

Institutional Engagement with Indigenous Knowledge: A Global Scientometric Analysis

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Abstract

This study provides a comprehensive global scientometric analysis of institutional engagement with Indigenous Knowledge (IK) research from 1992 to 2025. It seeks to chart the transition from traditional preservation to contemporary digital curation and identify key geopolitical and disciplinary shifts. A corpus of 304 peer-reviewed publications was retrieved from Scopus. The study utilized science mapping via VOSviewer and performance metrics through the R-package Bibliometrix to assess longitudinal changes and thematic clusters. The field exhibits a 10.86% annual growth rate, with a marked “governance turn” after 2018. Library and Information Science (LIS) has emerged as the disciplinary anchor. The geographical distribution of research output exhibits structural asymmetries, with the United States and India serving as primary nodes of productivity. While Anglophone nations maintain a lead, this concentration highlights a persistent participation paradox regarding knowledge production in the Global South. Thematic evolution shows a shift toward digital curation, metadata standards, and data sovereignty. The study is limited to English-language peer-reviewed documents indexed in Scopus. This may exclude localized indigenous-language scholarship and “grey literature” not present in major citation indices. The findings advocate for the adoption of the CARE Principles and the development of decolonized metadata standards. It highlights the need for institutional investment in digital infrastructures in underrepresented regions to foster epistemic justice. This is the first empirical, longitudinal mapping of the institutional IK landscape, offering a unique “macro-view” of how memory institutions are professionalizing the management of Indigenous wisdom.

Keywords: Indigenous knowledge management, Digital preservation, Metadata, Institutional governance, Thematic evolution, Knowledge organization systems (KOS)

INTRODUCTION

For ages, Indigenous Knowledge (IK) has been the foundation of Native people's intricate, complex, holistic, and adaptive knowledge systems for the stewardship of diverse ecological settings. This epistemological system contrasts with Western scientific methodology, which tends to utilize

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Received Date: June 12, 2026

Accepted Date: June 20, 2026

Published Date: July 15, 2026

Citation: Sarfraz Ahmed, Sudharma Haridasan. The UGC-CARE Initiative and Its Impact on Indian Research Productivity: A Bibliometric Analysis of Web of Science Publications. Journal of Advancements in Library Sciences. 2026; 13(2): 55–69p.

reductionist and fragmented perspectives as well as dichotomous approaches, but IK is relational and interpenetrates social, spiritual and biological realities [1]. Through the first part of the 20th century, the academic disciplines were not the owners and custodians of knowledge; Indigenous Knowledge systems were rejected and perceived as folk knowledge and superstitions by colonizers and institutionalized educational systems. Since then, and throughout the course of the 21st century, an epistemic shift has taken place. The urgent climate and biodiversity crises, as well as the challenges to food security, have led to the need to adopt and learn from Indigenous epistemologies within the formal institutions [2]. This is referred to as the

“institutional turn” in relation to the archives and institutions that are now beginning to institutionalize IK. However, surprisingly little is known about what institutions around the world are actually doing with Indigenous Knowledge. Which institutions are at the forefront? How has the discourse changed from the Rio Earth Summit in 1992 to the present? In order to answer these questions, this article intends to map the current Global landscape of institutional IK management using a scientometric approach.

Background of the Study

The process of transforming Indigenous Knowledge (IK) into a mainstream knowledge system for institutional engagement represents an evolution in both anthropology and information science. From an outsider's peripheral anthropological perspective to an insider's position, the discourse on IK underwent radical change in the late 20th century when IK became widely acknowledged as an effective epistemic system that is capable of providing the global community with relevant information on issues related to survival [3]. The aforementioned institutional turn toward IK stemmed from the observation that in today's world the Traditional Ecological Knowledge (TEK) plays a critical role in ecological adaptability and community resilience [4].

Memory institutions (museums, archives and libraries) which have previously played the role of holding colonial artifacts now constitute a new kind of 'contact zones' where institutional knowledge workers and indigenous peoples negotiate ownership and representation of cultural heritage [5]. Libraries and information centers operating in the Global South-specifically within an Indian and African context-are faced with the immense task of documenting IK without their appropriation; this is an indication of the critical role of libraries and information centers in its institutionalization [6, 7].

The 21st century has been characterized by a shift toward the digital environment and a professionalization of IK Management (IKM) involving storytelling, digital interfaces and decolonization of IK organization [8, 9]. Institutions are now attempting to utilize digital tools to enhance community-based monitoring, documentation and preservation of biocultural heritage, making data sovereignty and intellectual property protection a fundamental part of institutional engagement [10, 11]. This paper is aimed at charting this 33-year-old trend at a macro level.

Indigenous Knowledge as an Epistemic System

Before institutional Indigenous Knowledge Management (IKM) can be discussed, it is essential to acknowledge Indigenous Knowledge as an epistemic system that deserves study and attention. Indigenous Knowledge (IK) is not an archived artefact, rather a knowledge-based process that is always dynamic and can only continue through continuous adaptation and transmission to the next generation [3]. Unlike Western science, which relies on models of general laws and experimental learning for its operations, IK is intrinsically place-based. An Indigenous worldview focuses on the specifics of the environment that the people live in; the knowledge that Arctic native hold of sea ice movement is not anecdotal, but an age-old and empirically tested longitudinal data set for survival.

Main features of Indigenous Knowledge systems:

- *Holism*: Context specific, it does not distinguish between subject and object.
- *Oral tradition*: Related information contained in narrative and song.
- *Reciprocity*: ethics governs the man-environment relations.

The tensions between these systems of knowledge and the Western institutional framework were once the groundwork of an epistemic violence. However, the modern research landscape is leaning toward “Two-Eyed Seeing” (Etuaptmumk), in which learning from one eye through the lens of Indigenous knowledge and the other through the lens of Western knowledge is necessary [12].

The Institutionalization: from Extraction to Preservation

The Rio Earth Summit held in 1992 was pivotal for recognizing the role of Indigenous peoples within the conservation and scientific community and result was the Convention on Biological Diversity

(CBD) was the first global treaty to acknowledge it. Since then, an “institutional turn” to Knowledge Management, from previous more extractive research, began, and since the early 2000s, organisations like UNESCO and The Intergovernmental Panel on Climate Change (IPCC) have recognized the role of Indigenous Knowledge systems. Colleges, universities and other institutions worldwide are engaging in the process of “decolonising the university” and including Indigenous data in library catalogues, institutional archives and research programs. Institutions now engage in different facets of Indigenous Knowledge Management (IKM): Policy development, Intellectual Property (the ownership and copyright of traditional knowledge of Indigenous communities), and Digitalisation (using technology such as blockchain and AI to archive traditional knowledge with the consent of communities). However, a central challenge to the institutionalization of Indigenous Knowledge (IK) systems is the risk of “scientisation,” whereby Indigenous knowledge is often reified and validated only if and when the results can be confirmed by conventional science and laboratory experiments [13].

Research Gap: why Macro-Mapping is necessary

Although there are many researches on Indigenous Knowledge (IK) at the local and community level, However, it seems that limited information is available at a macro level (regarding Indigenous Knowledge Management [IKM]) as most of the studies are not coordinated at country and area level, or thematic focus without an overview of the system that defines how Indigenous Knowledge is organized, managed and dispersed within organizations and worldwide. In such condition, the development of the field in terms of the epistemological framework is obscure.

Using bibliometrics method we would analyze the pattern of publications: what are the leading countries in IKMs field? Is there any visible influence of the dynamics of North-South world on the research on IKM? What are the relevant journals and research centers of the research? Also, how the themes of the IKMs research has been evolving during the past 3 decade?

The paper is designed to answer those questions by analyzing the epistemic development of the institutionalization of Indigenous Knowledge from 1992 to 2025. Using scientometrics methods (like science mapping and co-citation), this research provides a clear and visual map of the thematic, collaboration, and research structure, identifying major influential articles, key institutions, researchers and topics within the field of Indigenous Knowledge Management.

Research objectives

To identify the gaps regarding IK in global institutions, the following research questions frame this study:

1. How has the global scholarly output on Indigenous Knowledge Management (IKM) in institutional settings expanded, and how influential has it become since 1992 to 2025?
2. Which intellectual communities and thematic patterns best describe the current state of the institutional application of Indigenous Knowledge?
3. What are the key emerging areas of research and unexplored thematic arenas that will provide a way forward for ethical institutional Indigenous Knowledge Management (IKM)?

METHODOLOGY

Research Design

This study uses a quantitative scientometric research design to map the intellectual, conceptual, and structural evolution of Indigenous Knowledge (IK) management in institutional settings. Scientometric methods enable systematic measurement of publishing output, citation structures, collaboration patterns, and thematic development over time and provide high-level analysis of a discipline's development trajectory.

This study combined the performance analysis framework like (productivity, growth, and impact measures) with a scientific mapping framework (co-citation, co-occurrence, and thematic mapping methods) to provide a holistic picture of the research knowledge structure.

Data Source and Search Strategy

The Scopus database was chosen to extract the dataset, as it provides a broad interdisciplinary coverage, standard indexed journals, and it is suitable for the purpose of scientometric studies. The search was made on June 7 2026, and the Boolean string used was:

TITLE-ABS-KEY ((“Indigenous Knowledge” OR “Traditional Knowledge” OR “Local Knowledge”) AND (“Management” OR “Preservation” OR “Conservation” OR “Documentation” OR “Digitization”) AND (“Cultural Institut*” OR “Museum” OR “Librar*” OR “Archiv*” OR “Heritage Center*”)) AND PUBYEAR > 1990 AND PUBYEAR < 2026 AND (LIMIT-TO (DOCTYPE, “ar”)) AND (LIMIT-TO (LANGUAGE, “English”)).

The research was not limited by field of study to ensure disciplinary comprehensiveness and to capture the institutional engagement across different dimension of IK research.

Data Cleaning and Inclusion Criteria

The data cleaning was conducted in MS Excel and included the removal of 4 duplicate titles and 165 unwanted document types, such as conference proceedings and reviews. Once bibliographic control was verified, we reduced the 403 initial records to 304 peer-reviewed journal articles published from 1992 to 2025.

We selected only articles published in the English language and containing either the phrase “Indigenous knowledge”, “Traditional knowledge” or “Local knowledge”, where the topic of Indigenous Knowledge was the management, documentation, preservation, or digitization within museum, library, archive and heritage.

Data Analysis Methods

The data analysis was performed with VOSviewer [14] and RStudio [15] in order to provide both a visualization of intellectual structure and the subject focus of this field of research by employing methods such as bibliographic coupling and term co-occurrence.

Performance Analysis

The following indicators of research performance were collected:

- The Yearly research production.
- Most cited journals (based on Bradford's Law).
- Most producing countries.
- Most cited authors (based on Lotka's Law).

Scientific Mapping Methods

The following network construction methods applied methods include:

- Term co-occurrence analysis.
- Author co-citation analysis (ACA).
- Source co-citation analysis.
- Thematic and evolutionary mapping.

Network Construction Parameters

For Network analyses, minimum number criteria used to reduce noise, and were normalized by association strength. To detect thematic grouping cluster algorithms applied to it, and for visualization force-directed layouts were employed. By using these parameters, it ensured clarity, interpretability and analytical rigor.

Reliability and Limitations

While Scopus is a reliable database, however, the limitations are also existed,

- The language criteria is one of the limitations as we only consider English and the omission of other work published could provide an incomplete picture of the global contribution (especially from the Global South) of research, and the non-indexing of certain regional journals could also impact this beyond.
- The Citation counts also lean towards to bias work which was published earlier in the time span.
- The inclusion criteria applied have served to focus this study and thus enhance its internal validity.

RESULTS

Annual Scientific Production

The longitudinal distribution of publications shows a clear expansion trajectory in institutional Indigenous Knowledge (IK) research in Figure 1. While publication activity remained modest between 1992 and 2010, and a visible acceleration began after 2011.

Post-2018, there has been a very high increase: 17 (2018) to 16 (2019) to 15 (2020) to 34 (2021) to 23 (2022) to 31 (2023) to 21 (2024) to 60 (2025) publications. This 2025 spike likely reflects the maturation of pandemic-delayed research projects and the rise of AI-focused heritage grants.

This sharp increase after 2020 is indicative of an exponential rather than linear growth and an annual increase of 10.86% illustrates the structural maturation of the domain. The spike at 2025 indicates increased interest by institutions and policy makers, likely due to: Digital Transformation; debates surrounding data governance and decolonisation; and the rise of debates on decolonising knowledge and heritage globally. The growth has been in three phases:

1. *Foundations Phase (1992-2005):* Thin but concept-building literature
2. *Growth Phase (2006-2017):* Initial slow institutionalisation
3. *Acceleration Phase (2018-2025):* Rapid consolidation and digitalisation

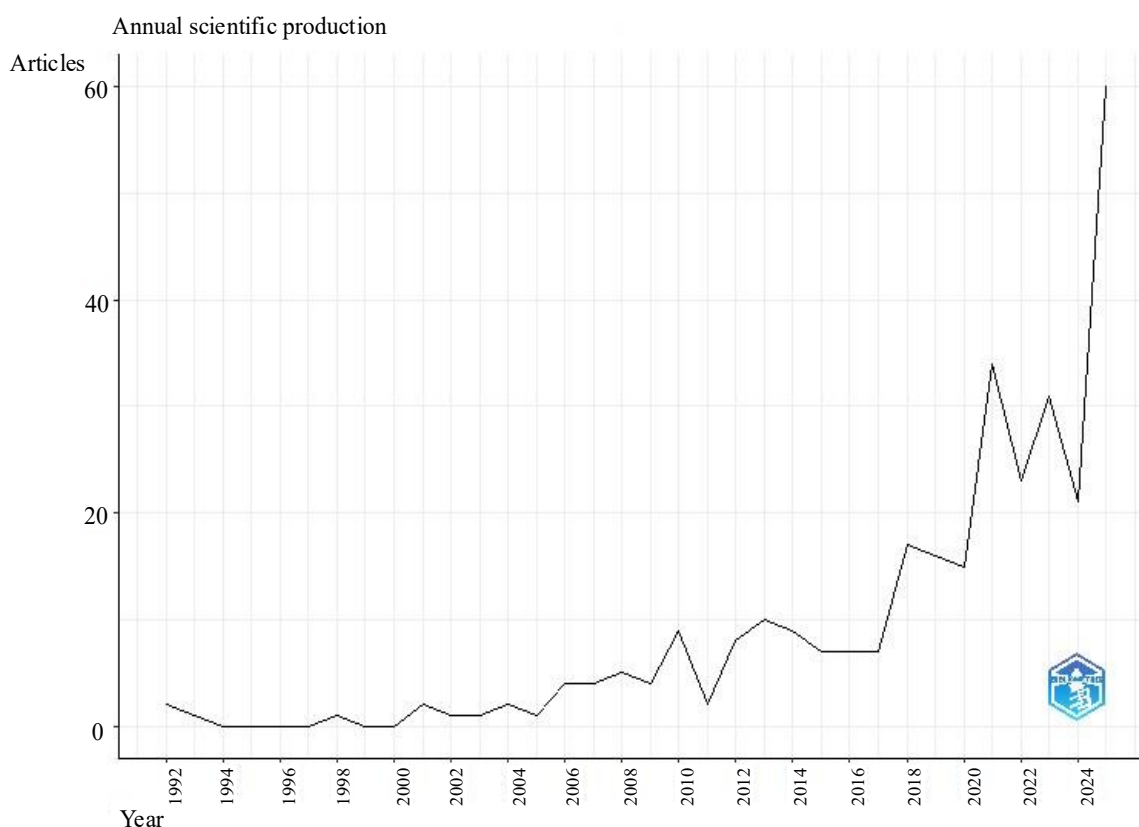


Figure 1. Annual scientific production.

This overall trend backs the hypothesis of IKM becoming part of institutional discussion.

Most Productive Sources

Around 304 articles are published in 215 sources which suggests relatively scattered sources and a few core journals beginning to emerge (Figure 2). The top five most productive journals are:

1. Library Philosophy and Practice (10 articles)
2. IFLA Journal (9 articles)
3. International Information and Library Review (9 articles)
4. Information Development (9 articles)
5. Preservation, Digital Technology and Culture (5 articles)

The Library and Information Science journals domination indicates that institutional research in IK is moving away from purely ecological and anthropological contexts and toward the LIS, supported by Preservation, Digital Technology and Culture as essential digital curation framework topics. It does not demonstrate concentration on a specific journal, indicating a yet-to-be-fully-established body of knowledge, though LIS journals are taking the lead.

Country Scientific Production

Country-level analysis reveals a geographically diverse but Global North-leaning distribution (Figure 3).

Top five contributing countries:

1. United States – 93 publications
2. India – 79 publications
3. Australia – 47 publications
4. Canada – 44 publications
5. New Zealand – 34 publications

India holds second place after USA, which is a major achievement of the Global South, shows policy frameworks align with cultural digitization, research activities and knowledge preservation. Settler-colonial nations like Australia, Canada and New Zealand's joint high rankings point to strong engagement and active Indigenous knowledge governance and reconciliation policy frameworks. This shows two structural characteristics:

1. High impact of funded research environments,
2. Countries active in indigenous policies, notably African and South-East Asian contributions are visible but smaller.

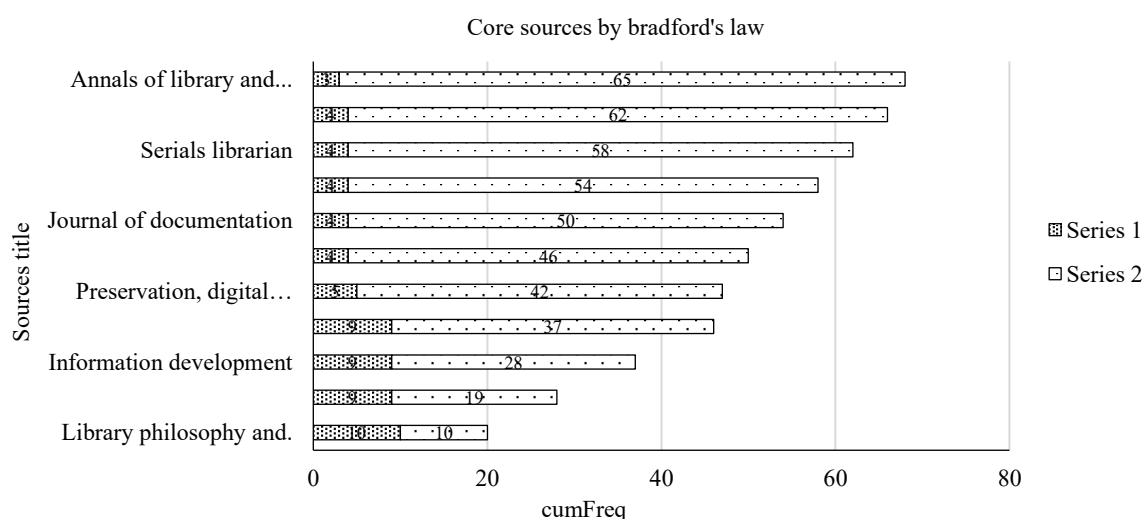


Figure 2. Core sources by bradford's law.

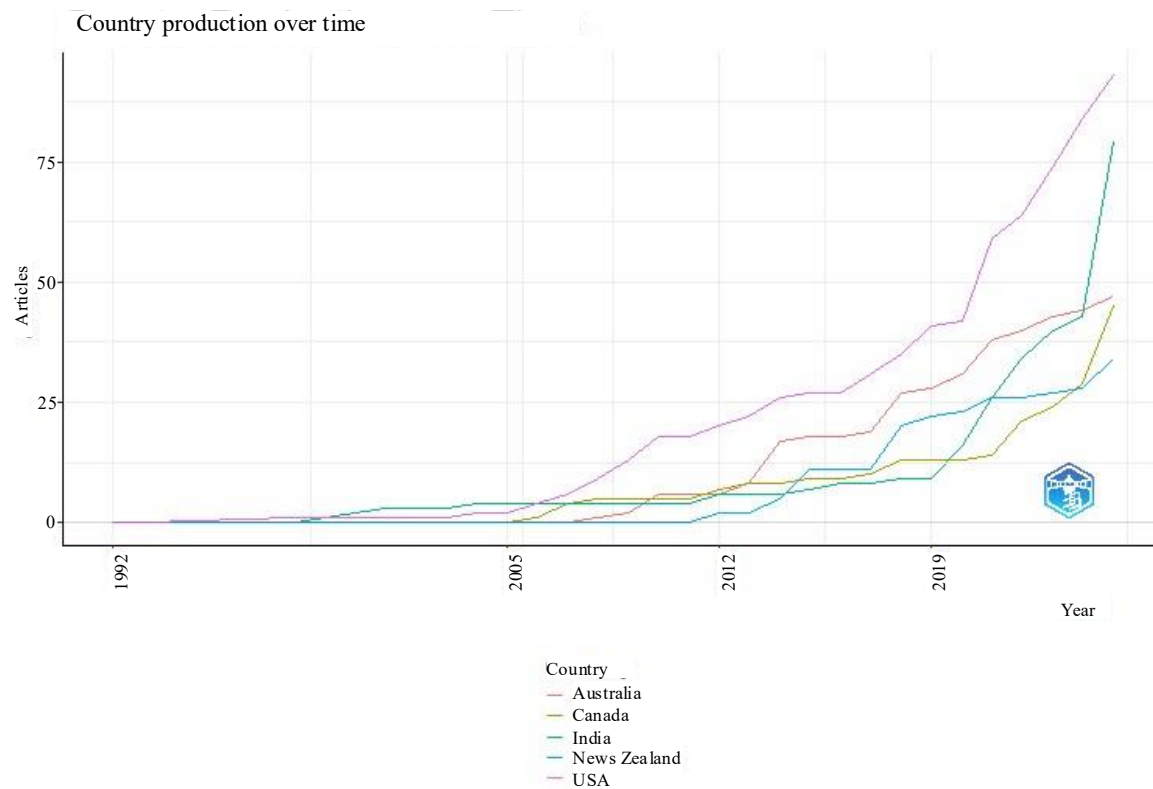


Figure 3. Country production over time.

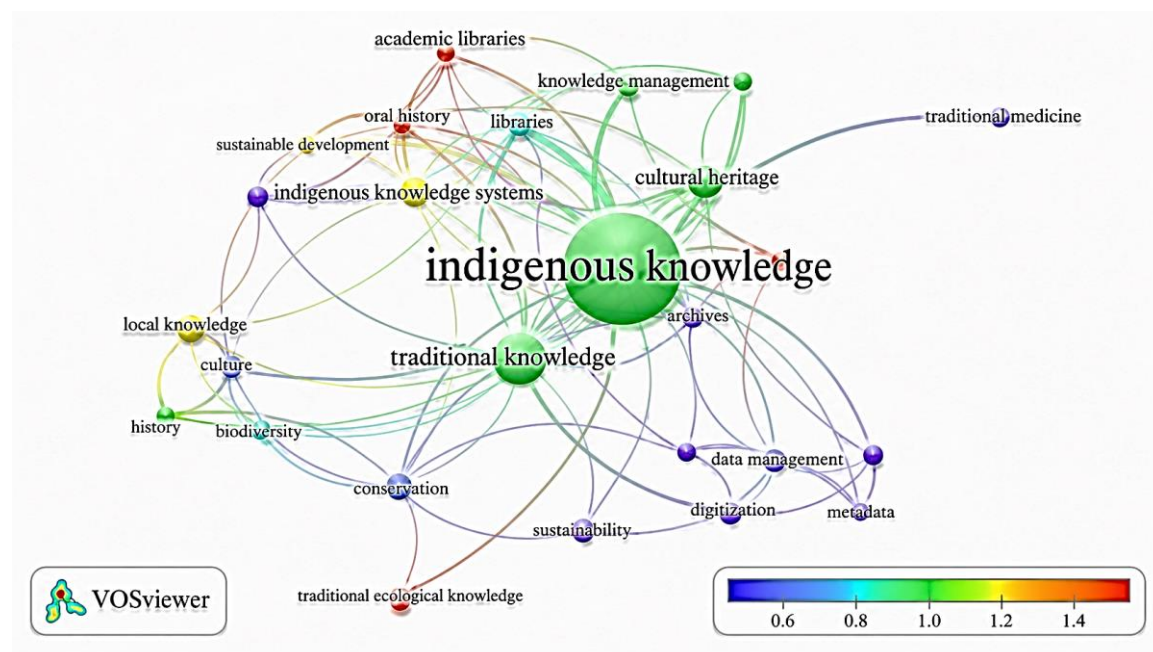


Figure 4. Keyword Co-occurrence Network.

Keyword Co-occurrence Network

The co-occurrence of author keywords validated the centrality of the concept of the two knowledge sets that have high strength linkage and are the strongest nodes (Figure 4).

The following strong links have been identified between concepts:

1. Indigenous knowledge-cultural heritage

2. Indigenous knowledge-archives
3. Indigenous knowledge-libraries
4. Traditional knowledge-conservation
5. Indigenous knowledge systems-knowledge management

The emergence of digitization, data management and metadata shows growing dependence on technology in institutions. Though biodiversity and conservation remain linked but have lost their position. This implies the removal of 'Ethno*' eliminated some ecological noise but true linkage with sustainability remains.

A review of the network structure showed three groups of concepts:

1. The Institutional-Technological Cluster has included (libraries, archives, digitization, metadata, data management).
2. The Cultural Heritage Cluster has included (cultural heritage, indigenous languages, preservation).
3. The Sustainability-Conservation Cluster has included (conservation, biodiversity, sustainability).

From these three different clusters, it is evident that institutional IK research is a multidisciplinary topic that involves intersection of cultural governance, technology infrastructure and environment management.

Intellectual Framework: Author Co-Citation Analysis

The author's co-citation network delineates a few prominent intellectual cluster centers that constituted the research landscape (Figure 5). One cluster can be mapped around scholars involved in the theoretical foundations related to traditional ecological knowledge and socio-ecological systems which contribute to connect Indigenous Knowledge to the sustainability paradigm. A second one appears more focused on institution and policy-oriented studies and deals with governance, archival work, and local-level management.

The relative scattering of clusters illustrated that, although the research field is intellectually rich and diverse, it is not yet constituted of one central core of thought, but rather of an intersecting disciplinary world (library sciences, environmental studies, heritage, information sciences, etc.). This scattering likely contributes to the enduring ambiguity in terms of methodological and conceptual directions of the research area.

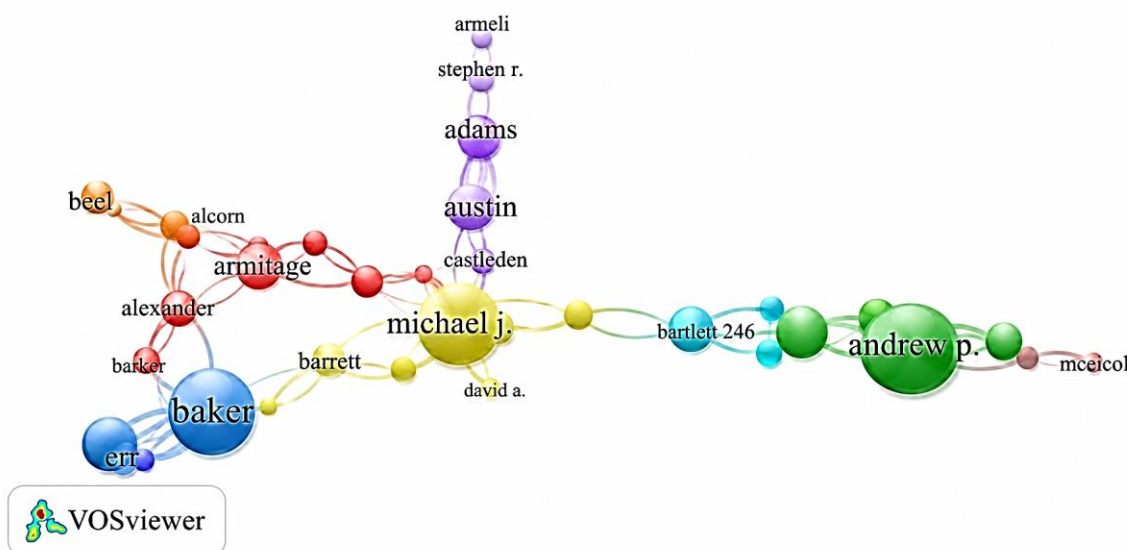


Figure 5. Author Co-citation analysis.

Source Co-citation structure

The source co-citation network illustrates the interdisciplinary scope of research in Indigenous Knowledge management (Figure 6). Important cited sources were: Conservation Biology, Human Ecology, Frontiers in Ecology and the Environment, Science, and Proceedings of the National Academy of Sciences. The citation streams showed that journals in environmental science (like Conservation Biology and Frontiers) are among the most cited, confirming that institutions still seek to legitimize IK discourse from ecological sources and conservation traditions. Alongside these citations, however, parallel streams of citations originate from library and archival studies and cultural heritage sources. These citation streams clearly show the increasing institutionalization of IK into library science and archives and also revealed the inherently hybrid nature of the discipline: built from an ecological epistemological foundation, but increasingly realized through institutional forms.

Conceptual Framework and Thematic Construction

The map shows a clearly delineated but changing research space constituted of four main thematic quadrants: motor, basic, niche, and new or dying thematic areas (Figure 7).

In the *motor thematic zone* (high centrality, high density) the issues of digital preservation, metadata and open science dominate. These are the well-established and strategically important themes in the area of digital infrastructure for Indigenous Knowledge (IK) preservation. The strong representation of metadata and open science points to institutional efforts for interoperability, access, and data management guidelines.

The topics of Indigenous knowledge, traditional knowledge, digital libraries, digitization, and libraries are found in the *basic thematic zone* (high centrality, low density). They provide the structural base of the knowledge field. They are highly important to the field yet they have relatively lower density which points to diversification of ideas and continuous development of theoretical underpinnings of the topic. The presence of “digital libraries” and “digitisation” highlights the institutional trend of technological mediation of IK systems.

In the *niche thematic zone* (low centrality, high density) we can observe groups of closely related topics such as traditional ecological knowledge, citizen science, documentation and historical ecology. These are all well-developed thematic areas but in a certain way isolated from the institutional discourse of IK management. They appear well developed in terms of method but have not established strong links with formal institutional knowledge management structures.

The themes that appear in the *new or declining thematic zone* (low centrality, low density) include environmental history and technology. These thematic areas could be interpreted as being in very early stages of development or simply decreasingly relevant.

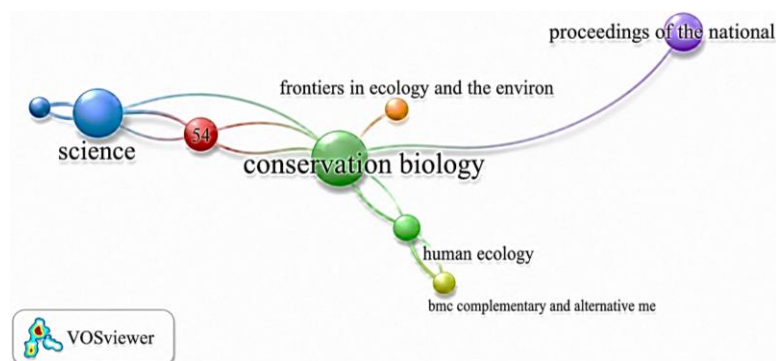


Figure 6. Source Co-citation analysis.

Thematic Shifts Over Time

A definite timeline in the temporal overlay visualization is present. Early phase (1990s to early 2000s): digital library, conservation, economy. Mid phase (2006–2014): indigenous knowledge, library, sustainable development, culture, indigenous population, information management, traditional knowledge, digital archives, and intellectual property. Latest phase (2015–2025): digitization, metadata, data management, sustainability, archives, cultural heritage, digitization, metadata.

The theme is expanding from knowledge acknowledgment toward knowledge management, then data management, toward digital curation. “Data management” and “metadata” appearing increasingly in recent years show a sign of institutional development and alignment with the general open science concept (Figure 8).

DISCUSSION

From marginal to established subject: Institutional IKM as an emerging field

This longitudinal study has revealed that institutional Indigenous Knowledge Management (IKM) is moving from the margin towards an established subject. The dramatic increase in publications since 2018 and the immense growth in the period since 2020 indicates that IK is no longer examined only as an anthropological subject but as a strategic subject (Figure 1). This growth has likely been spurred by the trend toward global digitalization, the agenda toward decolonization, and the Open Science paradigm. The 10.86% yearly growth rate is structurally sound, suggesting a more developed domain rather than a trend; the emerging field is taking on a more technology-centered, proactive stance as institutional IKM.

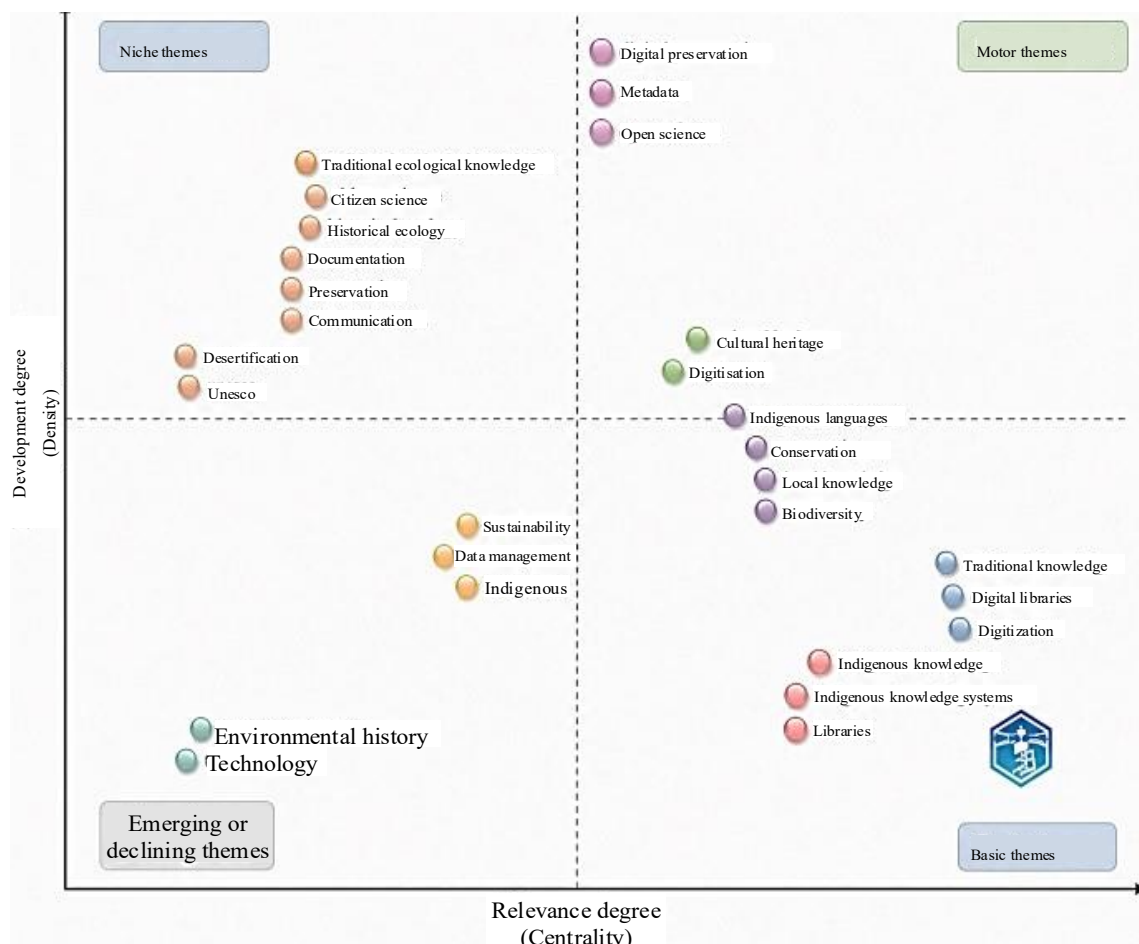


Figure 7. Thematic configuration.

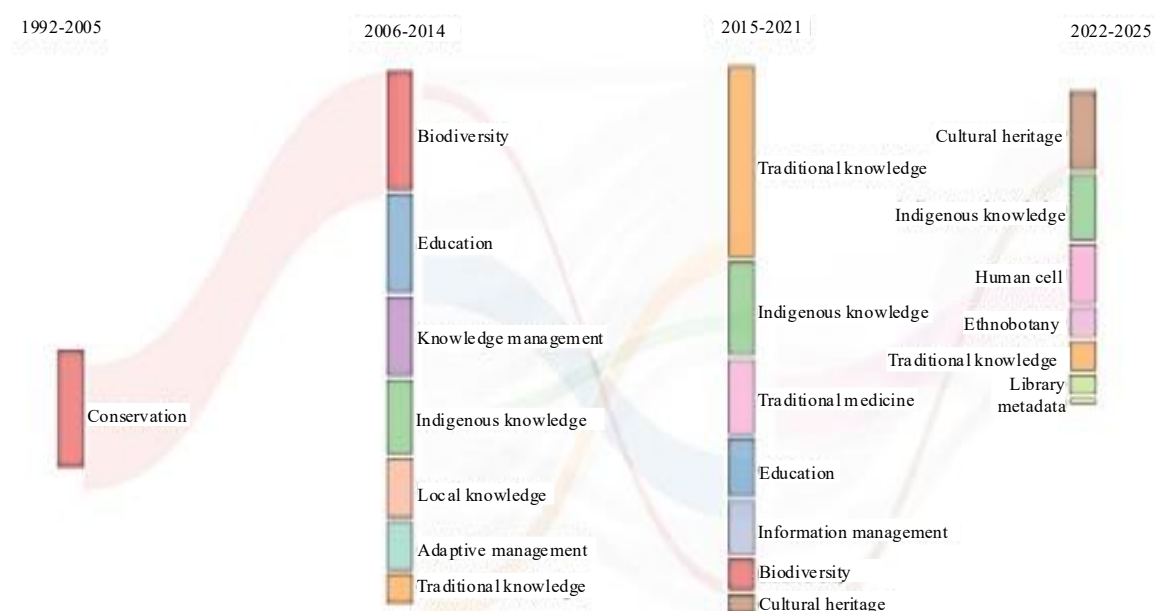


Figure 8. Thematic evolution.

Hybridity of Intellectual Tradition: From Ecology to Information Science

The epistemic tradition driving the field is a bifurcation, demonstrated in the co-citation network (Figure 5). On one hand, the most cited articles suggest that an ecocentric understanding, deriving from ecology in particular, forms an epistemic foundation of the field, exemplified in Berkes' [2] seminal work. On the other hand, Agrawal's [13] and Mazzocchi's [3] work provides a critical challenge to the knowledge dichotomies between indigenous and Western knowledge, challenging the essentialist discourse around knowledge systems. On the other hand, a growing trend of publications in Library and Information Science (IFLA Journal, Sarkhel [16], Lwoga et al. [17]) and archiving studies indicates an increased focus toward archives and digital information systems, suggesting an epistemic shift from the socio-ecological field towards archiving studies, information systems and digital humanities (Figure 6).

Consolidation of Concepts Around Digital Stewardship

The clustering analysis confirms the consolidation of concepts around the idea of digital stewardship, showing a shift from biodiversity-centric concepts in earlier publication years to later trends related to digitization, metadata, and open science. The paradigm has evolved from a “documentation paradigm” (collection of static records) toward a “governance paradigm” (information governance of access, rights, and interoperability), as institutions negotiate the twin agendas of transparency (via open science) and protection of IK through data sovereignty-centric policies (Figure 7) that compete with Nakashima [18].

Ongoing Fragmentation in Theory

Nevertheless, the theoretical literature remains fragmented, as evidenced by the author co-citation map. The field lacks a definitive theory of institutional IKM, drawing instead from perspectives as diverse as sustainability and community-based governance. However, there appears to be the emergence of a socio-technical governance framework which integrates the “Foundational Phase” (socio-ecological systems) and the “Acceleration Phase” (digital curation). This work, influenced by “Two-Eyed Seeing” as advanced by McGregor [12] and Battiste [1], sees institutions moving beyond the role of “data collector” toward that of “co-navigator” within living knowledge systems, consistent with a process of decolonizing methodologies advanced by Smith [19].

Asymmetries in Geopolitical Impact of Output

It is evident from the geographic distribution of research output that there is a disproportionate input

from some regions. Despite the leadership of the United States in terms of publications, there is also substantial input from India, Australia, Canada, and New Zealand (Figure 3). Settler-colonial countries with established relationships to Indigenous communities are doing relatively well in terms of Indigenous relationships and knowledge governance policies. Importantly, India represents a unique geopolitical link between the biodiverse and biocultural South and the indexed global scholarly system, offering a possible model for other emerging nations wishing to increase their visibility in global discourse. Nevertheless, a persistent “participation paradox” and “bibliographic bias” remain in Africa and parts of South Asia, indicating the need to address research capacity and scholarly participation throughout the Global South.

Evolution from Recognition Through Integration to Digital Governance

A progression of the research themes from 'recognition' (the earlier stages of the documentation of IK from an ecological perspective) toward 'integration' and toward the later themes of 'digital governance,' which encompasses archival studies, data management and interoperability (see Figure 4) reveals the evolution of the domain. Emerging Open Science themes further establish this transition and further show that managing IK is now established as an institutional practice rather than simply its documentation. The use of science mapping software and visualization approaches, as espoused by van Eck and Waltman [23] for tracing the evolution of a research domain and illustrating the transition toward strategically governing knowledge from documentation (see Figure 8), supports this argument.

Implications for Scientometrics and Research Policy

The results of this 33-year survey chart a course for memory institutions (libraries, archives, museums) out of a culture of extraction and toward collaboration. The “governance turn” we observe implies that the management of IK in the future will reside in the spaces that have come to comprise digital stewardship and epistemic justice. The following policy implications are put forth in light of our findings:

- *Moving towards epistemically just governance:* instead of exploitative practices, the adoption of data governance schemes such as the CARE Principles [14, 20] can strengthen actual data sovereignty for Indigenous Knowledge holders.
- *Decolonizing metadata:* it is imperative that beyond a technical understanding of interoperability, metadata be understood as a location of power; institutional policy toward the scientization of IK-reducing its cultural, spiritual, and historical context to fit a Western paradigm-should give way to the use of bicultural, pluralistic metadata regimes that honour the relational aspect of IK; a critical priority is the decolonization of knowledge organization systems (KOS) so that the use of Indigenous taxonomies, without reductive schemas, will guide the organization of knowledge.
- *Counteracting the participation paradox:* a funding approach should be adopted by investment agencies in the digital infrastructure and capacity building of the Global South [21].
- *An ethical technological frontier:* emerging technologies such as blockchain for intellectual property rights, and AI-driven applications, have a role in the preservation and dissemination of Indigenous Knowledge. we predict the decade of 2026-2036 could witness particular significance in applying large language models (LLMs) in the areas of endangered languages and the oral heritage of vulnerable and indigenous peoples, in particular through community-led efforts in support of knowledge that does not commodify life [22].

CONCLUSION

This scientometric exercise presents the first mapping of the intellectual, conceptual, and structural progression of institutional interactions with Indigenous Knowledge (IK) from the Rio Earth Summit in 1992 and up to 2025. This article documents an empirical progression of research over three decades from an ethno-ecological to a globalized research mainstream, which has long moved from the phase of 'documentation' to 'consolidation', digital information management, and governed interaction (annual growth >10% and acceleration post-2018). The research has established the 'intellectually diverse, structurally separated' nature of the field. While the access to the domains of ethno-ecological, heritage,

and information science knowledge may have been seen as a strength, a publication record distributed among 215 disparate sources indicates that institutional theory and practice surrounding IK has not yet been able to unite around core intellectual domains; as such, there is a relative lack of “theoretical gravity” for Indigenous Knowledge Management (IKM), hovering erratically between a Western bibliographic and an Indigenous way of knowing .

The geographical distribution results present the problem of a participation paradox. While US, Canada, Australia, and New Zealand take center stage in terms of publication output (given their respective strengths in research infrastructure), India demonstrates strong recent contribution from the 'Global South' while the under-representation of research output from Africa and SE Asia (in dominant bibliometric indexing databases like Scopus/WoS) calls into question bibliographic bias and the knowledge divide, demonstrating how the 'global' scientometric trend may not be driven as much by knowledge generation as it is by Western institutional interests, with a corresponding lack of adequate bibliometric support for researchers from biologically diverse regions. Arguably, the most important finding has been the field's move from documentation to governance; while the period from 1992-2010 was characterized by its attempts to legitimize Traditional Ecological Knowledge (TEK) relative to Western science, the period from 2011 to the present clearly displays the features of a conscious effort toward the management and digitization of IK, ethical concerns and information sovereignty. Rather than viewing IK as a repository of static information for storage in a library, scholars now view it as a dynamic living system to be engaged with respectful interaction and potentially governed with digital tools ranging from AI and blockchain IP rights to community-controlled databases. The institutionalization will need to strike a balance between the free exchange inherent in open-access digital systems and the inherent secrecy and ownership structures of private, sacred, and communally governed knowledge. Important priorities were established, including data sovereignty to replace documentation with governance based on 'CARE' principles; interoperable standards to enable connection between otherwise separate indigenous ontologies and standard library classification schemes, as well as greater disciplinary interdisciplinarity through integration of Library and Information Science (LIS) with Environmental Studies . In conclusion, the 'institutional turn' described here is irreversible. As we approach the mid-21st century, the statistics clearly indicate that the practice of Indigenous Knowledge Management has evolved far beyond an ancillary concern and now stands as integral to world heritage policy, the future success of which, it is argued, is less about publication output and more about the ability of global institutions to achieve epistemological justice in their intercultural engagements via technology.

DIRECTIONS FOR FUTURE RESEARCH

An Integrated Framework for Managing Indigenous Knowledge Systems

Future studies should seek to conceptualize, establish, and test a theoretical framework that integrates Indigenous epistemologies, Indigenous knowledge governance and Library and Information Science perspectives [24]. Research within libraries, archives, museums, and cultural institutions would provide a common grounding on which to advance a common Indigenous Knowledge Management research area.

Indigenous Knowledge Systems and Digital Governance

There needs to be research investigating how institutions have integrated indigenous data sovereignty in the digital sphere- how have libraries, archives, museums, cultural institutions incorporated CARE principles, community owned databases and culturally appropriate metadata and the benefits and risks associated with new technologies like AI, blockchain and smart contracts in different indigenous communities.

Author Contributions

Sarfray Ahmed: conceived the study, designed research protocol, collected and analyzed data, wrote

manuscript, interpreted data, drew the figures, revised methodology, edited manuscript.

Sudharma Haridasan: supervised the study, made the final revision, and approved the study.

Acknowledgments

We acknowledge the assistance of Grammarly for language and technical editing at the final stage of preparation of this manuscript. The authors take responsibility for all parts of this paper.

Conflict of interest

There is no conflict of interest among the authors.

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