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Navigating Barriers: Challenges and Strategies for Adopting Artificial Intelligence in Qualitative Research in Low-Income African Contexts

Kahabi Ganka Isangula[1*]

[1]Aga Khan University, School of Nursing and Midwifery, Dar Es Salaam, Tanzania.

Abstract

Introduction: AI is transforming qualitative research. It enhances efficiency, accuracy, and depth in studies. Technologies like machine learning (ML), natural language processing (NLP), and large language models (LLMs) simplify tasks like transcription, coding, and thematic analysis. However, in low-income African settings, there are barriers to AI adoption. These include ethical concerns, infrastructure limitations, financial constraints, and technical skill gaps. Issues around data privacy and the dehumanization of research also add challenges.

Methods: This paper explores the challenges and opportunities of AI in qualitative research in low-income African contexts. It uses a descriptive approach, reviewing literature and personal experiences from rural African settings. The paper highlights how AI can democratize research, promote multilingual inclusivity, and improve analysis.

Results and Recommendations: To integrate AI effectively, capacity-building, ethical frameworks, infrastructure investments, community engagement, and partnerships are crucial. If these challenges are addressed, AI could empower researchers in low-resource settings. This would lead to more relevant, equitable qualitative studies and help tackle Africa's unique challenges. AI can drive informed decision-making in public health, education, and social cohesion.

Keywords: Artificial intelligence, qualitative research, Africa, low-income Africa, ethical concerns, technical skills, financial accessibility

Introduction

The invention of artificial intelligence (AI) has increasingly revolutionized research methodologies by introducing tools that significantly enhance efficiency, accuracy, and depth. AI integrates technologies such as machine learning (ML), natural language processing (NLP), and neural networks, enabling machines to simulate human intelligence (Shoenbill, Kasturi, & Mendonca, 2023; Huawei Technologies, 2023). These technologies are increasingly adopted in research for automating repetitive tasks, analyzing large datasets, and identifying patterns that might otherwise go unnoticed. In qualitative research, AI has demonstrated profound utility, particularly in theory development, transcription, translation, coding, and thematic analysis (Christou, 2023; Morgan, 2023; Anis & French, 2023; Nashwan & Abukhadijah, 2023; Hitch, 2024), highlighting its transformative and ongoing value.

AI-powered tools have transformative applications in qualitative research, particularly in automating data transcription, enhancing multilingual analysis, and generating comprehensive insights. Delve, Ho, & Limpaecher (2024) highlight how AI speech-to-text technologies streamline transcription of interviews, focus groups, and recorded observations, significantly reducing researchers' time and effort. Additionally, AI supports data analysis through NLP and large language models (LLMs), facilitating efficient coding, thematic analysis, and trend identification in large datasets. Nashwan and Abukhadijah (2023) emphasize the role of LLMs in expediting data processing,

* **Corresponding author:** kahabi.isangula@aku.edu **Tel: +255628333332**

integration, and triangulation, ensuring analytical rigor while managing complex datasets. Moreover, AI enhances multilingual research by processing diverse languages and dialects, a critical capability in linguistically diverse contexts. Hitch (2024) exemplifies this through ChatGPT's utility in augmenting reflexive thematic analysis. AI tools also contribute to generating qualitative insights by synthesizing data from varied sources.

Christou (2023) proposes a framework that leverages the synergy between researchers' cognitive skills and AI capabilities, enabling theory creation and refinement. Collectively, these advancements position AI as a critical tool in advancing the efficiency, depth, and equity of qualitative research.

Qualitative research is indispensable in African contexts for understanding complex social phenomena, addressing public health challenges, and shaping locally tailored policies. For example, qualitative research has been pivotal in studies exploring health-seeking behaviors (Ssemata *et al*., 2024; Lyimo *et al*., 2024), barriers to education (Pallangyo & Isangula, 2023; Adamson & Brown, 2024), and fostering social cohesion (Adetunji *et al.,* 2023). The continent's diverse cultural, linguistic, and socio-economic conditions demand approaches beyond the scope of quantitative methods justifying for the continued need of qualitative research. Traditional qualitative methods are widely used in low-income African settings due to limited access to advanced technologies and skillsets.

For instance, a recent article titled 'manual data coding with MS Word' (Isangula, Kelly & Wamoyi, 2024) highlights the technical and financial constraints faced by researchers in low-income African contexts. However, these methods are time-intensive and resource-demanding. While AI offers promising solutions to enhance efficiency and depth, its adoption in low-income African regions remains constrained by infrastructural, financial, and technical barriers. This paper examines the challenges and opportunities associated with adopting AI in qualitative research within low-income African contexts. The findings aim to support researchers in these settings by highlighting AI's potential as a critical tool for enhancing the efficiency and effectiveness of qualitative research practices.

Methods

This article adopts a descriptive approach, combining personal experiences of conducting qualitative research in rural African settings with a synthesis of existing literature on the applications of AI in research. It places particular emphasis on the relevance of AI to low-income African contexts, drawing on data sources such as personal insights, peer-reviewed journal articles, research institution reports, and case studies.

Results: Trends and Rationale for AI adoption in African contexts

There is a growing interest in the application of AI within African contexts. Nuwer (2024), in her recent article "*Why AI Might Be a Game-Changer for Africa*" published in *Nature*, highlights how researchers across the continent are leveraging AI to design tailored solutions for health, development, and other critical sectors. Numerous scholarly publications and technical briefs have explored the challenges and opportunities associated with AI applications in African contexts (Kiemde & Kora, 2020; Ade-Ibijola & Okonkwo, 2023; Azaroual, 2024; Mienye, Sun & Ileberi, 2024; Falebita & Kok, 2024).

Consequently, the volume of scholarly outputs focusing on the application of AI within African contexts is steadily increasing (Kondo *et al.,* 2023), reflecting a rising interest in leveraging AI to address the continent's unique challenges across various sectors, including health, education, agriculture, and public policy.

Researchers in low-income African contexts are increasingly exploring the application of AI across various disciplines. For instance, a scoping review by Sukums, Mzurikwao, Sabas, et al. (2023)

identified 18 studies in Tanzania utilizing ML and deep learning for disease prediction, diagnosis, and vaccine stock optimization. Similarly, in Uganda, Mirugwe (2024) reported over 38 articles employing statistical learning, machine learning, and deep learning to manage large volumes of healthcare data. Ephraim *et al.* (2024) highlighted the valuable role of AI in enhancing the efficiency and accuracy of medical laboratories across Sub-Saharan Africa. In Tanzania, Isangula and Haule (2024) pioneered the development of a cough audio classifier for diagnosing respiratory diseases, building on extensive Western literature on AI applications in respiratory health. These examples underscore the growing recognition of AI's transformative potential to address low-income Africa-specific challenges in health, resource optimization, and data management, fostering innovative solutions tailored to the continent's unique needs.

The adoption of AI in qualitative research presents a transformative opportunity for addressing longstanding challenges faced by researchers in low-income African contexts. Problems with qualitative research in these settings include the labor-intensive nature of research processes such as data collection, transcription, coding, and analysis. These processes are often constrained by limited human and financial resources, time, technical capacity, and accessibility to advanced tools (Kumwenda *et al.,* 2017; Kassa *et al*., 2024; Isangula, Kelly & Wamoyi, 2024). AI-powered tools can significantly alleviate these challenges by streamlining processes, enhancing accuracy, and opening new avenues for insights.

One of the key advantages of AI in qualitative research lies in its ability to automate transcription, coding and analysis. Speech-to-text technologies, such as those discussed by Delve, Ho, and Limpaecher (2024), can convert recorded interviews and focus groups into written text with remarkable speed and accuracy. This capability not only saves time but also reduces the costs associated with manual transcription services, making qualitative research more feasible in resource-constrained settings. Furthermore, AI tools equipped with NLP and LLMs enable researchers to efficiently analyze textual data, identify themes, and uncover trends within large datasets. Nashwan and Abukhadijah (2023) highlight how LLMs facilitate data integration and triangulation, ensuring analytical rigor and enriching the depth of qualitative insights.

AI also may address the linguistic diversity inherent in African contexts. With over 2,000 languages spoken across the continent, multilingual analysis is often a significant barrier. AI-powered tools could process and analyze data in multiple languages and dialects, enhancing inclusivity and equity in research (Ekuma, 2024). Researchers for whom English is not a first language, can utilize AI-powered tools to refine and correct grammar, ensuring their work meets the linguistic and scientific standards required for academic publications (Figure 1). Tools such as ChatGPT have been emphasized for their role in augmenting thematic analysis across languages, enabling researchers to bridge linguistic divides and produce more representative findings (Hitch, 2024; Jalali & Akhavan, 2024).

Moreover, AI offers opportunities to overcome challenges related to small sample sizes, a common limitation in traditional qualitative research. Tools that synthesize and analyze data from various sources enable researchers to draw robust conclusions despite sample size constraints (Anis & French, 2023). In addition, AI can democratize access to research tools, empowering local researchers with technologies that were previously inaccessible due to financial or infrastructural constraints. This aligns with broader efforts to decolonize research and build local capacities in African academia (Shams, Zowghi, & Bano, 2023; Bali, Garba & Ahmadu, 2024). Overall, the adoption of AI in qualitative research holds immense potential for transforming research practices in low-income African contexts.

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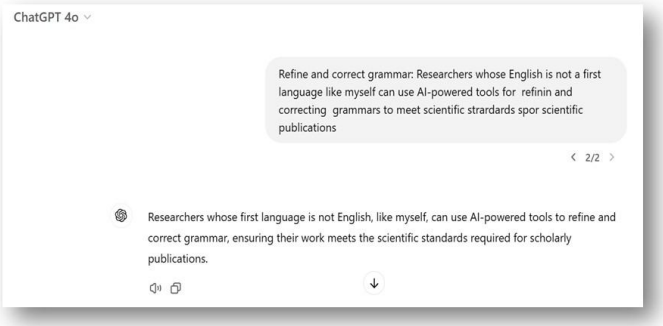
Figure 1



Fears of AI Application in Research

While AI offers transformative potential, its integration into qualitative research has elicited significant fears among researchers, both within and outside African contexts, due to ethical, technical, and societal concerns. Within the ethics realm, key issues revolve around data privacy, confidentiality, and research integrity (Floridi & Cowls, 2019; Akabayashi, Nakazawa, & Ino, 2022; Costa, 2023; Marshall & Naff, 2024). AI tools often require vast amounts of data, increasing the risk of sensitive information being exposed or misused. Consequently, researchers have emphasized the importance of robust data governance frameworks to protect participants' identities and ensure compliance with ethical standards (Floridi & Cowls, 2019).

Additionally, AI-driven analyses may perpetuate biases embedded in training datasets, potentially skewing results and compromising the equity and integrity of research findings (Nashwan & Abukhadijah, 2023). Concerns specific to qualitative research include fears that AI tools could enable researchers to generate entire manuscripts without collecting or analyzing original data, undermining the authenticity and rigor of the research process. Discussions with Tanzanian researchers revealed fears about the misuse of AI to bypass data collection and analysis, with calls for journal editors to implement stricter measures to verify the correctness of submitted manuscripts. A scoping review of AI application in healthcare conducted in Tanzania (Sukums *et al.*, 2023) recommended the development of national AI policies and regulatory frameworks to facilitate the adoption of responsible and ethical AI solutions in the health sector, aligned with the WHO's guidance on the ethics and governance of AI for health.

Within the technical realm, challenges related to limited familiarity with AI in low-income African contexts and the inadequate reliability of AI algorithms persist. Articles on AI applications in Tanzania and Africa highlight a lack of awareness among researchers, policymakers, and community members, perpetuating fears and misconceptions about its use (Sukums *et al.*, 2023; Stuart, 2024; Ponera & Madila, 2024). This has led to repeated calls for capacity-building interventions to enhance understanding and application of AI in these contexts.

While AI-powered tools excel in processing and analyzing large datasets, their accuracy depends heavily on the quality of the underlying data and algorithms. Errors in transcription, coding, or thematic analysis can undermine the validity of research findings (Jalali & Akhavan, 2024; Akhavan & Jalali, 2024). Ensuring the transparency and accountability of AI tools is therefore critical for building

trust in their application, particularly in qualitative research conducted in low-income Africa. Moreover, the 'black box' nature of many AI models—where the internal decision-making processes remain opaque—poses additional challenges (Hassija, Chamola & Mahapatra, 2024). This lack of transparency makes it difficult for researchers to fully understand, explain, or justify the results generated by these tools. Addressing these issues is essential for the responsible integration of AI into research methodologies.

Within the societal realm, fears about the role of AI in qualitative research extend to its impact on human researchers. Some researchers worry that AI-powered tools may overshadow the human contribution in qualitative research, particularly in the interpretation and contextualization of data, thus 'hijacking' the human element crucial for such studies (Akabayashi, Nakazawa, & Ino, 2022) and creating 'over-dependency and reduced critical thinking' among researchers (Stuart, 2024). Furthermore, critics argue that over-reliance on AI could devalue the nuanced, interpretive skills of researchers, shifting the focus from human expertise to machine efficiency (Anis & French, 2023). Relatedly, Hitch (2024) warns of the potential loss of critical reflexivity—a cornerstone of qualitative inquiry—as researchers increasingly shift on delegating analytical tasks to machines. This shift may also exacerbate existing inequalities, as access to advanced AI tools remains limited in low-income African regions, potentially widening the gap between well-resourced and under-resourced research communities. As a result, many advocate for cautious and judicious application of AI in qualitative research, as emphasized by Akabayashi and Nakazawa (2022) and Anis and French (2023).

A substantial body of research and technical reports highlights other critical societal concerns surrounding the adoption of AI in low-income African contexts. One of the foremost issues is the technical skill gap, as many low-income African researchers lack the expertise required to effectively utilize AI tools. This gap is exacerbated by limited training opportunities and the unavailability of user-friendly technologies tailored to local needs (Ade-Ibijola & Okonkwo, 2023; Azaroual, 2024).

The lack of adequate capacity-building initiatives restricts the ability of local researchers to leverage AI effectively in their work. Additionally, the fear of job displacement is a significant concern. Automating tasks traditionally performed by research assistants, such as transcription and data analysis, raises concerns about potential job losses, particularly in communities where employment opportunities are already scarce. Financial barriers further hinder the adoption of AI, as the high costs associated with acquiring, maintaining, and updating AI technologies make them inaccessible to many institutions. These challenges are compounded by infrastructural limitations, including unreliable internet access, frequent power outages, and inadequate computational resources, which pose significant hurdles to the effective deployment of AI tools (Kiemde & Kora, 2020; Ade-Ibijola & Okonkwo, 2023; Azaroual, 2024).

Another critical issue is the lack of cultural and contextual relevance in many AI tools. Designed primarily for global markets, these technologies often fail to consider Africa's unique linguistic and cultural diversity. For instance, many AI systems struggle to process local languages and dialects accurately, limiting their usability in research settings (Ahmed *et al.,* 2023). Researchers have often highlighted the need for AI solutions that are adaptable to Africa's specific cultural and linguistic contexts to ensure equitable and effective integration (Uchechukwu, 2018; Kiemde & Kora, 2020; Ade-Ibijola & Okonkwo, 2023; Azaroual, 2024; Mienye, Sun & Ileberi, 2024; Falebita & Kok, 2024). These challenges suggest that while AI holds considerable promise for advancing qualitative research, its adoption must be approached with caution, particularly in African contexts.

Recommendations for Optimizing AI Use in Low-income Africa

Despite the challenges associated with applying AI in qualitative research, Africa must harness its transformative potential while addressing its limitations. A multifaceted approach to AI integration in

low-income African contexts is essential, combining capacity building, infrastructure development, ethical oversight, and localized innovation. These elements, detailed below, are critical for maximizing the benefits of AI in Africa.

A growing body of research on AI applications across disciplines in African contexts emphasizes the urgent need to enhance AI literacy among researchers, policymakers, and community members (Sukums *et al*., 2023; Ayanwale *et al*., 2024; Ewa, 2024; Mienye, Sun & Ileberi, 2024; Falebita & Kok, 2024). These studies highlight the critical role of training programs and workshops in equipping diverse stakeholders in Africa with the skills necessary to effectively use AI tools.

Consequently, there are overwhelming calls for governments and academic institutions to prioritize capacity-building initiatives as a means of bridging the technical skill gap that continues to hinder AI adoption in African contexts (Ewa, 2024; Mienye, Sun & Ileberi, 2024). Ade-Ibijola and Okonkwo (2023) emphasize the importance of integrating AI training into academic curricula, ensuring that future researchers are prepared to leverage AI's transformative capabilities. Furthermore, Ewa (2024) advocates for introducing AI skills education as early as primary school to cultivate foundational knowledge and foster long-term familiarity with AI technologies. Such initiatives are essential to building a workforce and society that can engage with and benefit from AI innovations in a responsible and impactful way.

Building the capacity of low-income African qualitative researchers to optimize the use of AI requires strong partnerships and collaborations. Collaborations with international organizations, universities, and technology firms can foster knowledge exchange, provide technical support, and reduce associated costs. For instance, partnerships with institutions like UNESCO and global tech companies have demonstrated effectiveness in delivering tailored AI solutions to resource-constrained settings (Azaroual, 2024).

A practical example of such collaboration is a team which is currently partnering with experts from United Kingdom on Medical Research Council-funded grant by proposing an innovation aimed at enhancing respiratory disease diagnostic pathways in rural Tanzania through AI-powered cough analysis. A key aspect of this partnership is the exchange of AI knowledge, which plays a critical role in building local expertise and capacity. These types of collaborations not only facilitate access to advanced AI tools and training resources but also enable researchers to overcome financial and technical barriers, thus paving the way for sustainable and impactful AI integration in qualitative research across Africa. By leveraging such partnerships, African researchers can harness the transformative potential of AI while addressing local challenges in a meaningful way.

Another significant barrier to the adoption of AI in African contexts is the absence of ethical frameworks and guidelines to ensure its responsible use (Kiemde & Kora 2022; Sukums *et al*., 2023; Ayanwale *et al*., 2024; Ewa, 2024; Mienye, Sun & Ileberi, 2024; Ade-Ibijola & Okonkwo, 2023; Azaroual, 2024; Stuart, 2024). The establishment of robust ethical frameworks is widely recommended to safeguard data privacy, promote research integrity, mitigate biases, and respect the cultural values unique to African contexts. These frameworks are crucial for ensuring that AI technologies are applied responsibly and equitably. A critical aspect is building the capacity of African institutional review boards (IRBs) to review and monitor AI-powered research effectively. This includes developing mechanisms to oversee the ethical use of increasingly prevalent web-based AI datasets, which are often used for research purposes (McKay *et al.,* 2023; Bouhouita-Guermech, Gogognon & Bélisle-Pipon, 2023).

Strengthening IRBs can help ensure compliance with ethical standards and the responsible conduct of AI-driven research in low-income Africa. Furthermore, engaging local communities in discussions about data privacy, informed consent, and the societal implications of AI applications is another essential step. Such engagement fosters trust and helps address concerns about how

personal and community data are collected and used (Floridi & Cowls, 2022). Moreover, ethical guidelines must emphasize transparency in AI algorithms, ensuring that their operations are understandable and accountable, thereby preventing misuse and building public confidence in AI systems. Incorporating these recommendations into national and institutional policies will be pivotal in promoting responsible AI use across Africa while addressing the unique ethical challenges posed by technology.

The potential of AI applications cannot be fully realized in low-income African contexts under the current infrastructure limitations. Investing in foundational infrastructure is essential to enable widespread AI adoption, particularly in low-income regions. For instance, many rural areas in Africa face limited connectivity, inadequate power supply, and insufficient computational resources, all of which impede AI deployment and utilization. Expanding affordable internet access, electricity, and digital infrastructure is critical to addressing the systemic barriers that hinder the effective use of AI in these settings (Ade-Ibijola & Okonkwo, 2023; Mienye, Sun & Ileberi, 2024). It is no doubt that improving digital connectivity, particularly in rural and underserved areas, is a prerequisite for scaling AI-driven solutions. Kiemde and Kora (2020) emphasize that enhanced internet penetration not only supports AI adoption but also facilitates access to global knowledge resources and collaborations. Furthermore, initiatives aimed at improving energy infrastructure are vital for ensuring the reliability of AI systems, especially in resource-constrained environments where power outages are common.

In addition to physical infrastructure, investment in digital ecosystems, such as data centers and cloud computing platforms, is necessary to support the computational demands of AI technologies (Azaroual, 2024; Stuart, 2024). Building such infrastructure requires partnerships between governments, private sector actors, and international development organizations to pool resources and expertise. Moreover, fostering innovation through local technology hubs and incubators can enable the creation of context-specific AI solutions tailored to the unique needs of African communities. Supporting local tech startups and encouraging the development of AI solutions designed for low-income African contexts can address unique challenges, such as linguistic diversity and cultural sensitivity.

Local innovation ecosystems can also create sustainable research tools that are more aligned with the continent's socio-economic realities (Hitch, 2024). Ultimately, addressing these infrastructural challenges is foundational for unlocking AI's transformative potential in Africa, empowering researchers, policymakers, and communities to leverage AI for sustainable development. Other suggestions include promoting open-source solutions that offers a crucial pathway for increasing the accessibility of AI tools in low-income African contexts. Encouraging the adoption of open-source AI platforms can significantly reduce costs, making advanced tools more affordable for researchers in resource-constrained settings (Masanja & Mkumbo, 2020; Silva, Coutinho & Costa, 2023; Bali, Garba & Ahmadu, 2024).

These tools also enable customization, allowing researchers to tailor solutions to address specific challenges relevant to their regions. Open-source initiatives empower low-income African researchers to innovate independently while fostering collaboration across disciplines and geographies. Furthermore, financial investment and support for low-income African researchers are indispensable for advancing AI adoption. While there is a growing influx of international funding aimed at fostering disruptive innovations in Africa, it is equally critical for low-income African governments to establish dedicated funding mechanisms. Grants, public-private partnerships, and subsidies for AI-related initiatives can help reduce the financial burden on academic and research institutions (Anis & French, 2023). Strengthening domestic funding structures ensures a sustainable approach to supporting AI innovation within the continent.

Moreover, developing localized AI solutions tailored to low-income African contexts is another vital strategy. These solutions should integrate multilingual capabilities and culturally sensitive algorithms to ensure their relevance and inclusivity (Bali, Garba & Ahmadu, 2024). Engaging local communities in the design and development processes using human design centered approaches can help address unique societal needs and foster trust in AI applications (Nkwo & Orji, 2028; Eke, Chintu, & Wakunuma, 2023; Lazem, Peters & Shipepe, 2024). Incorporating community input ensures that AI tools align with the values, languages, and expectations of their intended users. Finally, creating collaborative networks within African countries is essential for fostering knowledge sharing and pooling resources among researchers. Some African nations are ahead in terms of AI adoption, providing an opportunity for co-learning and capacity building across borders. Platforms that facilitate the exchange of AI-related insights, experiences, and best practices can accelerate innovation and promote equitable growth in AI capabilities (Masanja & Mkumbo, 2020). These collaborative efforts also amplify the voices of African qualitative researchers in global discussions on AI ethics and governance, ensuring their perspectives are represented on the international stage.

Conclusion

AI holds immense potential to revolutionize qualitative research in Africa by addressing longstanding challenges. Automating the labor-intensive research processes, enhancing analytical precision, and enabling multilingual research in low-income African contexts can significantly improve the efficiency and depth of qualitative studies. AI-powered tools, such as automated transcription and NLP, offer opportunities to overcome linguistic diversity, reduce costs, and increase accessibility for researchers. These advancements have the potential to transform the research landscape in low-income Africa, enabling more inclusive and contextually relevant findings.

Realizing this potential requires a strategic and multifaceted approach to address technical, ethical, and societal challenges. Developing robust ethical frameworks, strengthening the capacity of local IRBs, and promoting transparency in AI tools are critical for safeguarding data privacy and ensuring research integrity. Investments in foundational infrastructure, such as reliable internet connectivity, electricity, and computational resources, are equally essential. Additionally, fostering collaborations between governments, academic institutions, and international organizations can enhance resource sharing and reduce costs, while open-source platforms can democratize access to advanced AI tools. Tailoring AI solutions to Africa's cultural and linguistic diversity and involving local communities in their development is crucial to building trust and ensuring relevance. Finally, establishing collaborative networks within the continent can amplify African voices in global AI discussions, fostering innovation and equitable growth. By addressing these challenges, Africa can harness AI's transformative capabilities to advance qualitative research and drive sustainability.

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