



Navigating the Politics of Indigenous Knowledge in the Digital Age

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ABSTRACT

Background: The increasing intersection between Indigenous Knowledge Systems (IKS) and digital technologies presents both opportunities and challenges in knowledge preservation and marginalisation. This issue is rooted in global power dynamics and the influence of technological advancements on knowledge representation.

Objective: This study explored the politics of Indigenous knowledge in the digital age, focusing on the role of Information and Communication Technologies (ICTs), Artificial Intelligence (AI) and Big Data in shaping how Indigenous knowledge is documented, disseminated and controlled. The study is grounded in the Dependency Theory and the Technological Determinism Theory, which provide insights into these influencing factors.

Method: Using the library research method, this study examined existing literature on digital knowledge systems, Indigenous epistemologies, and the socio-political implications of AI-driven data management.

Result: The findings suggest that while digital technologies offer unprecedented opportunities for preserving Indigenous knowledge, they also reinforce systemic marginalisation by favoring dominant knowledge frameworks and restricting Indigenous communities' control over their intellectual heritage. Additionally, AI and Big Data-driven systems often lack cultural sensitivity, leading to misrepresentation and exploitation.

Conclusion: The study concludes that navigating the politics of Indigenous knowledge in the digital era requires a critical balance between technological advancement and respect for cultural autonomy.

Unique Contribution: The study argues for a more inclusive digital ecosystem that recognises Indigenous knowledge as a legitimate form of intellectual capital, providing a critical framework for assessing technological impacts in this domain.

Key Recommendation: The study recommends policies that promote digital sovereignty, ethical AI development, and community-led knowledge governance. Strengthening legal frameworks and fostering collaborations between Indigenous communities and technology developers are critical steps toward ensuring equitable knowledge representation.

Keywords: Indigenous Knowledge Systems, ICTs, AI, Big Data, Knowledge Politics, Digital Marginalisation



INTRODUCTION

The digital revolution, driven by information and communication technologies (ICTs), artificial intelligence (AI) and big data offers profound potential to preserve and disseminate indigenous knowledge systems (IKS), yet it also poses deep political and epistemic risks. Across many African societies, traditional knowledge rooted in oral histories, ecological wisdom and cultural rituals is increasingly vulnerable to marginalisation, appropriation and erasure when repackaged via digital platforms or external technological frameworks without proper contextualisation or community consent (Adedokun, 2024; Nwafor, et al., 2013).

Recent technological advances in Nigeria illustrate both promise and peril. A 2025 study by Oveh, Aziken and Atomatofa highlights how AI-driven tools, such as natural language processing and image recognition can facilitate the documentation and digitisation of local languages, art and oral narratives, increasing accessibility and fostering cross-cultural exchange (Oveh, Aziken & Atomatofa, 2025). Yet, the challenges of digital division, linguistic invisibility and cultural homogenisation loom large. As noted in Eswatini's educational system, indigenous knowledge is often underrepresented in AI datasets, which lack the recognition and validation needed to maintain cultural authenticity (Nokulunga, Pinias, Claretah & Dhlamini 2025).

Critical scholarship further warns of digital culture's risks to indigenous methods of knowledge transmission. Nwammuo, Ezeonyejiaku & Ekwugha (2020) critically examine how global digital platforms threaten indigenous communication patterns in Nigeria, compounding loss of cultural identity and reinforcing Western paradigms (Nwammuo et al, 2020). Meanwhile, Eke and Adeyemi (2024) highlight the potential of community-driven digital tools: social media, virtual archives and interactive storytelling to empower indigenous communities, provided that local ownership and cultural protocols are respected (Eke & Adeyemi, 2024)

Furthermore, digitisation does not guarantee equitable participation. A comparative study of digital preservation in Nigeria, South Africa and Uganda shows that intellectual property rights, ownership and ethical frameworks are frequently overlooked, leaving indigenous knowledge systems exposed to external control and misrepresentation (Turner, 2019). Increasingly, calls for Indigenous Data Sovereignty insist on the right of communities to govern their own data, reinforcing CARE principles of Collective Benefit, Authority to Control, Responsibility and Ethics (Roberts & Montoya, 2023).

Finally, African-led technological innovations, such as Centre for Digitization of Indigenous African Languages, CDIAL's Indigenous AI, which enables native language keyboards and multilingual documentation in over 180 languages demonstrate the transformative potential of community-centric ICT solutions when aligned with cultural preservation goals (CDIAL, 2023).

While these innovations offer unprecedented opportunities for preserving and promoting Indigenous Knowledge Systems (IKS), they simultaneously introduce new layers of complexity, particularly in relation to control, access, representation and marginalisation (Roberts & Montoya, 2023). Despite growing scholarly attention to digital preservation, most existing studies tend to frame Indigenous knowledge either as static cultural artefacts or as content that



must be digitised for academic purposes, often without meaningful community involvement or attention to political dynamics (Biyela, 2016; Nokulunga, Pinias, Claretah & Dhlamini 2025).

Notably, many existing works have focused predominantly on the technical dimensions of ICT-enabled preservation, neglecting the epistemological and power-laden politics that accompany digitisation. For instance, Nwammuo et al (2020) highlighted the challenges of digitising indigenous communication systems in Nigeria but did not adequately interrogate the geopolitical and data sovereignty implications inherent in outsourcing indigenous memory to Western-designed digital infrastructures. Similarly, Eke & Adeyemi (2024) offered valuable insight into how digital tools support indigenous communication, yet failed to critically examine who controls the platforms, whose voices are amplified and whose knowledge gets excluded or decontextualised in the process.

Furthermore, while scholars such as Adedokun (2024) have explored the intersection of indigenous epistemologies and Nigeria's political economy of knowledge, there is a lack of empirical engagement with how emerging technologies such as AI and big data reproduce colonial hierarchies under the guise of neutrality and efficiency. AI-powered algorithms, often trained on non-representative datasets, risk misrepresenting or erasing indigenous perspectives altogether (Oveh et al, 2025). This concern is especially urgent given the growing momentum of global digitisation efforts, many of which remain unregulated and disconnected from the cultural and intellectual sovereignty of indigenous peoples (Roberts & Montoya, 2023; Aligwe, & Nwafor, 2016).

This study is thus motivated by the limitations and gaps in existing literature, particularly the failure to address the political and ethical dilemmas surrounding the digitisation and algorithmic treatment of indigenous knowledge. It seeks to interrogate how ICTs, AI and big data both enable and threaten the sustainable preservation of indigenous heritage. In doing so, it aimed to contribute to an evolving discourse that repositions Indigenous communities as co-creators and custodians of their knowledge, not merely as subjects of technological benevolence.

OBJECTIVES OF THE STUDY

The objectives of this study are:

1. To examine how Information and Communication Technologies (ICTs), Artificial Intelligence (AI) and Big Data influence the documentation, representation and dissemination of Indigenous Knowledge Systems (IKS) in the digital age.
2. To analyse the political and power dynamics that shape the control, ownership and governance of Indigenous knowledge within digital platforms and AI-driven systems.
3. To evaluate existing frameworks, principles and governance models, including Indigenous Data Sovereignty, CARE principles and participatory AI approaches that can promote ethical, culturally aligned and community-controlled preservation of Indigenous knowledge in the digital era.



THEORETICAL FRAMEWORK

Understanding the complexities of Indigenous Knowledge (IK) preservation and marginalisation in the digital era necessitates a multi-theoretical approach. This study draws on Postcolonial Theory, Critical Data Studies and the Indigenous Knowledge Systems (IKS) Framework to interrogate how ICTs, AI and big data mediate power, representation and epistemic sovereignty in contemporary knowledge regimes.

Postcolonial Theory

Postcolonial theory provides a critical lens for examining the historical and ongoing marginalisation of indigenous epistemologies. As articulated by scholars such as Spivak (1988) and further advanced in digital contexts by authors like Bhabha and Mignolo, the theory challenges the dominance of Western-centric narratives and highlights the ways in which colonial logics are embedded in contemporary systems of knowledge production and dissemination. In the digital age, this marginalisation is manifest in how indigenous knowledge is often subsumed, extracted or decontextualised through digital archives and AI models built on Eurocentric ontologies (Ndlovu-Gatsheni, 2013; Adedokun, 2024).

Digital technologies, rather than neutral tools, are frequently embedded with ideological assumptions that privilege certain forms of knowledge while invisibilising others (Coudry & Mejias, 2019). Postcolonial theory thus equips this study to critique how ICT platforms, often developed in the Global North, perpetuate asymmetric knowledge power relations and epistemic injustice (Mbembe, 2015). The theory foregrounds the importance of indigenous agency, resistance and reclamation of digital space for knowledge production and control.

Critical Data Studies (CDS)

The Critical Data Studies paradigm interrogates the politics of data – how it is collected, organised, represented and used. Scholars such as Boyd and Crawford (2012) and Iliadis and Russo (2016) argue that data is never neutral, but always situated within particular political, cultural and economic contexts. Within this lens, AI and big data technologies are examined not just for their technical capabilities, but for their embedded value systems, biases and impact on social structures.

In the context of indigenous knowledge, CDS draws attention to the risks of "data colonialism," that is the extraction and commodification of indigenous epistemologies without consent or context (Coudry & Mejias, 2019). The CDS framework critiques the use of standardised metadata and classification systems that erase indigenous worldviews, favouring datafied representations that are legible to Western institutions. For instance, when AI systems trained on mainstream datasets attempt to categorise indigenous expressions or languages, they often misclassify or exclude them altogether (Oveh et al , 2025). By applying CDS, this study emphasises the need for alternative data practices that are grounded in indigenous epistemologies, values and control.



Indigenous Knowledge Systems (IKS) Framework

The Indigenous Knowledge Systems (IKS) framework recognises indigenous knowledge as dynamic, context-specific, holistic and grounded in community practices and cosmologies (Odora-Hoppers, 2015). Unlike Western scientific paradigms that often separate the knower from the known, IKS embraces an integrative approach that combines ecological, spiritual, social and experiential elements. In this framework, knowledge is relational and embedded in language, rituals, and oral traditions.

In the digital age, the challenge lies in how these relational forms of knowledge are digitised, archived and represented in systems that are not designed to accommodate them. The IKS framework serves as a counter-narrative to dominant techno-scientific logics by emphasising indigenous ownership, custodianship and the need for culturally appropriate digital technologies (Nakata, Byrne, Nakata & Gardiner, 2020). It also provides a basis for ethical considerations around consent, intellectual property and data sovereignty, especially as indigenous communities navigate partnerships with governments, NGOs and tech corporations.

Synthesis of Theoretical Lenses

By synthesising these three frameworks: Postcolonial Theory, Critical Data Studies and the IKS framework, this study adopts a robust analytical posture for understanding how power, culture and technology intersect in the preservation and potential marginalisation of indigenous knowledge. Together, they enable a nuanced critique of how digital interventions can simultaneously serve as tools of empowerment and mechanisms of erasure. More importantly, they provide normative guidance for designing inclusive, just and community-driven digital knowledge systems that uphold indigenous rights and agency in the 21st century.

CONCEPTUAL REVIEW

This conceptual review examines key ideas shaping how Indigenous Knowledge (IK) intersects with digital technology by highlighting opportunities and risks in the preservation and potential marginalisation of cultural heritage through ICTs, artificial intelligence (AI) and big data.

Indigenous Data Sovereignty & CARE Principles

The concept of Indigenous Data Sovereignty (IDSov) articulates that Indigenous communities should own and control their cultural knowledge and data. Central to this are the CARE Principles: Collective Benefit, Authority to Control, Responsibility and Ethics which guide ethical governance of digital systems (Roberts & Montoya, 2023; Wikipedia, 2019). Without such frameworks, AI and big data projects often replicate colonial extraction by repurposing community knowledge in ways that undermine local autonomy.

Data Colonialism & Epistemic Injustice

Digital platforms and AI systems frequently reflect asymmetries of power and often marginalise cultural systems that don't conform to Western norms. Couldry and Mejias (2019) theorise this dynamic as "data colonialism" where dominant knowledge forms subsume or erase



Indigenous epistemologies under the guise of neutrality. AI-driven datasets trained on non-representative language and cultural samples risk misrepresentation or exclusion of IK (Jafari, 2023).

Cognitive Justice & Epistemic Plurality

Cognitive justice reminds us that all forms of knowledge deserve equitable recognition. Visvanathan and UNESCO education scholars emphasise that Indigenous and Western knowledges must co-exist in dialogue rather than hierarchy; a principle often ignored in technology-driven preservation attempts (Visvanathan, 2009). Without this pluralism, digital efforts risk reinforcing epistemic dominance and silencing alternative worldviews.

Participatory AI & Community-Led Development

Emerging global initiatives demonstrate that when communities lead AI projects from language models to digital archives, outcomes are more culturally appropriate and sustainable. For example, Te Hiku Media's Māori language model, built with archival community data, achieved 92% accuracy and resisted third-party commercialisation (Te Hiku Media, 2024). Such participatory design aligns with aspirations for digital sovereignty and community agency.

AI for Language Revitalisation & Cultural Resilience

Scholarly and technology reports highlight how AI and machine learning can support endangered Indigenous languages through tools like small language models and interactive storytelling (Pinhanez et al., 2024; Iliadis & Russo, 2016). Success has been documented in youth-led coding camps, transcription tools, speech-to-text apps and language learning platforms co-created with indigenous stakeholders. These projects demonstrate that community-aligned technology can be empowering when coupled with ethical stewardship.

Synthesis & Implications

These conceptual strands converge around critical tensions: who controls the technology, whose epistemologies are validated and whether digital systems reinforce or disrupt colonial patterns. Taken together, they underscore the importance of platforms that honour care, co-creation and cultural protocols rather than extractive, top-down digitisation. The review supports the study's thesis that ICTs, AI and big data can either perpetuate marginalisation or foster equitable knowledge preservation; depending on whether Indigenous communities hold authority over their digital futures.

Opinion Review

The interplay between Indigenous Knowledge (IK) and contemporary digital infrastructures – ICTs, AI and big data poses profound political and epistemic questions. This study rightly foregrounds how technological interventions can both safeguard and marginalise IK depending on control, design and governance. The concept of data colonialism, as articulated by Couldry and Mejias (2019), compellingly illustrates how global ICT systems extract and commodify social life in ways reminiscent of historical colonial exploitation. More disturbingly, these



frameworks often exclude indigenous epistemologies from digital archives, reinforcing existing power asymmetries.

Equally pertinent is the discourse around Indigenous Data Sovereignty, which insists that communities retain authority over their harvested data (Roberts & Montoya, 2023). This principle is essential if digital preservation is to respect indigenous self-determination rather than become an instrument of external control. However, many prevailing projects continue to collect IK without sufficient community participation, violating the CARE principles of Collective benefit, Authority to control, Responsibility and Ethics.

Further skepticism arises from the domain of cognitive justice, which challenges the hierarchy of knowledge systems. If AI systems are trained primarily on dominant worldviews, indigenous knowledges remain marginalised or misrepresented. The study's emphasis on epistemic plurality aligns with scholarship that calls for AI design grounded in community-specific ontologies rather than abstract universalism.

On the positive side, examples such as the Te Hiku Media Māori language model which achieved 92% accuracy and is fully owned by the Māori community demonstrate that participatory, community-led AI offers a viable alternative. These initiatives suggest a path forward, blending indigenous agency with technological innovation, provided communities govern the process.

Another highlight is the study's argument for ethical AI rooted in community ownership and transparency. This addresses growing concerns among IK scholars and technologists about algorithmic bias, data commodification and techno-extractivism. Indeed, without intentional governance frameworks, digital tools risk reinforcing epistemic injustice and eroding indigenous autonomy.

In conclusion, this study makes a timely and necessary contribution. It critiques technological optimism by revealing the political stakes of PTSD-style digital colonisation, while also celebrating community-driven alternatives. The challenge moving forward is to operationalise inclusive data governance, participatory AI design and respectful archiving models that empower IK holders; not merely digitise their knowledge for external consumption.

EMPIRICAL REVIEW

In "A framework for digital preservation of Indigenous Knowledge System (IKS) in repositories in South Africa", Balogun and Kalusopa (2021) examined institutional readiness for preserving IKS. They conducted multiple case studies, interviewing eight professionals at Indigenous Knowledge Documentation Centers and analysing policy documents. Findings showed an absence of formal digital preservation policies and inadequate infrastructure. They proposed a preservation framework emphasising long-term curation, disaster planning and institutional policy development. While valuable for institutional assessment, their study does not engage digital politics or community control, whereas this study foregrounds sovereignty, ethical AI and marginalised epistemologies across African contexts.



In “In consideration of Indigenous Data Sovereignty: Data mining as a colonial practice”, Roberts and Montoya (2023) explored the political dimensions of data extraction through case analysis and CARE principles. This qualitative research revealed how data mining reproduces colonial patterns and marginalises indigenous communities. They advocated for Indigenous data governance grounded in authority and collective benefit. Their conclusions highlighted the necessity for data sovereignty frameworks. This study extends their foundational work by applying these principles specifically to ICT, AI and big data in knowledge preservation, emphasising practical participatory governance rather than abstract critique alone.

Iliadis & Russo (2016) in their paper titled, “Critical Data Studies: An introduction” addressed the politics of big data and algorithmic systems. Although not fieldwork, they reviewed empirical cases across domains, identifying biases embedded in data infrastructures. They concluded that data systems reflect cultural and power hierarchies unless critically interrogated. Recommendations include equitable design practices and transparency in algorithmic processes. This study builds upon these insights by examining how practical systems such as indigenous language models and digital archives either reproduce or disrupt such biases.

in “Digital Realities of Indigenous Language Revitalisation” (Hawaiian study, 2018) used interviews with multilingual stakeholders and thematic analysis to assess AI impacts on Hawaiian language preservation. It found AI significantly supports language learning and community engagement, though technical and cultural barriers remain. Recommendations included culturally-sensitive co-design and ethical stewardship of language data. This study aligns closely in methodology and spirit but shifts focus to African indigenous systems and interrogates power imbalances in knowledge politics beyond AI’s technical affordances.

Fernandez-Sabido & Peniche-Sabido (2025) in “Redefining technology for indigenous languages”, reviewed global indigenous language technologies via comparative analysis, arguing that third-party solutions often fail, while community-led models succeed. They emphasised participatory design to ensure epistemic relevance and resist colonising technology narratives. Recommendations include enforcing legislation on language rights and empowering indigenous technologists. While this study deepens this by proposing governance frameworks for ICT, AI and big data that centre African indigenous agency and control over digital representation.

METHODOLOGY

This study adopted the library research method, which involves a systematic review and critical analysis of existing literature, documents and scholarly works relevant to the politics of indigenous knowledge in the digital age. The library method is appropriate for a conceptual and analytical inquiry such as this, where the objective is to draw insights, identify gaps and synthesise perspectives on how emerging technologies, including Information and Communication Technologies (ICTs), Artificial Intelligence (AI) and Big Data are reshaping indigenous knowledge systems.

Sources of data include peer-reviewed journal articles, books, conference papers, policy documents and credible online databases published from 2010 to 2025. These materials were accessed through academic databases such as JSTOR, Google Scholar, Scopus and institutional



repositories. The materials were selected based on their relevance to key themes such as indigenous knowledge preservation, digital marginalisation, data colonialism, algorithmic bias and the intersection of technology and cultural politics.

The literature retrieval process followed a structured protocol using a combination of keywords grouped into three primary clusters:

Cluster	Keywords
Indigenous Knowledge	"Indigenous knowledge systems," "IKS," "Indigenous epistemology," "cultural heritage," "traditional knowledge."
Digital Technologies	"Artificial Intelligence," "AI," "Big Data," "Information and Communication Technologies," "ICTs," "digital governance."
Political Dynamics	"Marginalisation," "digital sovereignty," "knowledge exploitation," "ethics of AI," "knowledge control," "digital politics."

The method employed involved a critical content analysis of selected studies, with attention paid to theoretical framing, methodological approaches, findings and conclusions. This approach enabled a comprehensive understanding of the prevailing discourses and allowed for the identification of conceptual gaps and contradictions. The review process also included comparative analysis across geographic regions and disciplines to ensure diversity and inclusiveness in perspectives.

Furthermore, this study employed thematic categorisation to organise the literature into key conceptual domains: (1) Politics of Indigenous Knowledge in the Digital Era; (2) The Role of ICTs in Knowledge Documentation and Dissemination; (3) The Impact of AI and Big Data on Indigenous Epistemologies; and (4) Marginalisation and Digital Injustice. These categories guided the analytical process and helped in forming evidence-based positions and recommendations.

DISCUSSION

The findings of this study demonstrate that while ICTs, AI and big data offer opportunities for preserving and expanding access to Indigenous Knowledge Systems (IKS), they also introduce significant risks of cultural misrepresentation, epistemic injustice and digital marginalisation. These results align with, but also extend, existing scholarship on the politics of knowledge digitisation.

First, consistent with the work of Roberts & Montoya (2023), this study found that digital projects involving Indigenous data often reproduce colonial power relations when control remains in the hands of external institutions. Their argument that data mining practices mirror earlier forms of extractivism is reflected in this study's observation that AI-driven systems frequently digitise IK without local consent or adherence to CARE principles. However, while Roberts and Montoya focused primarily on data governance, this study extends their work by



showing how AI algorithms, particularly those trained on non-representative datasets directly shape the visibility and interpretation of indigenous epistemologies in digital spaces.

Similarly, the findings correspond with Couldry & Mejjias' (2019) thesis on data colonialism, which describes how global digital infrastructures appropriate non-Western knowledge systems under claims of neutrality and efficiency. The misrepresentation of cultural concepts and the homogenisation of indigenous narratives identified in this study reflect their concerns. However, this research advances the discussion by demonstrating that data colonialism is not merely a consequence of corporate extraction but is also embedded in technical architectures such as metadata standards, classification schemas and automated language models that implicitly privilege Western ontologies.

Furthermore, earlier work by Nwammuo, Ezeonyejiaku & Ekwugha (2020) highlighted the erosion of indigenous communication practices in the face of digital globalisation. This study not only affirms their findings but also provides an additional explanation for this erosion by showing how AI systems, when not culturally aligned, perpetuate symbolic violence through misclassification, linguistic erasure and epistemic irrelevance. Unlike their focus on communication patterns, this study interrogates the deeper algorithmic structures that reinforce marginalisation.

The findings also resonate with research by Eke & Adeyemi (2024), who argue that community-driven digital tools are most effective when cultural protocols guide design. This study observed similar benefits in Indigenous-led initiatives such as AI-supported language revitalisation projects. However, whereas Eke and Adeyemi emphasised tool utilisation, the present study foregrounds political autonomy and ownership, demonstrating that even culturally sensitive tools may undermine sovereignty when governed by external institutions.

In contrast, some studies present more optimistic assessments of technology. For example, Hawaiian research on language revitalisation (Hewahewa, 2018) reported overwhelmingly positive community adoption of AI tools. While this study acknowledges the value of such innovations, it also argues that technological optimism must be tempered by an awareness of structural inequities. The divergence between these studies may stem from differing levels of state support, community governance and technological policy environments across regions.

Additionally, the findings align with global assessments such as Fernández-Sabido and Peniche-Sabido (2025), who argue that third-party solutions often fail because they do not reflect indigenous epistemologies. This study extends their work by offering a more detailed analysis of the ways algorithmic systems specifically misrepresent relational, holistic and context-dependent knowledge typical of Indigenous frameworks.

Finally, evidence from participatory AI models such as Te Hiku Media's Māori language initiative supports this study's assertion that technological empowerment is possible when Indigenous communities retain control of datasets, design protocols and governance structures (Jones, 2024). The success of such models reinforces the argument that digital sovereignty, not mere technological access is central to the future of Indigenous knowledge preservation.



In summary, this study's findings largely agree with existing research on data colonialism, digital marginalisation and the need for Indigenous data sovereignty. However, it contributes new insights by explicitly connecting these political concerns to the technical features of AI and big data systems, showing how algorithms, metadata architectures and dataset biases can reinforce epistemic inequality. It also provides a more nuanced explanation for why digitisation, despite its promise can lead to cultural distortion, arguing that the root causes lie not simply in access to technology but in the ownership, design and governance of digital systems. These contributions fill existing gaps and advance scholarly understanding of how Indigenous knowledge is contested, shaped and negotiated in the digital age.

CONCLUSION

The digital age presents a paradox for Indigenous knowledge systems: it offers unprecedented opportunities for documentation, dissemination and revitalisation, yet also carries significant risks of cultural erasure, data exploitation and epistemic marginalisation. The intersection of ICTs, artificial intelligence and big data with Indigenous epistemologies is deeply political. These technologies, when driven by extractive models and external interests, can reinforce historical injustices under the guise of innovation. However, when Indigenous communities are empowered to define, control and benefit from digital processes, these same tools can become powerful instruments of cultural continuity, sovereignty and resilience.

This study has shown that the politics of knowledge in the digital era cannot be separated from questions of ownership, access, consent and representation. Ensuring ethical engagement with Indigenous knowledge requires more than technological sophistication; it demands a fundamental shift in mindset, one that recognises the legitimacy and richness of diverse knowledge systems and prioritises the agency of Indigenous peoples in all digital interventions.

RECOMMENDATIONS

1. Governments, institutions and developers should establish and enforce ethical governance structures that give Indigenous communities full authority over how their knowledge is collected, stored, shared and used. This ensures alignment with community values and mitigates the risks of exploitation and data colonialism revealed in the study.
2. Digital preservation and AI development efforts should originate from within Indigenous communities, supported by funding, training and infrastructure. Community-led approaches address findings that externally imposed systems lack relevance, sustainability and cultural fit.
3. Policies guiding ICT and AI use should be built on ethics, cultural sensitivity and community norms. Such frameworks will prevent misuse or misrepresentation of Indigenous knowledge - issues highlighted by the study as major current challenges.
4. Curricula in technology, AI and data science should incorporate Indigenous epistemologies and promote interdisciplinary learning. This responds to the study's finding that capacity-building is essential to empower Indigenous communities in digital spaces.



5. Digital tools must be developed to reflect linguistic, cultural and contextual specificities. Indigenous languages and knowledge forms should be digitised using methods that ensure accuracy, accessibility and cultural integrity, addressing the limitations identified in the study.
6. Indigenous voices must be meaningfully included in policy discussions at national, continental and global levels. Strengthening representation will ensure that digital governance frameworks reflect Indigenous rights, aspirations and the study's call for inclusive decision-making.

Ethical clearance

Ethical consent was sought and obtained from the participants used in this study. They were made to understand that the exercise was purely for academic purposes, and their participation was voluntary.

Acknowledgements

We acknowledge Angel Alilionu and Chukwubuikem Oguchukwu for assisting us with data collection. We equally appreciate the Pan-Atlantic University Library staff for their cooperation and support.

Sources of funding

The study was not funded.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Authors' Contributions.

Okeke and Omosotomhe conceived the study, including the design, Okeke and Chukwubuikem collated the data, and Okeke and Omosotomhe handled the analysis and interpretation, while Okeke and Nze Chukwuebuka drafted the initial manuscript. All authors have critically reviewed and approved the final draft, and are responsible for the content and similarity index of the manuscript.

Availability of data and materials.

The datasets on which conclusions were made for this study are available on reasonable request.

Citation

Okeke, O. R & Omosotomhe S. I. (2025). Social media and construction of ethnic identity among Nigerian youth. *International Journal of Sub-Saharan African Research (IJSSAR)*, 3(4), 314-327



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