkages that connect a source text to its diverse commentaries, making it difficult for researchers to trace the historical and intellectual evolution of a specific idea or school of thought (Kumar, 2024 and Pandit, 2025).

The existing efforts have successfully moved IKS into the digital realm; they have created a fragmented environment of non-interoperable data silos characterized by insufficient metadata, limited full-text search capabilities, and a narrow scope (Rohith, 2025). The reforms proposed in the following sections—specifically new repository models and resource mapping techniques—are designed to address this core structural and scoping deficits, creating a truly integrated digital ecosystem for IKS.

3. Repository Models and Metadata Standardization

Section 2 describes two main problems which need a complete digital system to solve them effectively at scale. The framework depends on two essential components which include a specialized metadata standard for Indian Knowledge Systems (IKS) and three fully interoperable repository architectures.

3.1. Proposal for the IKS-Core Metadata Standard

Current efforts often fail because they rely on a generic schema (e.g., Dublin Core), which lacks the semantic depth required to index the relational nature of IKS texts (Pandit, 2025). This paper proposes the adoption of IKS-Core, an extensible metadata standard built upon a foundation of established academic digital humanities standards (such as MODS or CIDOC-CRM) but specialized with IKS-specific fields (Lakkundi, 2025).

(a) Core Structural Fields (IKS-Core Mandatory)

These fields ensure basic machine readability and interoperability:

- **Identifier:** Unique Persistent Identifier (PID).
- **Title/Transliteration:** Original title (in script) and IAST transliteration.
- **Creator:** Author, Editor, or Compiler.

- **Language:** Primary text language (e.g., Sanskrit, Tamil, Pali) and associated language of commentary.
- **Format:** Physical form (e.g., *Tāḍapatra*—palm-leaf manuscript; *Bhurjapatra*—birch-bark; printed text).
- **Date:** Multiple dating systems (e.g., Saka Era, Gregorian date, estimated date).

(b) Specialized Relational Fields (IKS-Core Extensions)

These fields are crucial for mapping intellectual lineage and complexity:

- **Paramparā Lineage:** A controlled vocabulary field linking the text to its originating school of thought (*darśana* or *sampradāya*) and traceable teacher-student lineage (Kumar, 2024).
- **Commentary Relationship:** Attributes that specify the relationship to other texts: is*_commentary_on*, *is_source_text_for*, *is_translation_of*.
- **Grantha-Parimāṇa:** Physical extent metrics (e.g., number of folios/pages, number of *ślokas* or verses) vital for textual criticism.
- **Locational Context:** Specific geo-temporal coordinates of discovery or historical production, addressing the regional bias observed in current initiatives (Ghosh, 2024).

3.2. Interoperable Repository Architectures

The DLI requires centralized mass digitization but *pathashalas* need decentralized authority which makes it impossible for any single repository model to handle their different IKS requirements. The three architectures function independently yet maintain compatibility through IKS-Core standards for uninterrupted data transfer between them.

(a) The Hierarchical Repository Model (Centralized Authority)

The model exists to manage substantial digital storage requirements while providing ongoing data protection and centralizing the organization of essential digital assets which usually exist in large quantities.

- **Structure:** The system depends on a main server which functions as the primary archival storage system to keep master copies that include high-resolution images and complete TEI-encoded texts.
- **Function:** Ensures perpetual preservation, data integrity, and uniform application of IKS-Core by a dedicated central authority.
- **Deficiencies Addressed:** Technological obsolescence and lack of standardized archival formats.
- **Interoperability:** Data is exported daily as IKS-Core compliant records to the Federated layer, providing a stable backbone for all other systems.

(b) The Federated Repository Model (Decentralized Access and Collaboration)

The Federated Model focuses on linking existing institutional and private digital silos without forcing them to surrender local autonomy (Vallabhaneni).

- **Structure:** A network of independent nodes (university libraries, specialized research centers, and private trusts) retains control over their local data. A central **Federation Hub** maintains only the metadata and a PID for each asset.
- **Function:** When a user searches, the Federation Hub queries all connected nodes using IKS-Core-compliant query syntax, returning results from multiple sources simultaneously.
- **Deficiencies Addressed:** Fragmentation of existing digital silos and linguistic/content bias by enabling easy inclusion of specialized regional archives.
- **Interoperability:** Relies entirely on IKS-Core for metadata exchange. The data itself resides locally but is accessible globally through the Hub's single-query interface.

(c) The Semantic Web-based Model (Knowledge Graph and Relational Discovery)

This concept offers the highest degree of integration and is intended for advanced academic research that enables truly serendipitous discovery beyond simple phenomenological search.

- **Structure:** Utilizes *Resource Description Framework (RDF)* and *Web Ontology Language (OWL)* to model IKS concepts, creating a massive Knowledge Graph where texts, authors, concepts, and geographical locations are nodes, and IKS-Core relational fields become the edges (or relationships) between them (Pandit, 2025).
- **Function:** Enables sophisticated queries (e.g., "Find all commentaries on the *Yogasūtra* written between the 10th and 14th centuries by authors belonging to the Advaita School in South India"). This directly maps the intellectual lineage (*paramparā*).
- **Deficiencies Addressed:** Failure to map intellectual lineage and lack of semantic depth.
- **Interoperability:** Consumes metadata from both the Hierarchical and Federated layers, converting IKS-Core fields into triples (Subject-Predicate-Object) for semantic reasoning.

The integration of the IKS-Core standard across these three specialized and interoperable architectures forms a robust and sustainable infrastructure for the digital reform of Indian Knowledge Systems (Ashokan et al., 2025).

4. Technical Implementation: Resource Mapping Techniques

Proper resource mapping is the fundamental technical implementation layer that turns the suggested IKS-Core metadata standard and the multi-tiered repository architecture into an interconnected, searchable database of knowledge. It involves rigorous, computationally intensive techniques for standardization, reconciliation, and semantic linking, explicitly designed to overcome the inherent heterogeneity and fragmentation of IKS data identified in Chapter 2.

4.1. Ontology Development for IKS: The IKS Meta-Ontology (IKS-MO)

A formal ontology is the basis for good resource mapping, and it shows clearly the concepts and their relations in the IKS area. Using generic ontologies is not enough because they do not include the subtleties of intellectual lineage and textual dependence which are typical of Indian traditions and four primary methods (Lakkundi, 2025).

(a) Core Ontological Structures

The article puts forward the idea of creating an IKS Meta-Ontology (IKS-MO), which will serve as the cognitive core of the Repository Model based on the Semantic Web. The IKS-MO is composed of four main modules that are organized conceptual domains:

- **Textual Module:** The textual hierarchy was specified through this module and classes were drawn out like *Grantha* (Primary Text), *Bhāṣya* (Commentary), *Vārttika* (Sub-commentary), and *Tīkā* (Gloss). Furthermore, the object properties of this module were the most important ones that were formally defined, such as *is_commentary_on*, *is_translation_of*, and *has_textual_variant*, which eventually formalized the Commentary Relationship directly in IKS-Core.
- **Scholarly Module:** Models the social and intellectual context of knowledge creators, defining *Āchārya* (Teacher), *Śishya* (Student), and *Sampradāya* (School/Tradition). The central relationship, *paramparā* (lineage), is modeled as a transitive property linking individuals and institutions over time (Pandit, 2025).
- **Temporal Module:** Formalizes the complex and often localized dating systems found in manuscripts (*e.g., Saka Era, Vikram Samvat*) and provides standardized conversion logic to the Gregorian calendar, resolving the lack of chronological consistency across repositories.
- **Geographical/Locational Module:** Maps ancient place names (*e.g., Kāśī, Vijayanagara*) to standardized modern geographical coordinates, enabling spatiotemporal analysis of IKS text production (Ghosh, 2024).

(b) Ontology-Driven Data Transformation

In the case of a mapping process, it is necessary to make the conversion of either relational or XML data, which was obtained from Hierarchical and Federated Models, into graph-based RDF (Resource Description Framework) semantics that are required for the Semantic Web model. This conversion is performed by R2RML (RDB to RDF Mapping Language) tools or dedicated SPARQL CONSTRUCT queries. These tools use the IKS-MO definitions to convert rows (or metadata fields) into Subject-Predicate-Object triples, ensuring that semantic meaning is preserved and standardized across the entire ecosystem.

4.2. Cross-Lingual and Cross-Script Indexing

The multi-script, multilingual nature of IKS is one of its greatest assets but also its most significant indexing challenge. The techniques to unify access need to be able to connect these linguistic divides.

(a) Standardized Transliteration and Canonicalization

To make sure that the same word can always be found no matter the script it was originally written in, two steps are necessary:

- **IAST Indexing:** Every textual asset, upon entry into the Hierarchical Model, must be indexed using the International Alphabet of Sanskrit Transliteration (IAST) standard. This dual indexing (original script + IAST) allows scholarly searching and reduces ambiguity.
- **Canonical Entity Resolution:** A controlled vocabulary authority file, governed by the IKS-MO, must be used to map variant historical spellings of names and places to a single canonical identifier (Buoy, Rina et al.). For example, different transliterations of '*Vedavyāsa*' must all resolve to one persistent entity ID.

(b) Multilingual Named Entity Recognition (MNER)

Since much IKS content exists as imperfect OCR or plain text, *Multilingual Named Entity Recognition* (MNER) is deployed as a critical preprocessing step. This machine learning technique, trained explicitly on IKS terminology, automatically identifies and classifies entities (Persons, Texts, Concepts, Dates) within the full text of documents.

- **Semantic Anchoring:** MNER tags every mention of an entity (e.g., the name of a specific commentary) and links it directly to the corresponding canonical node in the IKS-MO. This process of semantic anchoring transforms plain text into semantically rich data, enabling contextual search functionality far superior to simple keyword matching (Pandit, 2025).
- **Robustness to Errors:** MNER models are designed to be robust against common issues, such as low-quality manuscript OCR and historical spelling variations, thereby enhancing search reliability where traditional indexing is ineffective.

4.3. Entity Resolution and Deduplication Across Repositories

The success of the Federated Model hinges on its ability to identify and reconcile identical knowledge assets cataloged independently by different institutions—a process known as entity resolution (Vallabhaneni).

(a) Manuscript Fingerprinting

For physical manuscripts, high-level metadata comparison is often insufficient due to cataloging errors. Advanced techniques have been employed for positive identification:

- **Colophon and Incipit Analysis:** Automation of comparison and clustering of the initial (incipit) and final (colophon) verses. Colophons are made up of essential scribal information (date, place, patron) that can single out a copy even if the main text title is wrongly cataloged.

- **Textual Hashing:** For texts that have been fully structured (TEI-encoded), cryptographic hash functions (e.g., SHA-256) are used to generate a unique digital fingerprint of the textual content. Identical hash values across different Federated nodes indicate a definite match, allowing the Hub to merge its metadata records.

(b) Hierarchical and Probabilistic Linking

In case no exact matches can be identified; a probabilistic method is used to provide confidence linkages of a high nature:

- **Confidence Scoring:** An algorithm sets a weighted score depending on the closeness of certain IKS-Core fields (for instance, matching the Author and *Grantha-Parimāṇa* will give a higher score than matching only the Title.
- **Human-in-the-Loop Validation:** Federated merging of links that exceed a confidence threshold of around 90% is carried out automatically in the Federation Hub. A group of scholarly curators is alerted to links that have a medium level of confidence (e.g., 60-90%) and they manually review them. The continuous, human-involved validation loop is essential for ensuring that the level of accuracy necessary for academic research is met (Vallabhaneni).

The strict mapping methods, based on computational linguistics and ontology engineering, guarantee that the IKS digital infrastructure envisioned is more than just a repository but a networked, semantically rich resource for worldwide research.

5. Implementation Challenges and Institutional Collaboration Roadmap

The innovative IKS-Core metadata standard combined with the three-level repository architecture (Hierarchical, Federated, and Semantic Web-based) presents a technically viable solution. The only condition for the successful implementation of the solution is that the company should be able to overcome significant challenges arising from non-technical, institutional, and policy issues. This section identifies these major obstacles and sketches out the stages of a roadmap aimed at encouraging the required institutional collaboration.

5.1. Non-Technical Implementation Challenges

The core challenges often lie outside the realm of technology, revolving around governance, expertise, and sustainability.

(a) Standardization and Governance Authority

The success of the entire system depends on the universal adoption of the IKS-Core standard. Current initiatives, being independent silos, often resist relinquishing local metadata practices (Vallabhaneni). Establishing a non-partisan, authoritative Governance Body is necessary to:

- Mandate the adoption of IKS-Core for all centrally funded digitization projects.
- Resolve conflicts during the probabilistic linking phase (Chapter 4).

- Maintain and evolve the IKS Meta-Ontology (IKS-MO) over time.

(b) Expertise and Capacity Building

The proposed framework requires sophisticated technical skills that are often scarce in traditional academic and archival environments. Specifically, expertise is lacking in:

- **Semantic Web Technologies:** Developing, maintaining, and querying RDF/OWL ontologies for the Semantic Web-based model.
- **Computational Linguistics:** Training Multilingual Named Entity Recognition (MNER) models for specialized IKS terms and handling non-Latin script OCR errors (Buoy, Rina et al.).
- **Manuscript Curation:** Scholars with domain knowledge must be trained on digital curation tools to perform the essential human-in-the-loop validation for entity resolution.

(c) Intellectual Property Rights (IPR) and Access Policy

The IPR status of digitized materials is a major obstacle to the creation of a federation and is the main reason why the IPR status is unclear and often contradictory. These are especially those which are in private collections or institutions with restrictive access policies. A single framework needs a clear, federated access policy which makes a distinction between open-access public domain works and restricted-access content for scholarly use, thus ensuring that preservation is combined with ethical usage (Ministry of Culture, 2018).

(d) Financial Sustainability

Initial project funding usually covers the expenses of digitization, but they do not consider the continuous costs of digital preservation that are related to, for example, server maintenance, data migration, and software upgrades (Vallabhaneni). The plan should then include sustainable and expandable financial models for the future, maybe a public-private partnership or a certain national preservation endowment.

5.2. Roadmap for Institutional Collaboration

A phased, collaborative approach minimizes risk and builds the institutional trust necessary for data sharing. The roadmap is divided into three successive phases, with the Governance Body established at Phase 0.

Phase 0: Governance and Standards Establishment (6-12 Months)

- **Establish Governance Body:** Create a multi-stakeholder body comprising government agencies (e.g., NMM, Ministry of Culture), leading universities, and representatives from traditional *pathashalas*.
- **Finalize and Publish IKS-Core:** Consensus finalized on the metadata standard and IKS-MO.
- **Pilot Program Selection:** Select three varied types of establishments (a large-scale government archive, a private trust, a university library) to conduct the standards trial.

Phase 1: Hierarchical and Federated Hub Development (12-24 Months)

- **Hierarchical Model Implementation:** Use the main archival server to fetch and unify the original documents from the record of the pilot institutions.
- **Federation Hub Deployment:** Build the Federation Hub infrastructure that can store IKS-Core metadata records. This focuses on interoperability, not data migration.
- **Data Standardization Training:** Implement large-scale training programs for catalogers across potential collaborating institutions on the implementation of IKS-Core.

Phase 2: Semantic Integration and Knowledge Graph Expansion (24-48 Months)

- **Semantic Model Deployment:** Deploy the Semantic Web-based repository, starting the R2RML transformation process for converting IKS-Core data into RDF triples.
- **MNER Integration:** Implementation of trained MNER models to annotate the entire digitized text corpus with semantic tags.
- **Federation Expansion:** Onboard the next wave of institutional collaborators, focusing on addressing regional and linguistic gaps (e.g., specific regional language universities), thereby addressing the linguistic bias highlighted by Ghosh, 2024.

Phase 3: Sustainment and Global Outreach (48+ Months)

- **Sustainment Model Activation:** Transition to the long-term financial model to ensure perpetual access and maintenance.
- **API and Tool Development:** Publish open APIs for the Federated Hub and Semantic Model, allowing global researchers to build custom analytical tools and applications.
- **Global Scholarly Integration:** Integrate the IKS Meta-Ontology with international scholarly standards (e.g., connecting IKS-MO Scholarly nodes to VIAF/ORCID identifiers) to position IKS within the global digital humanities framework.

Successful digital reform requires overcoming the inertia of institutional fragmentation through mandated standardization and collaborative governance. The phased roadmap outlines a feasible plan for constructing the required technical infrastructure over time while also dealing with the local issues of expertise, IPR, and financial sustainability, thereby making sure that the extensive heritage of IKS turns out to be a freely available global resource that anyone can use.

6. Conclusion: Impact and Societal Implications

This study is a move in the direction of resolving a significant issue in the area of digital heritage management: the lack of a standard, unified framework for Indian Knowledge Systems (IKS). The examination of ongoing projects (Chapter 2) has, actually, unveiled a heritage division-based, poorly described metadata, and semantically limited that, in combination, obstruct the open access to the heritage and the employment of advanced scholarly research methods at the global level.

The primary contribution of this paper is the proposal of an all-inclusive solution based on two main components: the IKS-Core Metadata Standard and a three-layered repository architecture including Hierarchical, Federated, and Semantic Web-based Models (Chapter 3). Furthermore, this article detailed the advanced Resource Mapping Techniques—including Ontology Development, MNER, and Probabilistic Entity Resolution—necessary to transform disparate data into a unified, semantically rich knowledge graph (Chapter 4). Even though the implementation requires overcoming a large number of governance and sustainability challenges (Chapter 5), the outlined roadmap provides a possible way for various institutions to cooperate. In brief, the modernization and transformation of IKS to a digitally sound and efficient system is more than just a rescue of the records; it is a revolution at the very core with the ripple effect reaching the entire university world, public policy, and cultural identity.

The framework through Federated Hub unifies fragmented resources thus it is ensuring that the knowledge of IKS which is made up of different things such as Ayurvedic texts and ancient mathematical treatises is accessible to everyone irrespective of their institutional affiliation. Such a democratization not only breaks down the geographical barriers but also it is contrary to the historical pattern according to which IKS has been largely limited to the elite or local scholarly circles (Vallabhaneni). Thus, it exposes the intellectual heritage of India to the world market. The study holds the power of a revolution in the case of a model based on the Semantic Web. The system, through the formalization of the intellectual lineage (*paramparā*) as well as the intricate network of primary texts and their commentaries, allows scholars to track the historical transformations of ideas in various disciplines. Imagine a medical historian who is able to follow the change of a single botanical term in the *Caraka Saṃhitā* trace through various medieval commentaries and regional versions in no time, thus allowing comparative studies which are currently not feasible due to isolated archives. The system being planned, by its compulsory nature of detailed *Locational Context* and *Paramparā Lineage* fields in IKS-Core, offers deep documentation which is the primary requirement to define the source and the proprietors of traditional knowledge. The standardized documentation system functions as a protective shield which prevents biopiracy and unauthorized use through its official recording of IKS origins to safeguard national and international Intellectual Property Rights for traditional practices. By promoting the adoption of structured text formats (like TEI) and leveraging MNER, the framework opens IKS to sophisticated computational analysis. Researchers can use text mining and stylometric analysis and machine learning techniques to analyze thousands of texts rapidly for authorship detection and manuscript dating and linguistic pattern assessment which enables a new Digital Humanities approach to study Indic languages

(Pandit, 2025). The system achieves two main goals through its design. First, users gain access to all IKS foundational texts and non-textual traditions including performing arts and temple architecture. The system uses user-friendly interfaces to present these materials which helps preserve cultural heritage and supports educational content creation. This provides an academically rigorous basis for integrating IKS into modern education, moving beyond anecdotal representations to evidence-based engagement (Ministry of Culture 2018).

In conclusion, reforming Indian Knowledge Systems for the digital age is an investment in global intellectual heritage. Standardization of semantics and architectural unification surpass basic digitization because the proposed repository models together with resource mapping techniques achieve both preservation and active utilization of extensive knowledge repositories. These methodologies transform knowledge repositories into dynamic resources which make information freely accessible to academic researchers and general public users across the globe.

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