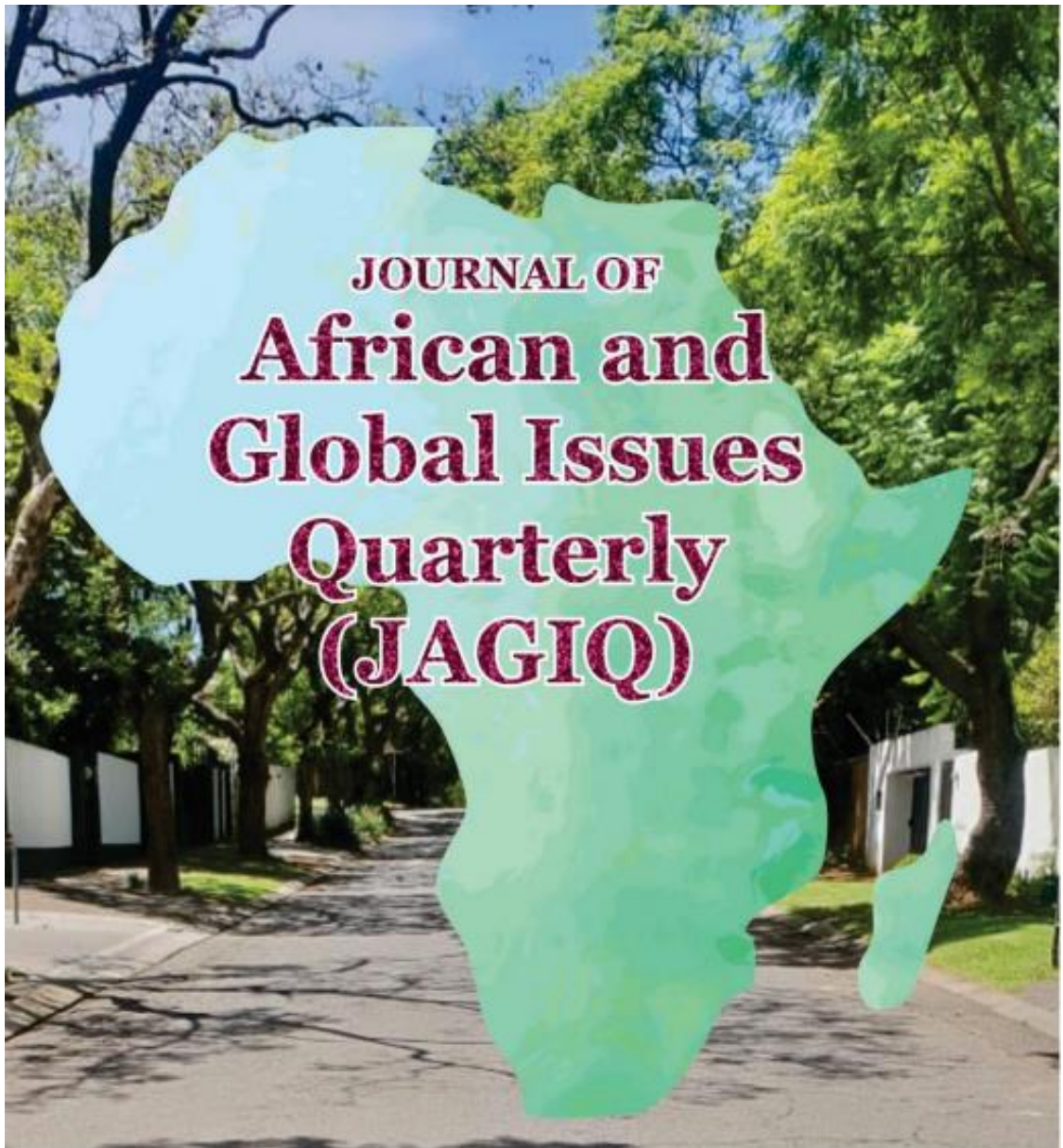




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## EDITORIAL NOTE

This volume represents concerted calls within and outside Africa on the need for multidisciplinary collaboration and research output. Specifically, papers were drawn from all disciplines and research focuses, which has further increased the quality of research and collegial engagement. Hence, topics covered in this volume cut across the areas of economics, politics, security, ICT, indigenous knowledge, development studies, finance, trade, youth engagement, agriculture, democratization, and nation-building, among others.

For instance, Thizwilondi Josephine Mudau in *African Youths and the Promotion of Sustainable Development through the Lens of Indigenous Knowledge (IKS) in the 21st Century* employed qualitative desktop research methodology in synthesizing existing literature to argue that IKS represents a dynamic body of wisdom encompassing sustainable agriculture, natural resource management, and community resilience and offers proven, contextually grounded solutions to modern challenges like climate change and food insecurity. The analysis highlights youth-led initiatives across the continent that are revitalizing indigenous crops, integrating traditional ecological knowledge with climate adaptation strategies, and using digital platforms for cultural preservation. Mudau concluded that for Africa to achieve authentic and sustainable development, a concerted effort is needed to empower youth through inclusive education, supportive policy frameworks, and intergenerational dialogue, thereby transforming indigenous knowledge from a cultural heritage into a living toolkit for a resilient future.

Masila Joshua Masipa in *Beneficiaries of Corruption? An analysis of the function of South African banks in handling and making money from crime proceeds* adopted institutional theory and the political economy of corruption and a qualitative research design that combines semi-structured interviews with compliance officers, financial regulators, and civil society actors with document analysis of Zondo Commission and Financial Intelligence Centre (FIC) reports, legal statutes, and policy papers in examining how, in spite of strict anti-money-laundering (AML) and anti-corruption laws, South African banks may profit from, handle, or ineffectively stop the flow of monies associated with corruption. Specifically, with an emphasis on whether banks directly or indirectly benefit from the proceeds of crime, Masipa investigated the relationship between financial institutions and illegal financial flows within the following objectives: (1) assess the regulatory framework that oversees AML compliance; (2) examine high-profile cases of corruption in which banks are implicated; (3) evaluate due diligence and institutional accountability; and (4) suggest changes to improve ethical banking governance.

Then Sipho Patrick Bhengu-Mancosa & Andrishah Beharry-Ramraj in *Advancing Small, Medium, and Micro Enterprise Growth through Digitalized Enterprise and Supplier Development in South Africa* examined the current state of Enterprise and Supplier Development (ESD) in South Africa, investigated the role of digitalization in enhancing ESD, identified the challenges and opportunities in digitalizing ESD, and provided recommendations for policymakers, corporates, and Small, Medium, and Micro Enterprises (SMMEs). A qualitative secondary data approach was employed, drawing on thematic analysis of existing literature, reports, and industry initiatives. For key findings, Bhengu-Mancosa & Beharry-Ramraj indicated that ESD adoption remains limited; digitalization (Mancosa) significantly enhances market access and supplier diversity; infrastructure and skills gaps persist; and strategic digital integration can unlock growth opportunities for SMMEs.

Lere Amusan & Ebenezer O. Oni, in their study, *Disinvestment of Multinational Corporations (MNCs) in Developing Areas: An Assessment of Shoprite Disengagement in Nigeria, started by reflecting on why*, at the global level, many MNCs have started to disengage from their host states. In a bid to respond to the possible reasons, Amusan & Oni pushed further into examining possible reasons that could explain why Shoprite, a large South African retailing

company, disinvested from Nigeria after operating in the country for about 15 years, using secondary sources supported by primary data and personal observations. For them, the reasons range from political, economic, marketing, and legal to civil society attitudes towards their business. Employing the twin theories of neoliberalism and oligopoly that facilitate globalization, Amusan & Oni concluded that, aside from losing litigation to its erstwhile Nigerian business partners, competition from domestic and foreign retail companies contributed in no small measure to why Shoprite exited the Nigerian market.

***In A sober teacher is a problem”: Unpacking Political Ideology and Emancipatory Struggles Within teacher unionism***, Zwane Theminkosi Trevor & Matsepe David adopted the grounded postcolonial theory in examining how teacher unions embody and deploy political stances and ideologies to promote the emancipation and freedom of education, as well as the broader communities they aim to serve. Clearly, Trevor and Matsepe employed a qualitative interpretivist approach to analyze data from narrative interviews with unionized educators, along with further examination of public union discussions. Key findings of their research indicated four interrelated themes: (1) political consciousness as both a threat to order and a driver of democratic emancipation; (2) teacher unions functioning as a counter-hegemonic force challenging neoliberal geopolitics and political norms; (3) the ideological repositioning of teacher unions as intellectual activists rather than compliant officials; and (4) tensions between political agency and professional identity.

***Douglas Nyath in Rural Youth and the Future of Farming in Sub-Saharan Africa: Revisiting the Abandonment Debate*** explored whether rural youth are truly abandoning agriculture or are instead redefining their involvement through diversified livelihood strategies. It examines the socio-economic, institutional, and cultural factors influencing youth decisions and analyzes how emerging hybrid forms of engagement—such as agripreneurship and part-time farming—are reshaping rural economies. A systematic desktop synthesis of peer-reviewed literature (2000–2025) was conducted using databases like Google Scholar, Scopus, and Web of Science. Nyaath observed that youth disengagement from agriculture is not uniform but context-specific, and the key determinants to such disengagement include land scarcity, education, labor market structures, gender norms, and limited access to finance and technology.

Then, in ***Equal Ideals, Unequal Realities: Gender Dynamics in the Workplace of an International Religious Non-governmental Organisation in Eswatini***, Thembumenzi Jomo Ntshalintshali & Innocent Simphiwe Nojiyeza examined attitudes, experiences, and organizational practices regarding gender roles, power dynamics, and inclusivity by drawing on in-depth interviews and focus groups with 20 employees from a range of departments and hierarchical levels. The results of their findings show that male participants, who were primarily ideologically devoted to gender equality, showed conflicted feelings about shifting power dynamics. Unconscious bias, policy implementation gaps, and organizational culture were equally identified as the primary obstacles to change. The results emphasize that in order to guarantee changes in gender equality, context-specific solutions are required that go beyond the adoption of policies.

***In Indigenous Knowledge Systems and Environmental Conservation Ngugi’s Petals of Blood***, Thabo Prince Zondo started by reflecting on members of the impoverished and socio-economically disadvantaged community who are distressed by incessant drought and who consult a seer and offer sacrifices to seek solutions. Using this as a point of departure, Zondo explored how text gestures and Indigenous Knowledge Systems (IKS) address the real dilemmas faced by Africans following the extensive and cross-generational crises that accompany coloniality. In this, Zondo provided an ecocritical reading of the text, drawing on relevant postcolonial/decolonial ideas to illustrate the ways in which indigenous African epistemologies can indeed boost efforts at environmental conservation and poverty alleviation in rural communities today.

Also, **Rendani Tshifhumul** in *Exploring the Role of African Indigenous Knowledge Systems in Healing Practices and Resilience During the COVID-19 pandemic in Thohoyandou*, presented a narrative inquiry into the experiences of individuals who survived COVID-19 without requiring hospitalization, based on in-depth interviews with three respondents. For Tshifhumul, among the identified practices were the inhalation of steam treated with stones and salt, as well as the application of various herbal concoctions, including *Tshiumbeumbe*, *Musese*, *Mufula Musudzungwane*, *Miora*, and *Mubomo*, guava leaves, and lemon grass tea, including a mixture that comprises onion, ginger, lemon, honey, and garlic. Therefore, Tshifhumul concludes that these findings not only shed light on the adaptive strategies employed by individuals in response to the pandemic but also underscore the significance of traditional healing practices in the context of contemporary health crises. **Khulisile Judith Nkuna & Sikhumbuzo Sibuso Khoza**, in their work, *Capturing Cultural Heritage: Exploring the Poetic Elements of Domesticated Animal Praise*, carried out an analytical analysis of the lyrical components found in the praises of Siswati domestic animals. Nkuna & Khoza observed that expressing gratitude to animals for their contributions to human life remains a significant goal of animal praise. Reflecting on case studies, they noted that the Nguni people view domestic animals as very close environmental companions, particularly for those who live in rural areas. Praise poetry's primary goal is to commemorate great men's accomplishments. However, the reverse is the case for the Swati people, who have a tradition of honoring non-human animals in their poetry, including the wild animals they encounter in their environs as well as the domestic livestock they raise.

**Intaher M. Ambe, Ellsworth C. Jonathan, Phathutshedzo D. Lavhelani,\* and David H. Selby**, in their study, *Exploring the landscape of demand management practices in the public health sector in the Gauteng Province, South Africa: An Empirical Analysis*, employed secondary sources in determining what demand management practices are employed within Gauteng, South Africa, and public health sector institutions. Findings in their study revealed substantial obstacles in organizational structure, demand management techniques, budget, and alignment between demand planning and strategic goals, as well as supply chain management (SCM) rules, regulations, and specifications. They conclude that the paucity of demand management implementation in public sector organizations reveals a misalignment between strategic goals, demand management, and demand planning, resulting in a loss of value for public sector organizations.

**Aderinsola E. Kayode, Shalini Sing, & Patricia P. Badenhorst's research**, *ICT for Indigenous Knowledge Dissemination and Education in Africa: A Systematic Review*, conducted a systematic review of literature published between 2015 and 2025 to examine how ICT tools and platforms have been deployed to support indigenous knowledge dissemination and education in African contexts. The findings of their research indicated that ICT can enhance indigenous knowledge preservation, improve youth engagement, facilitate intergenerational learning, and broaden global visibility of African knowledge systems when implemented with community participation. However, challenges remain regarding digital access, cultural sensitivity, intellectual property rights, and the sustainability of technology-driven initiatives.

In *Donald Trump-Twitter Diplomatic Disruptions And Impact On The Post-World War II International Order.*, **Ndivhoniswani Aaron Tshidzumba & Puseletso Nthate** examine how President Donald Trump's unprecedented use of Twitter as a direct channel for foreign policy communication disrupted established diplomatic norms inherited from the post-World War II international order. Through content analysis of Trump's social media communications, examination of foreign policy outcomes, and comparative analysis with traditional diplomatic practices, Tshidzumba & Nthate demonstrated that Trump's social media presidency constituted a significant departure from institutional diplomacy and contributed to broader challenges facing the established international order. Further findings reveal that digital direct engagement by heads

of state bypasses institutional constraints, undermines multilateral consensus-building, and creates new vulnerabilities in international relations.

Furthermore, in ***Determinants And Effect Of Small-Scale Livestock Production On Household Income In Malawi: Evidence From Fifth Integrated Household Survey***, Gladson Andrew Chipala, Christopher Chombo & Hannah Dunga examined the determinants and effects of small-scale livestock production on household income among farmers in Malawi, using cross-sectional data from the Fifth Integrated Household Survey (IHS5) with a sample of 8,795 households. Their key findings indicate that household size, access to credit, access to extension services, landholding size, distance to the market, and location in the Northern region significantly increase the likelihood of participation in livestock production. Notably, households engaged in livestock production earned, on average, an additional MWK 36,405.76 compared to non-producing households, demonstrating its important role in improving economic welfare.

In ***Navigating Artificial Intelligence Personalization and Consumer Privacy in Digital Marketing across South Africa and Global Contexts***, Suraksha Moothura and Andrishya Beharry-Ramraj critically examined how AI-driven hyper-personalization in digital marketing influences consumer privacy, with a specific focus on its ethical implications and regulatory challenges in South Africa in comparison to global standards using desktop literature review methodology. Moothura & Beharry—Ramraj observed that ethical concerns such as manipulation, algorithmic bias, and reduced consumer autonomy were found to be inadequately addressed in South Africa, where legal instruments like POPIA lack the specificity and enforcement capacity evident in global standards like the GDPR. Taleat, Bisiriyu Abiodun & Lukamba, Muhlya Tshombe's article, ***Energy Sustainability and Sustainable Development Agenda: The Role of Public-Private Partnership in South Africa***, investigated the role and effectiveness of Public-Private Partnerships (PPPs) in South Africa's energy development towards sustainability using a qualitative desk research methodology to analyze secondary data from policy documents, scholarly literature, and government publications. For Abiodun & Tshombe, key findings demonstrate that PPPs have attracted a substantial amount of private investment and benefited the economy through job creation and community development. However, institutional and systemic barriers, e.g., Eskom monopoly, regulatory uncertainty, grid integration constraints, and institutionalized dependency on coal, impede the full implementation of PPPs in accelerating the energy transformation. Hence, they recommend policy stability, energy regulation reform, enhancing financial methods, and ensuring that social equity consideration is factored into PPP structures.

For Olukayode Idris Lasisi in ***The Governance–Development Nexus in Nigeria: A Conceptual Synthesis of Good Governance and Policy Discourse Theories***, a qualitative, conceptual, and desk-based review approach was employed, relying on the literature, policy documents, and theoretical frameworks in reevaluating the governance development interface in Nigeria in terms of the role of institutional weaknesses, the inconsistency of policies, and discursive framing in the determination of sustainable development outcomes. Findings revealed that weak institutions, corruption, bureaucratic inefficiencies, low accountability, and marginalization in policymaking processes bedeviled Nigeria's sustainable development, thereby distorting policy implementation and weakening effective service delivery. Lasisi concludes by calling for the need to strengthen institutions, improve transparency, guarantee policy sustainability, encourage civic participation, and apply digital governance solutions, which is essential to attaining sustainable development.

Eyitayo Francis Adanlawo & Mpho Chaka in ***The Effect of Ethnicity And Politics on the Democratization of African Nations*** examined the theoretical challenge that ethnicity poses to the African state and the challenges it poses for democratization on the continent. To guide the discourse, critical questions are raised: What kind of connection exists in Africa between politics and ethnicity? Under what conditions may ethnicity either support or undermine democracy? Can

citizenship rights be reconciled with ethnicity? . Furthermore, Adanlawo & Chaka explored the evolution of ethnicity from the viewpoints of development communication and provided it with a psycho-social meaning. In their conclusion, Adalanwo & Chaka posited that, if ethnicity has an informative component, we should anticipate that voters' reliance on ethnic cues will decrease when certain forms of higher-quality information become available.

Lindokuhle Senamile Ntuli & Innocent Simphiwe Nojiyeza in ***Does Resource Scarcity Constrain Rural Women's Entrepreneurial Performance in KwaZulu-Natal, South Africa?***, examined whether resource scarcity significantly constrains the entrepreneurial performance of rural women in KwaZulu-Natal (KZN), South Africa. Anchored in the Resource-Based View (RBV), the study adopts a quantitative research design using survey data collected from 273 rural women entrepreneurs across uMhlabuyalingana, Big5Hlabisa, and eJozini municipalities. **Ntuli & Nojiyeza** revealed statistically significant relationships between entrepreneurial performance and seven resource-based constraints: leadership skills, financial institutional barriers, entrepreneurial experience, regulatory constraints, access to financial resources, technological limitations, and limited training opportunities. Lastly, in ***Transformative Governance Frontiers: Relational Public Administration for Smart City Inclusivity***, Melvin Diedericks examined the conceptualization of informal systems in the context of South African smart city initiatives. By repositioning informal systems as co-creators in urban governance, this study advocates for a paradigm shift from technocratic optimization to relational inclusion. This reframing aligns with South Africa's constitutional and developmental goals, enabling transformative governance and the effective localization of SDGs in sustainable cities.

It is expected that these works compiled in this volume will further enrich the discourse and provide policy options to individuals, governments, and countries, particularly in Africa.

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## **ICT FOR INDIGENOUS KNOWLEDGE DISSEMINATION AND EDUCATION IN AFRICA: A SYSTEMATIC REVIEW**

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### **Abstract**

*Indigenous Knowledge Systems (IKS) in Africa constitute a vital resource for cultural identity, sustainable development, and community resilience, yet it remains at risk due to historical marginalisation, generational gaps in transmission, and limited integration into formal education. Rapid expansion of Information and Communication Technologies (ICT) across the continent presents new possibilities for documenting, disseminating, and teaching indigenous knowledge in culturally responsive ways. A systematic review of literature published between 2015 and 2025 examined the deployment of ICT tools and platforms to support indigenous knowledge dissemination. Following PRISMA guidelines, 30 empirical and conceptual studies using keywords, digital archives, mobile learning, and social media knowledge exchange, e-learning platforms, and language preservation technologies with an African context were included. The findings indicated that ICT enhanced indigenous knowledge preservation, improved youth engagement, facilitated intergenerational learning, and broadened global visibility. However, challenges remained regarding digital access, cultural sensitivity, intellectual property rights, and the sustainability of technology-driven initiatives. It was concluded that although ICT held transformative potential for revitalising African indigenous knowledge, success depended on co-design with knowledge holders, ethical governance frameworks, and policy support to ensure community ownership. Gaps identified include comparative*

*evaluations of ICT models, long-term educational outcomes, and strategies for safeguarding cultural epistemologies within digital systems.*

**Keywords:** *Indigenous Knowledge Systems (IKS); Information and Communication Technology (ICT); Africa; knowledge dissemination; digital learning; cultural heritage; community participation*

## **Introduction**

Indigenous knowledge (IK), also referred to as traditional or local knowledge, comprises the understandings, skills, and philosophies developed by societies with long histories of interaction with their natural environment (Mseleku, 2023; Mdhluli et al., 2021). In Africa, such knowledge is deeply embedded in community practices, oral traditions, languages, and livelihoods, covering domains from agriculture and medicine to ecology, arts, and governance. These Indigenous Knowledge Systems (IKS) represent a rich resource for sustainable development and cultural identity. However, African indigenous knowledge has often been marginalized by colonial education systems and the dominance of Western scientific paradigms (Lazarus, et al., 2025; Adeyeye & Mason, 2020). Formal curricula historically ignored or even disparaged local knowledge, leading to generational gaps in IK transmission and a risk of loss as elders pass away (Harris, 2022; Mdhluli et al., 2021). There is thus an urgent need to preserve and revitalize IK in African communities, and to integrate it into education in culturally relevant ways.

At the same time, the past two decades have seen rapid growth in digital infrastructure and ICT access across Africa. Mobile phone penetration in particular has increased dramatically, including in rural areas. This creates new opportunities to document, share,

and teach indigenous knowledge through digital platforms. ICTs (Information and Communication Technologies), ranging from mobile applications and SMS to social media, digital libraries, radio, and e-learning tools, can help bridge distances and connect younger generations with elders and knowledge holders (Yusuf, Rawayau & Suleiman (2025). They also enable broader dissemination of local knowledge to global audiences, potentially correcting the historical exclusion of IK from mainstream knowledge repositories

A growing body of projects and research in Africa has begun exploring ICT-facilitated indigenous knowledge initiatives. Examples include community-based digital archives of oral history, mobile apps for learning indigenous languages, and blended learning programs that incorporate traditional practices into school curricula (Vigil-Hayes et al., 2024). For instance, South Africa's National Recordal System (NRS) was established to record and protect indigenous knowledge nationally digitize Akan proverbs, stories, and rituals, training community members in digital literacy to actively participate in preservation. In the realm of agriculture, smallholder farmers are using social media apps (e.g. WhatsApp) to exchange farming tips rooted in local knowledge, effectively democratizing agricultural knowledge sharing. These initiatives suggest that, if carefully deployed, ICT can amplify and strengthen

indigenous knowledge systems rather than displace them.

However, the intersection of ICT and IK also raises challenges and questions. How can digital tools be used in culturally sensitive ways that respect community intellectual property rights and protocols? What kinds of ICT platforms are most effective for different types of indigenous knowledge (e.g. oral storytelling vs. medicinal knowledge)? Do these technologies truly empower local communities, or do they risk extracting and appropriating knowledge? What outcomes have been achieved in terms of learning, knowledge preservation, or community wellbeing? To date, literature on these questions has been dispersed across case studies, conceptual papers, and project reports spanning education, development, and information science fields. A systematic synthesis is needed to consolidate what is known and identify gaps for future inquiry.

The aim of this review is to systematically examine how ICT has been used to support the dissemination and education of indigenous knowledge in African contexts, and to analyze the outcomes, benefits, and challenges of such initiatives. We seek to inform educators, technologists, policymakers, and community stakeholders about effective practices and considerations when integrating ICT and IK.

### **Theorizing the study**

The conceptual base of this review is based on an interconnected theory that prefigures decolonial thinking, participatory strategies and socially oriented learning in the ICT-indigenous knowledge integration.

The decolonial theory helps to inform the study by proposing historically dominant knowledge production models that are externally imposed and the fact that indigenous knowledge systems are themselves valid and authoritative (Naicker, 2024). In this school of thought, ICT is not perceived as neutral and a technical tool, but as a medium whose composition and utilization should be attentive to power relations, culture and community ownership.

Constructivist and situated learning theories further contribute to reviewing and conceptualizing learning as an active, contextual, and socially mediated process (Gannar & Kilani, 2025). The theories underline practices whereby students and societies make direct contributions to the production, adaptation, and use of knowledge using digital media instead of passively receiving it (Gannar & Kilani, 2025). Participatory design and co-creation models are closely connected, as they focus on involving educators, researchers, and indigenous people in the process of creating ICT-based resources (Gannar & Kilani, 2025). These methods are consistent with the knowledge-sharing and community-of-practice models in the sense of relevance, inclusion, and long-term capacity building, especially among educators, when incorporating the indigenous knowledge via ICT. Collectively, the theories offer a consistent prism through which the ICT initiatives can be used to disseminate indigenous knowledge and ethical knowledge preservation.

### **Methods**

This systematic review was conducted following the PRISMA 2020 guidelines (protocol and registration,

eligibility criteria, information sources, search strategy, and selection process). To identify the type of articles that would be included in the study, a review protocol was created before the search itself; to ensure the success of the search, screening, and extraction processes, the protocol was not registered in a public registry. Scopus, Web of science, ERIC, IEEE Xplore, ACM Digital Library, African journals online, and Google Scholar were searched thoroughly to find English-language studies published between 2015 and 2025. Search strings terms included indigenous knowledge, ICT, and African settings and were adjusted to each database. All documents were consolidated in reference management software and duplicates were eliminated and screening was done in phases (title/abstract and full text) using the predefined inclusion and exclusion criteria.

There were 30 studies that were duplicated and screened but all articles satisfying the inclusion criteria were incorporated into the synthesis. Structured form was used to extract data in which bibliographic information, geographic, indigenous knowledge field, education or community, ICT tools, study purpose, theoretical context, methodology, major findings, and the benefits, challenges, and ethical issues were reported. Because of the heterogeneity of the studies and results, a meta-analysis was inappropriate; thus, the synthesis of the findings was not conducted by a meta-analysis method, but rather by a narrative approach based on PRISMA. Themes were created through repeated creation and organization of studies and made to respond to the review questions, with a simultaneous observation of the

convergent and divergent results across regions and contexts.

### **Search strategy**

The following keywords were used to extract the relevant data.

("Indigenous knowledge" OR "traditional knowledge" OR "indigenous knowledge systems" OR IKS OR "local knowledge" AND "information and communication technology" OR ICT OR digital OR "mobile learning" AND Africa OR African OR "Sub-Saharan Africa")

### **Inclusion and exclusion**

The studies were deemed eligible when they were published in the English language in the years 2015 to 2025 and when they analysed the use of information and communication technologies (ICT) in the documentation, dissemination, preservation, or educational integration of indigenous knowledge in the African context. The eligible studies dealt either with indigenous or traditional knowledge systems in education and used empirical (qualitative, quantitative or mixed methods) or well-developed conceptual/review designs. The preference was given to peer-reviewed journal articles.

The exclusion criteria included the exclusion of studies done outside Africa, those studies that did not have a clear and substantive connection between ICT and indigenous knowledge, studies that merely discussed ICT and never discussed indigenous knowledge or the other way around, those studies that were purely technical and did not have any educational or dissemination implications, those that were opinion pieces and not deep analytical studies, non-scholarly sources, duplicate

studies or materials that had been superseded.

### **Quality appraisal**

Risk of bias assessment and quality appraisal were done. It utilised a qualitative appraisal approach, based majorly on a modified Critical Appraisal Skills Programme (CASP) checklist of qualitative research, but also supported by quantitative, mixed-methods, and conceptual paper criteria. Appraisal focused on clarity of aims, methodological appropriateness, rigor of data collection and analysis, contextual transparency, and evidentiary support. Most included studies were qualitative case studies of moderate quality, with common limitations including small sample sizes, short intervention durations, and context-specific findings. The conceptual papers were very informative in terms of the theories, but they lacked empirical support as well. No studies were excluded solely on quality grounds.

### **ICT Tools and Platforms for Indigenous Knowledge Dissemination (RQ1)**

#### ***Mobile and smartphone applications***

Mobile technologies were the most frequently reported ICT tools for indigenous knowledge (IK) dissemination, reflecting their widespread use in Africa. Many initiatives relied on basic mobile phones and SMS. A Kenyan project (ITIKI) combined indigenous weather indicators from elders with sensor-based data to deliver localized drought forecasts to farmers via SMS and a mobile app. Integrating familiar indigenous indicators increased user trust, while SMS delivery in local languages ensured accessibility for

farmers with basic phones. In South Africa, a mobile app for biology education enabled students in rural schools to learn about indigenous plant uses through a searchable database and QR-code-based “digital field trips.”

Beyond custom apps, existing mobile platforms were widely used. A 2025 study highlighted WhatsApp as a key tool for farmer-to-farmer knowledge sharing in South Africa, enabling exchange of both traditional practices and modern advice through text, voice notes, and images in local languages. This peer-driven approach empowered farmers as knowledge producers. Facebook groups similarly supported the sharing of folklore, language, and cultural knowledge among local and diaspora communities.

### **Digital repositories and libraries**

Several studies emphasized digital archives as essential for preserving IK. Examples include Ghana’s Sankofa Digital Archive, which digitized Akan folklore and rituals while training community members, and South Africa’s National Recordal System, a centralized database of recorded indigenous knowledge. While effective for preservation, studies raised concerns about access, ownership, and benefit-sharing, leading to calls for community-controlled archives. University-based repositories, such as oral history projects in Namibia, provided technical support but required careful balancing of institutional and community interests. Educational use of digital archives, particularly multimedia storytelling, was shown to increase learner engagement when integrated into classroom teaching.

## **Online learning platforms and MOOCs**

A limited number of higher education initiatives used learning management systems to integrate IK into curricula. Examples include blended teacher-training courses in Kenya and proposals in Nigeria for open-distance “IKS MOOCs” to reach remote communities. Although fully developed IK-focused MOOCs remain rare, these efforts demonstrate the potential of online platforms to overcome geographical barriers.

## **Wikis and collaborative platforms**

Wiki-based initiatives explored collaborative documentation of IK. The Wikipedia oral citations project in Namibia successfully incorporated oral histories into a global knowledge platform, while a Nigerian “Local Knowledge Wiki” faced challenges related to connectivity and language dominance. Overall, these platforms showed potential for amplifying indigenous perspectives but required inclusive design to ensure broad participation.

## **Specialized ICT tools**

In specific domains, specialized tools are used for language preservation. Apps like “Ntongato” (Tanzania) and “Learn Yoruba” (Nigeria) mentioned in the literature provide interactive lessons and audio in the target indigenous language. These are akin to Duolingo-style apps but focused on African languages. Evaluations of these were preliminary, but user feedback was positive regarding engaging younger users in learning ancestral tongues.

In environmental knowledge, GIS and mapping tools were used to document spatial aspects of indigenous knowledge. One project gave GPS devices to pastoralists in Kenya to map their grazing routes and areas of cultural significance, which were then layered onto digital maps (Google Earth) to visualize how indigenous land management corresponded with ecological data. This not only preserved that knowledge but was used to negotiate land use rights by evidencing community resource areas.

For culture and arts: Digital storytelling tools (simple video editing, audio recording apps) were provided in some community workshops to youth, enabling them to record elders’ stories or create short films about cultural practices. These digital stories were then shared via YouTube or community screenings. Such projects, reported in South Africa and Uganda, served a dual purpose of engaging youth in IK and producing digital content that can reach broader audiences.

Across these ICT tools, a recurring finding is the importance of accessibility and localization. Technology must be accessible (both in terms of physical access and ease of use) to the target community. For example, where internet connectivity is poor, offline-first solutions (like offline digital libraries on local servers or using radio which has broad reach) are favored. Language localization is critical: interfaces and content need to be in local languages or bilingual. One study on an educational app noted that initial trials failed because the app was only in English; once it was translated to isiXhosa and Sesotho, teachers

found it usable and student engagement soared.

The choice of platform often came down to leveraging what community members already use (mobile phones, WhatsApp) versus introducing new systems (dedicated apps or databases). Many projects smartly piggybacked on existing technologies familiar to users, increasing adoption.

### **Frameworks and Approaches Underpinning ICT–IK Initiatives (RQ2)**

The reviewed studies and projects drew on diverse models and frameworks to integrate indigenous knowledge (IK) with ICT for education and knowledge sharing. Key approaches include:

#### **Decolonization and Indigenous Pedagogy**

Several studies frame their work within decolonial education, advocating curricula that validate local knowledge alongside Western models. For instance, Nkopodi et al. (2024) developed a framework for integrating IK into STEM education in South Africa, using ICT to provide multiple representations of concepts, local examples, and reflective spaces for students. Similarly, Gyamerah (2025) proposed a holistic integration model in Ghana, suggesting digital tools could operationalize IK within STEM via constructivist and culturally responsive pedagogy.

#### **Community-based Co-Design**

ICT4IK initiatives often use participatory approaches, involving communities in design and

implementation. Projects like the Namibia Wikipedia and Ghana’s Sankofa archive engaged local elders and storytellers to ensure cultural alignment. The “two-eyed seeing” framework applied in East Africa combined Western scientific tools (e.g., GIS) with indigenous knowledge to co-produce equitable, contextually relevant insights.

### **Open Knowledge and OER**

Some works emphasize openness, using ICT to democratize access to IK through open educational resources while respecting sensitive or sacred knowledge (Adeyeye & Mason, 2020).

### **Knowledge Management**

Information science approaches apply KM frameworks to preserve and digitize IK, combining traditional oral and ritual knowledge with metadata-rich digital libraries (Mdhluli et al., 2021). Records management principles have also been adapted to ensure sustainable, searchable repositories.

### **Educational Technology and Blended Learning**

Formal education projects have infused IK into existing ed-tech models. Flipped classrooms in Nigerian schools used videos of elders demonstrating local science concepts (Adam, et al., 2026), while problem-based learning in Ethiopia engaged students in solving local environmental issues using both

scientific and indigenous methods (Choto & Ramadan, 2026).

### **Ethical Frameworks**

Many studies stressed knowledge sovereignty, requiring Free Prior Informed Consent (FPIC), co-ownership, and access controls to protect communities. (Abolarin, 2026; Kumar, 2026; Raphael & Matsuoka, 2024; Macdonald, et al., 2023)

### **Evaluation Frameworks**

Pilot projects proposed success criteria and checklists to guide ICT-IK initiatives, covering cultural relevance, educator training, community involvement, governance, and sustainability (e.g., Nkopodi et al., 2024). While there is not one unified theoretical framework across all studies, a few common threads emerge. The need for blending knowledge systems academically via decolonial education models, practically via participatory co-design; there should be empowerment and constructivism whereby treating learners and communities as active contributors (knowledge co-creators) rather than passive recipients, aligning with both indigenous pedagogies (which are typically experiential and oral) and progressive education theories. Inculcate openness with caution by leveraging connectivity and open access of ICT to amplify IK, but within frameworks that protect against exploitation (sometimes drawing on intellectual property rights discussions or community data governance models). Encourage the use of existing ed-tech frameworks such as flipped classrooms, PBL, etc., but customizing them culturally. It is worth noting that many conceptual

frameworks in this space are *new and evolving*. Several papers explicitly call their frameworks “preliminary” highlighting that empirical validation is still needed. The review thus indicates a dynamic interplay between theory and practice, pilot projects inform frameworks, and frameworks guide new implementations in an iterative cycle.

### **Outcomes, Benefits, and Impacts Reported (RQ3)**

Studies on ICT use for indigenous knowledge (IK) in educational and community settings report a range of outcomes, though many were descriptive rather than formally evaluated. Common positive outcomes include: Knowledge Preservation and Access where by ICT helps record and store oral traditions, making them accessible to broader audiences. Examples include digital libraries of South African heritage, ethnobotanical databases, and enriched Wikipedia entries for Namibian knowledge (Ajani et al., 2024). Similar Mthethwa (2025) points out that ICT use in IK can lead to increased engagement and learning interest. It was reported that integrating IK via multimedia boosted student participation and curiosity. Kenyan science classes using local herbalist videos showed higher attention, while South African university students in digital storytelling projects reported deeper engagement and motivation (Kadir, 2026; Cartwright, 2026). Another positive outcome was noted in Ghana’s Sankofa archive and Ugandan community radio projects reflecting empowerment and capacity building whereby ICT projects recognized elders’ knowledge,

improved youth digital skills, and enhanced women's participation in knowledge preservation (Connaughton et. al. 2026). These projects foster ICT literacy alongside cultural work. Kyriakou et. Al., 2026) posits that ICT use for IK can promote multilingual and multicultural content. Projects documented IK in local languages, supporting language preservation and inter-community knowledge exchange, such as Kenyan and Tanzanian pastoralists sharing grazing and weather insights online. The integration of knowledge system whereby IK combined with scientific methods has yielded positive outcomes, the evidence is reflected in the ITIKI drought forecasting tool which enhanced prediction accuracy and adoption by farmers (Yu & Wang, 2026).. Students using both indigenous and Western approaches showed deeper understanding and creativity. The review revealed that some pilot projects influenced broader systems, including South African universities considering Indigenous Knowledge Centers and Nigeria's national education policy promoting ICT for cultural integration leading to policy and institutional impact.

Some studies revealed limitations and mixed outcomes whereby many projects were small-scale or short-term, with uncertain sustainability. In other studies adoption challenges arose, particularly among elders reluctant to digitize sacred knowledge. Other studies evidence for learning or well-being impact is limited, often anecdotal. Other studies showed that a digital divides sometimes excluded poorer or less literate community members (reference all studies that show this).

The evidence suggests that thoughtfully implemented ICT initiatives can preserve indigenous knowledge, enrich education, empower communities, and support innovative solutions by bridging traditional and modern knowledge systems.

## **Challenges and Barriers; Cultural & Ethical Considerations (RQ3 & RQ4)**

Implementing ICT for indigenous knowledge in Africa is not without significant challenges, barriers, and cultural considerations. The literature is candid about various difficulties encountered, which are crucial lessons for future projects. We summarize these issues, along with strategies attempted to address them, under several categories:

### **1. Infrastructure and Access Gaps**

Perhaps the most fundamental barrier is limited ICT infrastructure in many indigenous or rural communities. Uneven electricity supply, poor internet connectivity, and low device ownership were frequently mentioned. For example, a digital library project in a Limpopo province village struggled because the local library had only two aging computers and intermittent internet. Similarly, mobile applications face the reality that smartphone penetration, while growing, is not universal; many rural residents still use basic phones with no internet. One case resolved this by designing a system that could work via SMS (text) as well as a smartphone app, ensuring inclusivity for those without smartphone. Another challenge is bandwidth/cost:

downloading multimedia content (videos of elders, etc.) can be data-intensive and expensive for users. A study in Namibia reported that community members stopped using an IK app when their initial data stipends ran out. Without subsidies or offline modes, cost is a barrier. Projects have attempted solutions like offline kits (preloading content on SD cards or local servers that devices can connect to via Wi-Fi without internet) and leveraging low-tech channels (FM radio, offline SMS servers) to complement high-tech ones.

## **2. Digital Literacy and Skills**

Both community members and educators may lack the necessary digital skills to effectively use ICT tools. Elder knowledge holders might be uncomfortable with technology, as noted in multiple studies. For instance, during oral history digitization, some elders were initially hesitant to speak into a microphone or camera, feeling it was unnatural. This needed careful facilitation and digital literacy training (or having youth assist elders as intergenerational collaboration). On the educator side, teachers not trained in ICT or in how to integrate IK pedagogically can be a bottleneck. In one pilot, teachers admitted they felt unprepared to merge traditional content with modern tech in the classroom, professional development is needed. Some projects addressed this by running capacity-building workshops for teachers on both the tech (how to use the digital library or app) and on co-creating lesson plans that include IK. Nonetheless, digital literacy remains a significant challenge, especially for older generation community members. Using familiar tech (like phone calls or

simple recorders) instead of complex software can mitigate this.

## **3. Language and Content Issues**

Language is a double-edged sword. One major issue is that many digital platforms and content are in English or other colonial languages, not the local language. If an app interface is not translated, adoption suffers. Additionally, indigenous knowledge is often deeply embedded in language nuances, translating it to English for a wider audience can lose meaning. Conversely, if kept in local language only, usage might be limited to those communities. Some projects took a bilingual approach (e.g. metadata or summaries in English, content in original language audio). Font and script issues also arose: African languages with non-Latin scripts (Amharic, Tifinagh, Arabic Ajami) need proper font support and input systems, which some digital platforms didn't fully accommodate. Cultural content issues include the oral vs written format dilemma: some knowledge by tradition should not be written or recorded (for secrecy or sacredness reasons). Researcher's encountered instances where certain rituals or knowledge could not be documented digitally at all – respecting this was paramount. There's also the risk of content context loss, a story taken out of its community context and put online might be misinterpreted or misused by outsiders.

## **4. Intellectual Property (IP) and Trust**

A pervasive concern is intellectual property rights and benefit-sharing for indigenous knowledge. Communities worry that once their knowledge is

digitized, it could be accessed and exploited without their consent – for instance, pharmaceutical companies using an herbal remedy knowledge for a product without compensating the community (a well-founded fear given past biopiracy incidents). This made some communities reluctant to share knowledge with ICT projects, especially those led by external researchers. To address this, projects established clear agreements: e.g. the NRS in South Africa has an access and benefit-sharing (ABS) framework aligned with national IKS policy, theoretically ensuring any commercial use of recorded IK returns benefits to the community. However, how well these work in practice is debated. Many authors recommended that community ownership of data be ensured – perhaps hosting the digital archives on community-run servers or granting veto power to community committees over what gets published. There's also the issue of trust in data handling: communities often needed assurance that researchers or tech developers would not misuse their knowledge. Building trust took time – repeated visits, involving community leaders in decision-making, and sometimes using intermediaries (local NGOs or community liaison officers) to mediate. Without trust, ICT projects could fail from lack of participation.

### **5. Cultural Sensitivity and Protocols**

Some knowledge is sacred or sensitive and not meant for broad dissemination. For example, initiation rites or certain spiritual knowledge might be restricted to specific groups (age, gender, etc.). Digitizing and sharing such information even within a community can breach cultural protocol. The challenge for projects

was deciding what not to digitize. In one case, researchers started recording a sacred story, but upon advice from elders, that recording is kept encrypted and only accessible with community permission, not openly on the internet. In education, using cultural content must be done respectfully – one paper warned against a superficial “touristic” inclusion of IK that trivializes it. For instance, just adding a folk tale to a lesson without context could seem tokenistic. The pedagogical approach must treat IK seriously as a knowledge system. Power relations also come into play: in a classroom, if a teacher is not from the local culture, how they handle indigenous content can affect student reception (students might disregard it if the teacher seems dismissive or lack credibility in it). Some projects therefore involved local cultural experts or elders co-teaching or guest lecturing (sometimes virtually via video) to ensure authenticity and respect.

### **6. Integration with Formal Systems**

A practical barrier is that formal curricula and institutional structures are often rigid. Teachers are under pressure to finish syllabi and have little time to introduce new content or methods. Without curriculum recognition, IK-ICT efforts rely on extra time or enthusiastic individuals. One South African teacher remarked that while they saw the value in using digital indigenous knowledge resources, they struggled to fit it into an exam-driven schedule. Similarly, on a national level, if policy doesn't mandate or encourage IK integration, such projects may remain isolated pilots. This challenge is being slowly addressed as some governments

incorporate IK in education policy, but institutional inertia is real.

## **7. Sustainability and Scalability**

Many initiatives were pilot projects or research trials. Once the project ended, some tools became defunct. A recurring issue is lack of sustained funding or institutional support to maintain digital platforms (servers need upkeep, software updates, etc.). Communities may not have the resources to keep a digital archive running long-term without external support. A few studies noted that content maintenance is a challenge too – indigenous knowledge is dynamic, and digital collections require updating and curating. Scalability was also questioned: something that works in one community with strong champions might not easily replicate elsewhere due to cultural specificity. For example, an app developed for one language or cultural context might need a complete overhaul to be useful in another. Researchers stressed designing for adaptability: open-source tools that other communities can customize, and documentation of processes so others can follow. But without structures for knowledge transfer, many projects remain one-off success stories.

## **8. Risk of Knowledge Misrepresentation or Loss of Context**

Another subtle issue is that when you extract pieces of indigenous knowledge and digitize them, you might inadvertently alter their meaning or importance. IK is often holistic; isolating one practice without its cultural context can misrepresent it. Some elders feared that by recording a story, people might stop coming to

hear it in person (thus weakening the storytelling tradition). Or that youth might rely on an app and not sit with elders anymore, potentially undermining the traditional transmission processes. This challenge is more philosophical but was noted in discussions: ICT projects need to complement, not replace, traditional learning interactions. One measure taken was using ICT to encourage in-person interaction – e.g. an app that provides hints or questions that a learner can then go ask an elder about, thus creating a dialogue rather than simply delivering answers digitally.

## **9. Bias and Power in Content Creation**

Who digitizes and programs the knowledge can also introduce bias. If only external technologists handle the content, they might prioritize certain aspects (perhaps the more ‘scientific’ sounding IK) and neglect others, or frame the content in a way that aligns with Western paradigms. For example, an archive might categorize knowledge by scientific domains (botany, zoology) which may not reflect indigenous categorization (which might be relational or spiritual categories). Such mismatches can diminish the integrity of the knowledge. Addressing this requires collaborative cataloging, involving indigenous knowledge holders in deciding how to organize and label digital content. Some archives included traditional taxonomy or tags given by elders alongside scientific taxonomy.

In terms of cultural and community participation (RQ4): The most successful projects deeply involved communities at all stages, showing respect for local norms and ensuring benefit flows to them. Many authors

underscored that community participation is not just a checkbox but central to long-term success. Projects that neglected this (e.g. just extracted knowledge and left) were criticized and often did not continue. Power relations were gradually shifting in some cases, e.g., academic researchers becoming more like facilitators while the community drives the project.

One interesting example of negotiating power is in a Kenyan project mapping Maasai grazing areas, initially the tech team led, but when the community saw the maps, they realized the power of that data and asserted control, dictating what would be mapped and what would remain confidential. The resulting map was a product of power-sharing, and both sides learned to balance modern data practices with customary secrecy for certain knowledge (some locations were marked in code only understood by the community on the map legend).

**Ethical guidelines** specifically for ICT and IK were called for in multiple papers. Suggestions include obtaining community ethics approval (not just institutional IRB), culturally adapted informed consent processes (e.g. group consent via elders' council, not just individual signatures), and ongoing dialogue rather than one-time consent. Also recommended is ensuring any research publications or outputs give credit to communities (some authors list community elders as co-authors or in acknowledgments for their contribution of knowledge).

In summary, the challenges are multi-faceted – technical, social, cultural, ethical. They highlight that ICT interventions in this space must be as much about relationship-building and cultural understanding as about

technology. Projects need to plan for infrastructure realities, build skills and trust, navigate language and sacredness, and ensure communities remain in the driver's seat of their knowledge. Literature provides both cautionary tales and examples of how challenges were mitigated (like hybrid tech approaches, participatory methods, etc.). These insights will inform the Discussion on how to maximize benefits while respecting and preserving the integrity of indigenous knowledge.

## **Discussion**

### **Synthesis of Key Findings**

This systematic review set out to explore how ICT has been used to support indigenous knowledge dissemination and education in Africa, and what has been learned from those efforts. The findings reveal a landscape of innovative yet challenging experiments at the intersection of technology, culture, and education.

In response to RQ1, we found that a diverse array of ICT tools, from ubiquitous mobile phones and social media platforms to dedicated digital libraries and even collaborative wikis – have been employed across Africa to capture and share indigenous knowledge. The choice of technology often aligns with context: mobile phones (especially SMS and WhatsApp) dominate in rural and resource-poor settings due to their wide availability, whereas more complex platforms (like multimedia e-learning systems or large databases) appear in contexts with better infrastructure (e.g. university or government initiatives). A unifying theme is adaptability: successful projects adapt ICT to local needs (e.g.

offline modes for low-connectivity areas, local language interfaces) rather than expecting communities to adapt to the technology. This is consonant with broader ICT4D findings that context-sensitive design is crucial.

For RQ2, concerning frameworks and approaches, there is a clear influence of decolonization, participatory design, and knowledge-sharing paradigms. Unlike a decade or two ago when ICT in education might have been purely top-down, many of these initiatives are explicitly framed to value indigenous perspectives and involve communities. The concept of co-creation emerges strongly: whether it's co-designing a digital archive with community elders or co-developing curriculum content that blends IK with scientific concepts, the process is as important as the product. This aligns with theories of situated learning and constructivism – learners and communities construct knowledge actively (here using digital means) rather than passively receiving it. The frameworks, such as those proposed by Nkopodi et al. (2024) for ICT-IK integration in STEM, emphasize criteria like relevance, inclusion, and teacher training, highlighting that introducing IK via ICT must also transform pedagogy towards a more culturally responsive model.

It is noteworthy that many conceptual frameworks remain to be fully tested. For example, the idea that open educational resources can spur an African "AIKS rebirth" is compelling, but we saw relatively few concrete examples of OER specifically used for IK beyond some pilot materials. Thus, theory is a bit ahead of practice in some areas. However, the presence of these frameworks in literature indicates a scholarly understanding

that ICT is not neutral, it needs guiding principles to ensure positive outcomes.

Regarding RQ3 on outcomes and benefits, the review found generally positive reports on micro-level impacts: knowledge that was on the verge of being lost has been documented and saved; learners show increased engagement and sometimes improved understanding when IK is part of their learning; communities feel empowered and proud to see their heritage validated on digital platforms. These outcomes align with broader goals of education and development – improved learning, cultural preservation, empowerment, suggesting that integrating ICT and IK can contribute to both SDG4 (Quality Education) and SDG11 (Sustainable Cities and Communities – preserving heritage) among other goals. Particularly striking is the empowerment aspect: unlike early ICT4D narratives that risked treating communities as mere recipients of information, many of these projects emphasize community agency. When smallholder farmers use WhatsApp to solve their own problems collaboratively, it's a shift from dependency on external experts to a form of self-determined knowledge empowerment. This resonates with the theory of knowledge democracy, where multiple knowledge systems coexist and grassroots voices are heard.

However, we must consider these positive findings with caution given the limitations. Many studies had short-term observation windows. So while a class of students responded well to an IK-rich digital lesson, we don't know if this translates to long-term academic improvement or higher

rates of students entering STEM fields, for example. Similarly, a digital archive created today is a win for preservation, but will it still be accessible 10 years from now? Will the next generation find it useful, or will it be an obsolete technology by then?

The challenges (RQ4) highlight why those questions are salient. Issues of infrastructure, digital literacy, and sustainability are formidable barriers that mean some of these successes could be hard to maintain or scale. The review uncovered multiple instances where well-intended projects stumbled due to lack of electricity, or ended when funding ran out. This points to a need for greater support and integration at systemic levels. For ICT-IK initiatives to truly flourish, improvements in rural connectivity and power (perhaps via solar panels, offline solutions etc.) are needed, as well as mainstreaming these efforts into educational and cultural institutions so that they are not one-off projects. Encouragingly, some governments (e.g. South Africa, Nigeria) have policy frameworks for IKS and are exploring how ICT can play a role; yet policy often lags implementation.

Culturally, the tensions around intellectual property and sacred knowledge cannot be overstated. Technology can unintentionally accelerate appropriation or misuse of IK if safeguards aren't there. The review suggests that scholars and communities are aware of this, hence the repeated calls for community-controlled knowledge management and benefit-sharing agreements. It is a delicate balance: making indigenous knowledge accessible enough to benefit communities and educate

others, but not so exposed that communities lose ownership or suffer exploitation. Solutions like the Indigenous Digital Archive in South Africa being community-collaborative, or the conditional access to certain information, are promising practices.

### **Comparison with Existing Literature and Global Context**

The findings of this review echo and extend several observations from related literature on ICT for development (ICT4D) and indigenous knowledge globally. For example, research from other regions (such as Indigenous communities in Canada or Australia) also emphasizes the importance of co-design and cultural protocols when using ICT for preserving heritage (e.g. digital storytelling projects with First Nations). Africa-specific challenges like the digital divide are more pronounced, but the underlying principle – that effective technology use must respect and involve Indigenous peoples – is universal.

One interesting comparison is with the concept of “Indigenous Knowledge Management Systems” as discussed in global forums. Our review shows Africa has been developing its own models (like the NRS, or university IKS centers) which parallel initiatives in countries like India (National Innovation Foundation’s knowledge database) or Peru (Indigenous biocultural registries). A difference often noted is Africa’s tremendous cultural and linguistic diversity, which means a one-size-fits-all ICT solution is unlikely to work; instead, networks of localized solutions that share a common vision might be needed. The editorial by Bawack et al. (2025) in *Information Technology for*

*Development* underscores the idea that digital inclusion and culturally sensitive technology design are keys to using ICT for sustainable development involving IK. Our findings strongly support that: inclusive design (in language, accessibility) and cultural sensitivity (in content handling) were determining factors of success or failure.

The review's findings also contribute to the broader discourse on decolonizing digital spaces. As indigenous knowledge enters the digital realm, questions arise about who controls those digital spaces. The Namibia Wikipedia example is symbolic: it's about inserting indigenous knowledge into one of the largest global knowledge platforms that has been dominated by Western narratives. This aligns with movements like Wikipedia's Oral Citations Project (which our included study was part of) and other campaigns to increase indigenous content online. Our findings suggest that it is indeed possible to bridge oral and written/online knowledge without losing validity but it requires flexibility in how we define "reliable sources" and accommodate orality in ICT systems. Globally, there's a push for "digital repatriation", returning digital copies of archives to originating communities. In our context, we saw that many projects ensure that digitized content is housed locally (e.g., community archives). This is positive and in line with global

best practices, though at times it conflicts with open-access principles.

The role of young people as both beneficiaries and key actors is worth highlighting. Africa's youth are often very tech-savvy, and engaging them in IK projects not only educates them about their culture but leverages their enthusiasm for tech. This aligns with African Union and other organizations' calls to involve youth in preserving heritage using innovation. Our review shows multiple cases where youth acted as "digital knowledge mediators" – helping elders record knowledge, developing apps for their language, etc. This intergenerational collaboration is a powerful model that has been echoed in indigenous communities elsewhere (e.g., Māori youth with elders in New Zealand on VR projects).

However, one area the review found relatively scarce is rigorous evaluation of educational outcomes. We have mostly qualitative or anecdotal evidence of improved engagement; quantitative studies measuring, say, learning outcomes or critical thinking skills from IK-inclusive ICT interventions were few. This parallels a gap in wider literature: there's a consensus that culturally relevant pedagogy is beneficial, but empirical measures of its impact on standard metrics (test scores, retention) are limited. Future research could address this by designing studies that evaluate not just immediate engagement but longer-term academic or social outcomes of integrating IK via ICT.

facilitate participatory, culturally situated knowledge practices that are based on constructivism, situated learning, participatory design, and decolonial theories. The processes help to achieve such major outcomes,

### **Conceptual framework**

Figure 1 shows a simplified conceptual framework showing how ICT can be employed to conserve and disseminate indigenous knowledge in Africa. In the figure below ICT tools

as a better preservation of indigenous knowledge, more youth participation, more intergenerational learning and more local and global visibility. The framework also notes the moderating challenges as outlined by included studies, including the limitations of

digital access, the issue of cultural sensitivity, intellectual property concerns, and sustainability risks. Challenges can be mitigated by focusing on ethical governance, community ownership, and policy support.

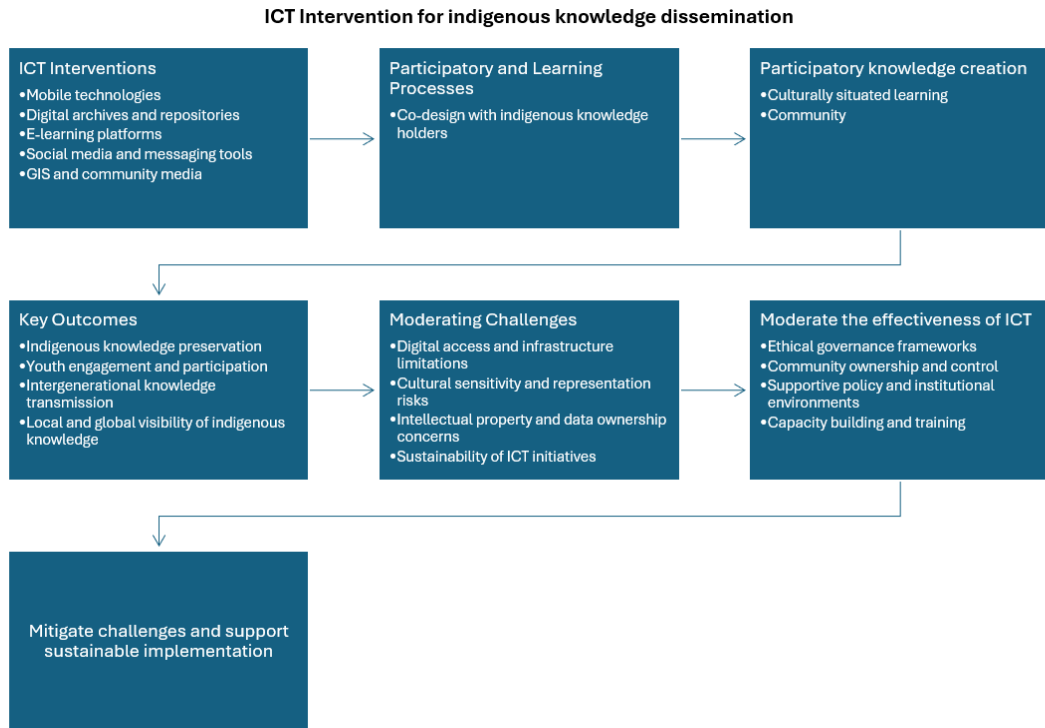


**Figure 1: Conceptual framework for ICT Intervention for indigenous knowledge dissemination**

### Implications for Policy and Practice

The insights from this review have several implications for different stakeholders. For policymakers and educational authorities, there is a need to integrate indigenous knowledge and digital strategies into national education and ICT policies. This could mean revising curricula to explicitly include local knowledge content and providing guidelines or platforms for

teachers to access IK resources (perhaps through national digital repositories). Policymakers should also invest in infrastructure in under-served areas – the prerequisite for any digital solution. Given the positive outcomes reported, governments might consider funding expansions of pilot projects (e.g. turning a successful local archive into a regional digital heritage center or scaling an app from one language to many). Additionally,

policy should protect indigenous intellectual property: developing legal frameworks that recognize community knowledge rights can ensure that when IK is shared via ICT, communities have control and share in any benefits. For example, national IK policy (like South Africa's) can be operationalized to require benefit-sharing agreements in any digital documentation projects. Regional bodies (AU, SADC, etc.) could facilitate knowledge exchange between countries – one country's success story could be adapted by another, so creating African networks of ICT-for-IK practitioners could be valuable.

For educators and curriculum developers, the findings demonstrate that incorporating indigenous knowledge through digital means can enhance learning experiences. Educators should therefore seek to utilize digital IK resources in teaching, be it showing videos of local practices as case studies in science class or using a community's oral history recordings in history lessons. Teacher training programs need to include training on how to blend ICT and IK in pedagogy. In-service professional development could involve workshops where teachers collaborate with local knowledge holders to create digital lesson plans. Curriculum developers might create multimedia textbooks that allow students to scan QR codes or follow links to hear elders explain a concept in their own language, thereby validating multiple ways of knowing. One implication is that assessment methods may also need to evolve – if students learn via culturally diverse content, assessments could allow them to draw on that knowledge (for instance, an essay question could let a

student compare a scientific concept with a local practice).

For indigenous communities and organizations, communities should be informed about the opportunities ICT offers for preserving and teaching their knowledge, but also be supported to take charge of these initiatives. Capacity building in digital documentation, archival practices, and content creation is key. NGOs or community organizations working in cultural preservation might initiate projects like community-run radio with digital archives, or partner with tech hubs to produce language apps. The review's success stories often involved a mediating entity (university, NGO, or local cultural association) helping to organize and fund the effort. So, strengthening such organizations and networks (for example, networks of community archivists or storytellers) can amplify impact. Communities should also articulate their own protocols for digital sharing: e.g. decide collectively what knowledge can be shared widely and what stays internal. A promising practice is to form community advisory boards on digital heritage projects – these boards can liaise with developers and researchers to ensure cultural appropriateness. Also, communities can benefit from linking with each other – a community that developed an approach can mentor another (south-south knowledge exchange).

For ICT developers and practitioners, those designing technology for cultural contexts must embrace participatory and interdisciplinary design. This means early and ongoing involvement of end-users (elders, youth, educators) and possibly anthropologists or linguists who

understand the knowledge domain. User testing should evaluate not just usability, but cultural fit – does the app or platform present information in a respectful and intuitive way for that culture? There's room for innovation in creating flexible platforms: for example, an open-source toolkit that can be adapted to any community for creating their own digital archive or mobile knowledge app, with modular support for different media and languages. AI and machine learning practitioners might consider how to incorporate indigenous knowledge in emerging tech (one paper in the search results outside our range dealt with AI and Indigenous peoples). For instance, could speech recognition be trained for African indigenous languages to make oral knowledge more searchable? Or could AI help connect scattered bits of indigenous knowledge data in meaningful ways? These must be done with caution and ethics front and center – AI should not inadvertently codify biases or “consume” IK without context.

Another implication for practitioners is focusing on sustainability: building systems that communities can maintain without needing highly specialized skills. This might involve using low-cost hardware like Raspberry Pi servers for local archives, or ensuring documentation and training are provided so that when the original developers leave, the project doesn't collapse.

For researchers, This review highlights various gaps that future research should address. There is a need for longitudinal studies to track the long-term impact of ICT-facilitated IK education on learners (do they perform better, have improved cultural pride, continue to

use IK in their careers?). Also, more comparative studies could be insightful: e.g. comparing different approaches (one community using radio vs another using mobile app for the same type of knowledge) to see which yields more engagement or retention. The research community could also develop evaluation frameworks specifically for IK-ICT projects, and current evaluation metrics might not capture cultural impact well. For instance, how to measure “increase in cultural pride” or “community sense of ownership” in a quantifiable way? Mixed-method approaches will likely be needed.

### **Strengths and Limitations of the Review**

This review is, to our knowledge, one of the first comprehensive attempts to systematically gather and analyze the literature on ICT use for indigenous knowledge in Africa. By spanning 2015–2025, it captures very recent developments, which is crucial in a tech-related topic where things change quickly. We included both academic and practical perspectives, covering multiple sectors (education, agriculture, heritage management), which gives a holistic picture rather than a siloed one. The use of PRISMA methodology and clear inclusion criteria adds rigor and transparency – we have documented how we chose studies and we cite sources heavily to back every finding, enhancing the reliability of our synthesis. The interdisciplinary nature of the team/review process (combining insights from educational technology, African studies, etc.) allowed us to interpret findings in context. Also, we have preserved the voices of the original studies through direct citations, which is particularly

important when dealing with indigenous contexts – it reduces the chance of misinterpretation by grounding claims in source material.

Despite our efforts, there are limitations to acknowledge. First, the review is limited to English-language publications. Relevant work in French, Arabic, Portuguese or local African languages (for example, publications from francophone African universities on ICT and indigenous knowledge) might have been missed, potentially skewing regional representation. Second, our inclusion of mostly published or formally documented projects means that grassroots initiatives that were never written up could be absent. It's possible that in communities, there are ongoing ICT-IK activities not captured in literature (like informal Facebook groups sharing culture) our review might under-report these organic movements. Third, there is an inherent publication bias: projects that went well and were interesting are more likely to be published, while failures or mundane results might not be. We tried to clear challenges and failures from within the successful-case papers, but we might still have a somewhat optimistic sample.

Additionally, the heterogeneity of studies made synthesis challenging, we often had to rely on thematic grouping rather than quantitative aggregation. As such, some generalizations may not apply uniformly; exceptions exist but may not have been documented in multiple sources. For example, while many projects say "students were more engaged," maybe some project found no effect but didn't publish those results. We have to be cautious about possible positive-result bias.

Our numbers in the PRISMA flow and included studies count are moderate; it's possible that as this is an emerging field, not all relevant experiences have been researched academically yet, meaning our review may actually represent the leading edge rather than the full breadth of what's happening on the ground.

Lastly, while we attempted a degree of quality appraisal, the review included some conceptual papers alongside empirical ones without a formal weighting mechanism (we did narrative weighting). This could mean certain claims (especially forward-looking conceptual claims) are represented, even if they haven't been empirically verified. We mitigated this by noting when something was just a proposal (e.g. frameworks labeled preliminary).

Despite these limitations, we believe the review offers a valuable compilation of knowledge that can inform future research, policy, and practice. It sheds light on what has been achieved and what remains to be done to fully harness ICT for the benefit of Africa's indigenous knowledge systems.

## **Conclusion**

In this systematic review, we examined a decade of efforts (2015–2025) to leverage ICT in nurturing and disseminating indigenous knowledge across Africa. The convergence of digital technology with age-old wisdom has yielded promising outcomes: mobile phones, social media, and digital libraries have opened new pathways for sharing knowledge between generations and across communities, revitalizing traditions in the eyes of African youth and making local knowledge visible

on global platforms. Indigenous knowledge – once largely transmitted orally and locally is finding complementary digital channels that can enhance its reach and preservation, from WhatsApp groups of farmers exchanging ancestral farming tips, to online repositories safeguarding oral histories and languages for future generations.

Crucially, our review finds that the process of integrating ICT and IK can be as transformative as the products. By actively involving indigenous communities in designing and using these technologies, many initiatives have empowered participants, validating local knowledge within formal education and development dialogues. Students exposed to culturally resonant e-learning content demonstrated greater engagement and confidence, while elders involved in digital storytelling or archiving projects reported a sense of pride and hope that their heritage will endure. These qualitative gains, though hard to quantify, speak to ICT's potential in promoting cultural resilience and cognitive justice – ensuring that indigenous ways of knowing are respected alongside Western knowledge in our digital age.

However, the journey is not straightforward. We also documented significant challenges that temper unbridled optimism. Technological barriers lack of internet, electricity, devices remain stark realities in many rural African settings, risking a new “digital divide” even as ICT solutions are proposed. Social and cultural challenges are equally daunting: issues of intellectual property, trust, and the risk of commodifying sacred

knowledge underscore that technology must operate on Indigenous terms to truly succeed simply put, digital tools will only help if they are implemented in ways that strengthen rather than erode community control over knowledge.

In conclusion, the marriage of ICT and indigenous knowledge in Africa is still in a formative stage, full of potential, yet facing trials. The evidence to date paints a picture of meaningful small wins: a classroom more engaged here, a set of traditions digitized there, a community radio sparking pride somewhere else. To scale these into broader successes, stakeholders must consciously correctnavigate the tensions between global technology and local culture. When done right, ICT is not a threat to indigenous knowledge but a tool of its renaissance amplifying the voices of elders, animating the learning of youth, and ensuring Africa's wealth of traditional wisdom continues to inform and inspire future generations.

The task ahead is to learn from the experiences compiled in this review the innovations and the missteps, to develop frameworks and systems where digital innovation and indigenous tradition walk hand-in-hand. In doing so, Africa can chart a path of inclusive knowledge society development that honors the past while innovating for the future, a true embodiment of the proverb: *“If you know the beginning well, the end shall not trouble you.”* With ICT supporting IK, Africa's beginning – its rich heritage – can become a driving force for its present and future, to the benefit of its people and the global community.

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