Indian Journal of Library Science Research & Information Technology
VOL 1 NO.2 (JUL-DEC 2024)
ISSN - 3048-4677
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https://www.bmsgroup.in/indian-journal-of-library-science-research-information-technology/
DOI-10.5281/zenodo.22862234

Digital Libraries as Custodians of Indigenous Ecological Wisdom: A TAM-Based Conceptual Study on Sanskrit and Maithili Knowledge Systems

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Abstract

This conceptual paper explores how digital libraries can help to preserve and pass on indigenous ecological knowledge contained in the written Sanskrit tradition and the oral Maithili tradition of India. Both of these traditions contain considerable ecological knowledge, but each is at risk of being lost due to physical decay, language loss, and limited accessibility. By applying the Technology Acceptance Model (TAM) to this context, this paper constructs a conceptual framework which extends the core TAM constructs of perceived usefulness and perceived ease of use with three new constructs: perceived cultural relevance, perceived authenticity, and community engagement. Based on a narrative review of the literature on TAM, traditional ecological knowledge, and digital heritage preservation, this paper proposes seven theoretical propositions for further investigation; each proposition is derived from the narrative review of the literature, not from any analysis of the data collected for this study. This paper argues that digital libraries can act as more than just repositories for traditional ecological knowledge if people perceive them as being useful, easy to use, culturally relevant, and authentic. It offers implications for digital library design and for future research into these topics, while also grounding the discussion of digital libraries in the Sustainable Development Goals related to education, cultural heritage, and climate change.

Keywords: Technology Acceptance Model, Digital Libraries, ICT, Sanskrit, Maithili, Indigenous Knowledge Systems, Traditional Ecological Knowledge, Knowledge Preservation.

1. Introduction

Indigenous ecological knowledge is a set of accumulated wisdom about ways of living in harmony with nature, embedded within the philosophical statements, cultural beliefs, and values that inform relationships between people and their environments (Berkes, 2018). It exists in India among the various tribal communities and is classified broadly into two traditions: the classical Sanskrit textual tradition that includes the Vedas and the Upanishads and the oral Maithili tradition that includes folk songs, proverbs,

Citation *: Katiyar, H. K., & Gupta, D. R. K. (2024). Digital Libraries as Custodians of Indigenous Ecological Wisdom: A TAM-Based Conceptual Study on Sanskrit and Maithili Knowledge Systems. INDIAN JOURNAL OF LIBRARY SCIENCE RESEARCH & INFORMATION TECHNOLOGY, 1(2), 55–67. https://doi.org/10.5281/zenodo.22862234*

agricultural practices, and cosmologies. These two bodies of knowledge contain much ecological wisdom but are fragmented, inaccessible resources that are poorly documented and difficult to use (Gadgil & Guha, 1992; Shiva, 1993).

Digital libraries offer new opportunities for sharing and preserving such knowledge for future generations (Arunachalam, 1999). However, for such technologies to be widely adopted and used, they must be perceived by potential users as both useful and capable of being effectively adopted (Srinivasan et al., 2009). Researchers, practitioners, and indigenous communities themselves can use the Technology Acceptance Model to analyse and evaluate perceptions of digital libraries that house such collections of indigenous ecological knowledge (Davis, 1989).

Problem Statement

The ecological knowledge that had been developed and passed down in the Sanskrit manuscript tradition and the Maithili oral tradition is not well represented in current environmental discourse. Physical degradation of manuscripts, erosion of language and limited access continues to threaten the survival of this traditional knowledge system (Gadgil & Guha, 1992; UNESCO, 2003). While digital libraries are in a good position to act as custodians of this knowledge, their success is dependent on institutional capacity and receptivity on the part of users. Conceptual research which investigates the relationship between digital library acceptance and indigenous ecological knowledge preservation in the Indian context is however limited. This study conceptualizes a TAM based model to investigate the role of digital libraries in the preservation and dissemination of the Sanskrit and Maithili ecological knowledge systems. The specific aims are therefore:

1. To explore the ecological wisdom in the Sanskrit and Maithili knowledge systems.

2. To conceptualize the role of digital libraries as repositories of this ecological knowledge.

3. To modify the Technology Acceptance Model to understand the acceptance of the digital libraries as the means of distributing this indigenous knowledge.

4. To develop a strategy for integrating the indigenous knowledge into the digital library repositories.

Significance of the Study

● Academic contribution: extends TAM to the documentation and dissemination of indigenous knowledge, linking indigenous knowledge systems to digital library scholarship.

● Cultural preservation: addresses the need to safeguard the threatened linguistic-cultural heritage of the Sanskrit and Maithili traditions.

● Practical relevance: findings can inform the design of efficient, culturally relevant and user focused digital libraries which contribute to Sustainable Development Goals like cultural heritage protection, quality education, and climate action.

2. Review of Literature

2.1 The Technology Acceptance Model

The Technology Acceptance Model (TAM) pioneered by Davis (1986, 1989) is amongst the most widely used models used to explain user acceptance of any new technology. TAM argues that two constructs Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) shape users' attitudes toward technology, which in turn shape behavioral intention and actual use.

• Perceived Usefulness (PU): the degree to which a user believes that a system will improve their performance of a task.

• Perceived Ease of Use (PEOU): the degree to which a user believes that a system will be free of effort to use.

Venkatesh and Davis (2000) extended the original model into TAM2, adding social influence and cognitive-instrumental processes as antecedents of perceived usefulness, and demonstrating the model's robustness across longitudinal field studies. Subsequent research has applied TAM well beyond its original information-systems context, including to service robots (Park & Kwon, 2016) and to virtual knowledge-sharing communities, where Chiu et al. (2006) showed that social capital and social-cognitive factors shape members' willingness to contribute and use shared knowledge resources. This literature indicates that TAM provides a robust but adaptable base model, one that has repeatedly been extended with context-specific constructs a precedent this study follows in extending TAM to indigenous ecological knowledge systems.

TAM is not the only acceptance model available. Venkatesh et al. (2003) proposed the Unified Theory of Acceptance and Use of Technology (UTAUT), which integrates eight prior models into four core constructs performance expectancy, effort expectancy, social influence, and facilitating conditions and Venkatesh et al. (2012) later extended it to consumer contexts (UTAUT2) by adding hedonic motivation, price value, and habit. UTAUT and UTAUT2 explain more variance in behavioral intention than TAM in organizational and consumer settings, and UTAUT's social-influence construct overlaps conceptually with the community-engagement construct proposed later in this paper. TAM is nonetheless retained here, for three reasons. First, TAM's parsimony two core beliefs driving attitude and intention makes it easier to extend transparently with a small number of context-specific constructs without the model becoming unwieldy, a risk Bagozzi (2007) raised about UTAUT's growing number of independent variables. Second, TAM has already been extended successfully to knowledge-sharing and repository contexts structurally similar to a digital library (Chiu et al., 2006), giving a closer precedent than UTAUT's largely workplace- and consumer-technology lineage. Third, because this is a conceptual, pre-empirical paper, a smaller construct set is easier to operationalize cleanly in the questionnaire-based validation proposed in Section 9; UTAUT or UTAUT2 remain natural candidates for that later empirical stage, particularly if social influence and habitual use prove, in practice, to matter as much as cultural relevance and authenticity.

2.2 Traditional Ecological Knowledge and Its Vulnerability

Traditional ecological knowledge (TEK) refers to the cumulative body of knowledge, practice, and belief that evolves through adaptive processes and is transmitted across generations about the relationship of living beings with one another and their environment (Berkes, 2018). Gadgil and Guha (1992) traced how colonial and post-colonial resource-extraction practices disrupted community-based ecological management systems across India, while Shiva (1993) argued that the erosion of biodiversity and the erosion of indigenous knowledge are linked processes, each accelerating the other. This body of work both establishes the ecological value of traditional knowledge systems and highlights the political, economic, and linguistic forces that threaten their survival, supporting the need for preservation initiatives such as the one proposed in this paper.

2.3 Ecological Knowledge in Sanskrit Literature

Sanskrit literature contains a significant amount of ecological material. Jamison and Brereton's (2014) book has translated the hymns of the Rigveda, which describe rivers, forests, and even celestial bodies,

personifying them and praising their power and importance. Olivella's (1998) translation of the Upanishads develops the philosophical treatment of Prakriti (nature) and the interdependence of living beings that underlies much later Indian environmental thought. Ancient governance literature also engaged directly with resource management: Olivelle's (2013) translation of Kautilya's Arthashastra sets out an early administrative framework for forestry, agriculture, and natural-resource regulation. In the medical domain, Valiathan's (2003, 2007) accounts of the legacies of Caraka and Sushruta document the ecological and botanical knowledge embedded in classical Ayurveda, including detailed treatments of medicinal plants and environmental health. Together, this literature supports the claim that Sanskrit sources articulate a systematic, philosophically grounded ecological worldview.

2.4 Ecological Knowledge in the Maithili Oral Tradition

The Maithili tradition, centered on the Mithila region of Bihar and Nepal, preserves ecological knowledge through oral and performative rather than textual means. Yadav's (1996) grammar of Maithili documents the linguistic structures through which agricultural and seasonal knowledge is encoded and transmitted, underscoring that Maithili ecological knowledge is embodied and practice-based, in contrast to the more formalized, textual character of the Sanskrit tradition a distinction that motivates treating the two as complementary rather than interchangeable sources of ecological wisdom.

2.5 Digital Libraries and the Preservation of Indigenous Knowledge

Early work by Arunachalam (1999) positions digital access to information as a development issue: developing countries run the risk of being excluded from the rewards of digital knowledge infrastructure, unless access and contents are explicitly inclusive. Srinivasan et al. (2009) investigated how museums and digital catalogues represent diverse cultural knowledges, warning that conventional cataloguing practices can flatten and misrepresent indigenous material unless the source communities become involved in the curation and description. These practical and ethical issues resonate in international policy: UNESCO's (2003) Charter on the Preservation of Digital Heritage sets out principles for the preservation of digital and digitized heritage, while the United Nations' (2007) Declaration on the Rights of Indigenous Peoples affirms the rights of indigenous communities to control what happens to their cultural heritage and traditional knowledge, a principle directly pertinent to questions of consent and ownership in digitization projects.

India already has a working example of such custodianship in place. The Traditional Knowledge Digital Library (TKDL), created by the Council of Scientific and Industrial Research and the Ministry of AYUSH, has digitized and classified traditional medicinal knowledge from Ayurveda, Unani, Siddha and Yoga texts to prevent it being wrongly patented (Ansari, 2020). TKDL demonstrates that a Sanskrit-derived knowledge system can be digitized at national scale with institutional backing, and its defensive-patent success shows the practical value of treating a digital repository as an active custodian rather than passive storage the same argument this paper makes for ecological, rather than medicinal, knowledge. More recent scholarship extends this concern beyond the Indian medicinal case: Sukula and Singh (2025) examine how changing institutional contexts shape academic libraries' engagement with indigenous knowledge in India, and Ajani et al. (2024) argue that digital media technologies are increasingly central to revitalizing endangered indigenous languages elsewhere, reinforcing that the preservation challenge this paper addresses for Sanskrit and Maithili is part of a wider, ongoing global effort rather than a historical concern.

2.6 Research Gap

The literature reviewed above develops largely along separate tracks: technology-acceptance research, traditional-ecological-knowledge scholarship, textual and linguistic studies of Sanskrit and Maithili, and

digital-heritage and digital-library scholarship. Few studies bring these strands together to ask how user acceptance, as theorized by TAM, might explain the success or failure of digital libraries specifically as custodians of Sanskrit and Maithili ecological knowledge. This paper addresses that gap conceptually, proposing an extended TAM framework as a first step toward closing it.

3. Scope and Methodology

3.1 Research Approach

This is a conceptual and theoretical paper, not an empirical study. It follows a narrative literature review and deductive framework-building approach: relevant literature on the Technology Acceptance Model, traditional ecological knowledge, Sanskrit and Maithili scholarship, and digital heritage was reviewed and synthesized to identify constructs relevant to the adoption of digital libraries in an indigenous-knowledge context. The literature search was conducted primarily through Google Scholar, Scopus and institutional library databases, using combinations of the search terms "Technology Acceptance Model," "traditional ecological knowledge," "indigenous knowledge systems," "Sanskrit," "Maithili," and "digital library/heritage preservation," with no fixed start date and results considered through 2025; sources were included where they contributed directly to TAM theory, traditional ecological knowledge, Sanskrit or Maithili scholarship, or digital-heritage preservation, and excluded where they fell outside these thematic areas. These constructs were then organized into a conceptual model (Section 6), and a set of theoretical propositions was derived from that model.

3.2 Nature of the Theoretical Propositions

The propositions presented in Section 6 (P1–P7) are theoretical statements derived deductively from the literature, not hypotheses tested against primary or secondary data collected for this study. No survey, interview, or experimental data was gathered here. The propositions are offered as a structured starting point for future empirical research outlined in Section 9 in which they could be operationalized as measurable variables and tested using quantitative methods such as Structural Equation Modelling or explored qualitatively through interviews and ethnographic study. Readers should therefore treat the propositions as conceptual claims awaiting empirical testing, not as findings of this paper.

3.3 Scope and Delimitations

The study is limited to two knowledge systems- the Sanskrit textual tradition and the Maithili oral tradition- in the Indian context. It does not extend, in its current form, to other Indian or indeed global indigenous Knowledge systems (though Sect. 9 highlights this as an area of future research). The study is also limited to conceptual model building: no primary data collection was undertaken, no existing digital library platform evaluated, and no propositions tested.

3.4 Limitations

As a conceptual paper, the study's main limitation is that the propositions put forward have not been tested empirically. The synthesis draws on a necessarily selective set of literature and can make no claim to being exhaustive in either the TAM literature or the Sanskrit- and Maithili-related scholarship. These limitations are taken up in the future research agenda in Sect. 9.

4. Indigenous Ecological Wisdom

4.1 Understanding Indigenous Knowledge Systems

Indigenous knowledge systems (IKS) are collective knowledge rooted in people's long-standing interactions with the natural environment. Compared to the reductionist approach of modern science, Indigenous knowledge is holistic and incorporates relationships, ethics, and spirituality (Berkes, 2018). The information is passed from generation to generation and encoded in various forms such as rituals, sayings, songs, and manuscripts as a way of expressing pro-environmental values and ecological resilience. Ecological wisdom in this sense concerns not only the management of natural resources crop rotation, water harvesting, forest management, and medicinal knowledge- but the cultivation of a working relationship between people and their environment. In India, two long-standing cultural knowledge systems carry this wisdom: the Sanskrit textual tradition and the Maithili folk tradition.

4.2 Ecological Knowledge in Sanskrit Texts

Sanskrit scriptures contain substantial philosophical, medical, and ecological reflection on nature and on harmonious human-environment relations, including:

- Vedic scriptures (Rigveda, Yajurveda, Atharvaveda): hymns that personify rivers, forests, and celestial bodies and that articulate principles of respecting and protecting nature (Jamison & Brereton, 2014).
- The Upanishads and Bhagavad Gita: discussions of Prakriti (nature) and the interdependence of living beings, promoting sustainable living (Olivelle, 1998).
- Ayurveda: the Charaka Samhita and Sushruta Samhita contain extensive knowledge of medicinal plants, biodiversity, and environmental health (Valiathan, 2003, 2007).
- The Arthashastra of Kautilya: an early framework for forestry, agriculture, and natural-resource management, and an early example of environmental policy making (Olivelle, 2013).
- The Puranas and Smritis: ancient conservation measures such as sacred forests (dev vanas) and associated precepts and prohibitions.

Taken together, these Sanskrit texts articulate an eco-centric worldview in which sustainability is a feature of both culture and religion.

4.3 Ecological Wisdom in Maithili Practices

The Maithili cultural complex, centered on the Mithila region spanning Bihar and Nepal, comprises expressive oral traditions, collective rituals, and folk practices that carry ecological knowledge (Yadav, 1996). Unlike the Sanskrit textual tradition, Maithili knowledge is embodied and orally transmitted. It encompasses:

- Agricultural knowledge: proverbs and folklore concerning crop varieties and seasonal rhythms, such as sowing according to lunar calendars.
- Festivals and rituals, including Chhath Puja- the worship of the sun and rivers which express ecological reverence and support the conservation of water sources.
- Maithili folk songs (geet), including planting and harvesting songs, which carry environmental knowledge and ethics.
- Madhubani art, a traditional painting form portraying ecosystems, biodiversity, trees, animals, rivers, and cosmological themes.

- Local healers (ojha, Vaidya), who practice indigenous pharmacology and apply ecological knowledge of plants and herbs in treating illness.

Maithili ecological wisdom is thus practice-based and community-oriented, illustrating resilience, biodiversity management, and respect for natural processes.

5. Digital Libraries as Custodians

5.1 The Role of Digital Libraries in Preserving Indigenous Knowledge

Digital libraries are not only the repositories of information but also the key organizational units managing and maintaining cultural and intellectual knowledge for years to come (Arunachalam, 1999). It can be argued that they can serve as the storage space for diverse forms of cultural and indigenous knowledge threatened with extinction due to globalization, language extinction, and loss of biodiversity among many other reasons. The main functions of digital libraries include:

- Preservation – through digitization, the content such as manuscripts, oral-history recordings and artifacts is captured for preservation.
- Accessibility – the digital content of indigenous knowledge can be accessed on the web by scholars and policy makers.
- Integration – the information is stored digitally to form a comprehensive body of knowledge.
- Intergenerational – the digital libraries store information that can help pass on the indigenous ecological knowledge to the next generation.
- Empowerment – the presence of this information online will empower the communities to revive their culture and values.

The digital libraries, therefore, can be considered as the enablers of the end-to-end capture, storage, and sharing of indigenous knowledge thus playing a key role in ensuring that the ecological knowledge is passed down generations after generations (Srinivasan et al., 2009).

5.2 Sanskrit and Maithili Ecological Knowledge

The Sanskrit and the Maithili ecological knowledge needs to be integrated into one digital library because they complement each other. They have been described as the two pillars of the ecological knowledge in India. Whereas Sanskrit has been documented with codified information, the Maithili knowledge has survived in oral traditions passed from one generation to another. The benefits of integrating the two would include:

- The digitization of the two will help preserve the codified knowledge for future generations.
- The fact that the two have survived in different parts of the country and in different languages will enrich the linguistic repertoires and help sustain language diversity.
- The ecological knowledge in Sanskrit and Maithili will be of great interest to a wide range of scholars including the philosophers, ecologists, historians, and anthropologists.
- The traditional ecological knowledge in the two languages will provide alternative ways of approaching the contemporary ecological issues as well as community-level initiatives.

● Scholars will use the digital libraries to steward the knowledge as a shared responsibility.

5.3 Opportunities and Challenges of Digitization

Digital libraries offer opportunities and challenges.

Opportunities: Improvements in AI-based OCR for Indic scripts and multimedia archiving make more accurate digitization possible; web-based repositories offer greater global and location-independent access; university and community partnerships contribute to authenticity and inclusiveness as well as help incorporate indigenous knowledge into the curricula; and indigenous ecological knowledge can enrich contemporary curricula.

Challenges: Sanskrit requires expert philological skills, and Maithili oral material requires sensitive transcription and localization; digitization needs long-term funding and staff; insensitive approaches may lead to misrepresentation of indigenous materials if source communities aren't involved in curation (Srinivasan et al., 2009); unequal levels of digital literacy and internet access may exclude communities from being able to participate in the library; and ongoing revision, preservation standards, and ethical stewardship are needed for long-term sustainability (UNESCO, 2003).

Digital libraries that successfully serve as custodians for indigenous ecological knowledge will have to balance technological capabilities with cultural sensitivity and community participation.

6. Conceptual Model Development

6.1 Applying TAM Constructs

If the role of digital libraries is to act as custodians of indigenous ecological knowledge, the following TAM constructs are key:

● Perceived Usefulness (PU): the extent to which users believe that digital libraries improve access to and preservation of Sanskrit and Maithili ecological knowledge, e.g. for easier scholarly access to Sanskrit manuscripts, or community access to archived Maithili folk practices.

● Perceived Ease of Use (PEOU): the perceived ease of use for a culturally and linguistically diverse audience complex interfaces and poor translation may put users off.

● Attitude Toward Use (ATU): the user's attitude toward the digital repository, which is influenced by its design and other culturally appropriate features.

● Behavioral Intention to Use (BI): the likelihood that the scholar, practitioner, and community will use a digital library.

● Actual Use (AU): continued long-term use of a digital library for environmental education and cultural preservation purposes.

In line with the extension of TAM made by Venkatesh and Davis (2000) in terms of contextual antecedents, and the indigenous-knowledge literature reviewed in Section 2, this study adds three further constructs relevant to an indigenous-knowledge context:

● Perceived Cultural Relevance (PCR): the extent to which users feel that their values, traditions and cultural characteristics are reflected in the digital library.

- Perceived Authenticity (PA): the extent to which users feel that the Sanskrit texts and Maithili oral material in the digital collection are authentic.
- Community Engagement (CE): the extent to which the source communities are engaged with and using the digital collection.

6.2 The Conceptual Framework

The proposed model posits that PU and PEOU have a direct impact on ATU; ATU influences BI to use digital libraries; BI leads to Actual Use (AU) and, eventually, to sustainability; and PCR, PA, and CE moderate all relationships, increasing or decreasing the extent to which they are affected by the degree to which they are perceived to be culturally relevant, authentic, and community-engaged. The model thus extends technology adoption beyond technical uptake to incorporate cultural trust, authenticity, and inclusivity factors identified in the literature review as essential to indigenous knowledge systems (see Figure 1).

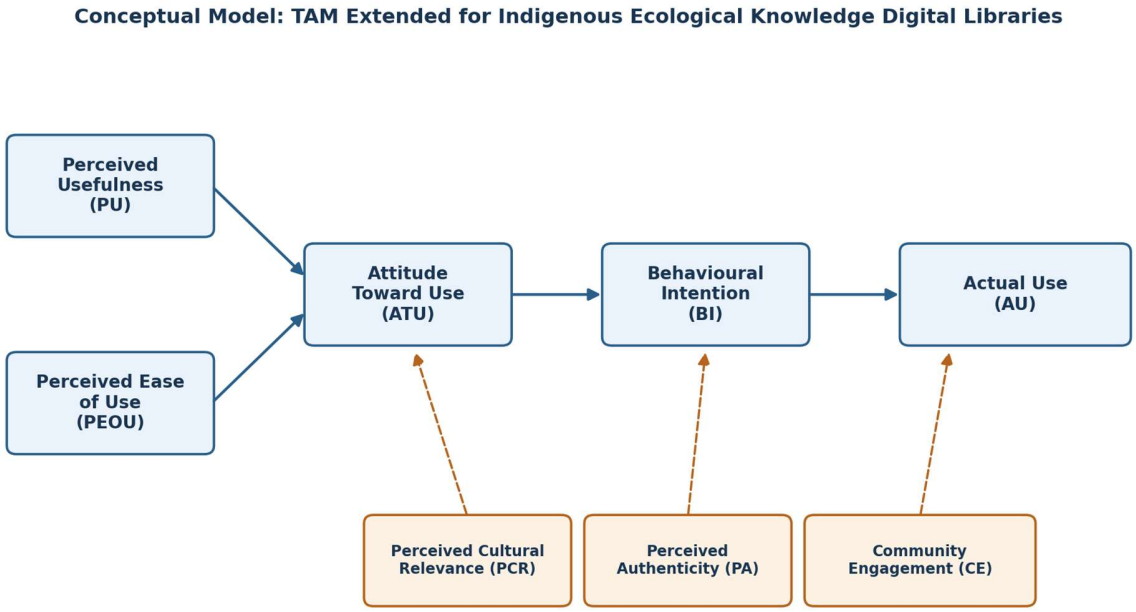


Figure 1. *Conceptual illustration: PU and PEOU → ATU → BI → AU, with PCR, PA, and CE moderating the PU–ATU, ATU–BI, and BI–AU relationship.*

6.3 Theoretical Propositions

Consistent with Section 3.2, the following are theoretical propositions derived from the conceptual model above, intended to guide future empirical testing rather than to report tested results:

- P1: Perceived Usefulness (PU) is positively associated with Attitude toward Use (ATU) of indigenous ecological knowledge digital libraries.
- P2: Perceived Ease of Use (PEOU) is positively associated with Attitude toward Use (ATU) of digital libraries.
- P3: Attitude Toward Use (ATU) is positively associated with Behavioral Intention (BI) to use digital libraries.

- P4: Behavioral Intention (BI) is positively associated with Actual Use (AU) of digital libraries for accessing Sanskrit and Maithili knowledge systems.
- P5: Perceived Cultural Relevance (PCR) strengthens the association between PU and ATU.
- P6: Perceived Authenticity (PA) is positively associated with ATU and with BI.
- P7: Community Engagement (CE) strengthens the association between BI and AU.

7. Key Conceptual Findings

As a conceptual paper, this study does not report empirical results; the "findings" below are the principal insights generated by synthesizing the literature into the framework above.

- Sanskrit and Maithili ecological knowledge are best understood as complementary rather than substitutable: the former systematic and textual, the latter embodied and practice-based and digital libraries are well positioned to house both.
- Standard TAM constructs (PU, PEOU) are conceptually necessary but not sufficient to explain adoption of indigenous-knowledge digital libraries; cultural relevance, authenticity, and community engagement emerge from the literature as necessary additions.
- Community engagement is theorized as a moderating rather than a direct predictor of use, implying that even a technically well-designed platform may fail to achieve sustained use without active source-community involvement.
- The digitization literature (Srinivasan et al., 2009) and international policy instruments (UNESCO, 2003; United Nations, 2007) converge on the same concern: digitization without community consent and contextual accuracy risks misrepresenting the knowledge it aims to preserve.
- The framework fits SDG 4 (Quality education), SDG 11 (Sustainable cities and communities/cultural heritage), and SDG 13 (Climate change), meaning that the study of digital library adoptions fits into a broader context of sustainability policy research in addition to library science.

8. Discussion

8.1 Implications for Knowledge Preservation

Digitizing the oral traditions of Maithili and textual traditions of Sanskrit have implications for cultural and ecological preservation. This study suggests that the future of indigenous knowledge lies beyond a technologically capable infrastructure and depends on factors of user acceptance as theorized by TAM. Digital libraries are more likely to be systems of living transmission, rather than mere repositories of information, if they are perceived by users to be useful, easy to use, culturally relevant and authentic (Berkes, 2018). This, in turn, may help address the erosion of indigenous knowledge in the dominant ecological discourse (Shiva, 1993).

8.2 Implications for Digital Library Design and Policy

- User-centered design: multilingual interfaces accessible to levels of literacy and cultural background;

- Cultural sensitivity: selection and presentation of contents must avoid decontextualization or misrepresentation (Srinivasan et al., 2009).
- Community involvement: source communities must be involved in digitization and curation to foster trust and shared ownership, in line with the principles of the UN Declaration on the Rights of Indigenous Peoples (United Nations, 2007).
- Policy frameworks: governments and institutions must develop policies to fund, institutionalize and ethically oversee digitization of indigenous knowledge, in line with UNESCO's (2003) Charter on the Preservation of Digital Heritage.
- Technological investment: AI-enhanced Indic-script OCR, audio-visual archiving and consistent metadata tagging can enable richer access and usability.

8.3 Wider Implications for Ecology and Sustainability

Indigenous ecological knowledge offers alternative paradigms for sustainable living based on harmonious co-existence with the natural world (Gadgil & Guha, 1992). Digitizing and disseminating such knowledge can contribute to sustainability discourse at local, national and international levels: it can enrich ecological ethics in school curricula, raise awareness around environmental issues among younger generations, position Sanskrit ecological texts and Maithili folk traditions as sources of community-led conservation policy and offer indigenous knowledge as a counterpoint in digital repositories that inform climate action and ecological-justice discourse. This ties into SDG 4 (Quality Education), SDG 13 (Climate Action) and SDG 11 (respect for cultural heritage). This proposed model thus contributes not only to the digital library scholarship but to the environmental and cultural sustainability goals.

9. Future Research Directions

9.1 Empirical Testing of the Model

This paper presents a conceptual model that requires empirical testing if one intends to rely on the claims made. The seven propositions (P1-P7) can be developed into measures that can be used to test the claims through surveys, interviews, or experiments with participants, stakeholders, or target audiences like scholars, students, librarians, policymakers, and practitioners in the communities. Quantitative analysis-for instance, Structural Equation Modelling could test the strength and direction of the proposed relationships, while qualitative methods such as ethnographic study could refine the model's fit to lived community experience.

9.2 Extending Beyond Sanskrit and Maithili Contexts

The conceptual model developed here may generalize to other knowledge systems, including other Indian traditions such as Tamil Sangam literature, Kashmiri Shaivite texts, or the ecological wisdom of tribal communities in Odisha and Northeast India; and to indigenous knowledge systems elsewhere, such as Maori environmental practices in New Zealand, Native American environmental management, or African oral traditions of water and land management. Comparative, cross-cultural studies could test whether the extended constructs proposed here cultural relevance, authenticity, and community engagement hold globally or require further adaptation. Recent digital-preservation initiatives documented outside India, such as the digitization of indigenous climate adaptation knowledge at the University of Maiduguri, Nigeria (Babagana & Kemboi, 2024), suggest that infrastructural constraints and conflict-related displacement, rather than cultural relevance alone, can also shape adoption in other developing-country

contexts a boundary condition this paper's model does not yet capture and that future comparative work should test.

9.3 Policy and Practice

- Policy analysis: how national and international policies such as India's Digital India initiative and UNESCO's intangible-heritage programmes create or constrain opportunities for including indigenous knowledge in digital libraries.
- Ethical questions: ownership, consent, and intellectual-property issues in digitizing community knowledge, informed by the UN Declaration on the Rights of Indigenous Peoples (United Nations, 2007).
- Design principles: models that combine technological innovation with cultural sensitivity, treating indigenous communities as co-creators rather than subjects.
- Impact evaluation: longitudinal studies of the social, cultural, and ecological impact of digital libraries on knowledge transfer and environmental awareness.

10. Conclusion

This study developed a conceptual framework for understanding digital libraries as custodians of indigenous ecological knowledge, with particular reference to the Sanskrit textual tradition and the Maithili oral tradition. Building on the Technology Acceptance Model, it identified cultural relevance, authenticity, and community engagement as constructs that, alongside usefulness and ease of use, are likely to shape adoption. Sanskrit offers formalized ecological philosophy and policy while Maithili offers embodied, practiced wisdom; both are valuable resources that digital libraries are well positioned to preserve and share. The framework proposed here is conceptual and untested, but represents a way for digital libraries to understand themselves not merely as storage systems but as living infrastructures for the preservation of knowledge, sustainable practice, and cultural continuity so long as their design and governance are rooted in the communities who possess them.

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