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Artificial Intelligence, Language Policy, and the Future of Indigenous Nigerian Languages in Multilingual Nigeria

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Abstract **Review Article**

Artificial intelligence (AI) is transforming the nature of communication, education, governance and the production of knowledge, offering unprecedented opportunities and challenges for multilingual societies. Although AI-based technologies have enabled digital participation for a large number of well-resourced languages, the lack of digital resources, computational infrastructure, and policy support for many indigenous languages puts them on the margins. With more than 500 indigenous languages in Nigeria and English and Nigerian Pidgin, this divide poses important questions of linguistic equity, cultural sustainability, and digital inclusion. This paper explores the relationship between AI, language policy and the future of indigenous Nigerian languages, drawing on the Digital Language Vitality Framework, which highlights the role of digital presence and technological accessibility for the survival of languages, and the AI Ethics Framework, which calls for fairness, inclusivity, transparency, and respect for cultural and linguistic diversity in AI systems. Based on the latest research in language policy, computational linguistics, digital humanities, and artificial intelligence, the paper discusses the potential and limitations of AI in language documentation, language education, machine translation, speech technologies and indigenous knowledge systems. It maintains that while AI holds great promise for revitalization and promotion of indigenous Nigerian languages, such gains will be unevenly distributed if sufficient attention is not paid to the development of language policies, digital language infrastructures, and language datasets, speech corpora, and natural language processing technologies. The paper also argues that the integration of AI governance and inclusive language planning is crucial to safeguarding linguistic rights and promoting equitable digital participation. The document brings to the fore four key pillars: technological innovation, ethical AI development, interdisciplinary collaboration, and language policies that look forward to support the long-term vitality of indigenous Nigerian languages. The paper therefore calls for a broad review of the Nigeria language policy to include the use of artificial intelligence and digital language planning, investment in indigenous language technologies and better inter-agency, university, technology and indigenous language community collaboration to support multilingual development in the digital age in Nigeria.

Keywords: artificial intelligence, language policy, indigenous Nigerian languages, digital language vitality, AI ethics, and digital humanities.

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Introduction

Artificial Intelligence (AI) is one of the most significant technological advancements of the 21st century, revolutionizing communication, education, healthcare, governance, commerce, and knowledge creation. The use of recent advancements in machine

learning, natural language processing (NLP), speech technologies and generative AI has transformed the way people and institutions produce, access, process and share information across languages and cultures (Bommasani et al., 2021; UNESCO, 2024). The advent of Large Language Models (LLMs) has further propelled this change, allowing for multilingual translation, automated transcription, intelligent tutoring systems, conversational agents, and content generation on an unprecedented scale. Although these innovations have offered digital possibilities to many languages, they have also revealed deep disparities in the representation of languages, especially the low-resource and indigenous languages (Bender et al., 2021; Mager et al., 2021; UNESCO, 2025).

Today's AI systems rely on vast amounts of digital resources, such as annotated corpora, lexical databases, speech databases, standard orthographies and multilingual databases. As a result, languages with sufficient computational resources continue to enjoy fast technological development, while thousands of indigenous and minority languages are underrepresented or completely absent from the AI ecosystems (Joshi et al., 2020; Bird, 2020; Nekoto et al., 2022). This expanding digital gap has raised the issue of language endangerment from the intergenerational transmission of language to issues of technological visibility, computational accessibility and digital participation. The vitality of a language in the twenty-first century is not only measured by the number of its speakers but also by its representation in digital environments where communication, education, commerce and governance are increasingly taking place (UNESCO, 2024; Digital Language Diversity Project, 2025).

Nigeria is a country of particular interest for this study since it is one of the most linguistically heterogeneous countries in the world, with more than 500 indigenous languages of which several language families are represented (Eberhard et al., 2024). These languages carry rich collections of oral literature, traditional knowledge systems, ecological knowledge, memory of history and cultural identity. However, there are still huge disparities in Nigeria's linguistic landscape. English remains the dominant language in governance, higher education, science and technology, commerce, and digital communication, and Nigerian Pidgin has been growing as an urban lingua franca. However, numerous indigenous Nigerian languages are underrepresented in formal settings and lack representation in current AI tools. This imbalance is not only a threat to linguistic diversity, but also to the equal opportunity for participation in the growing digital society.

These developments can be explained by the Digital Language Vitality Framework, which states that the vitality of the language in the digital era depends on the ability of the language to operate in digital ecosystems, using suitable computational resources, digital content, language technologies and technological accessibility. This model takes into account digital presence as a key aspect of language survival, in addition to other aspects such as speaker populations and educational policy, which are usually the focus of traditional models of language maintenance. Regardless of the cultural importance or numerical strength of an indigenous language, it is becoming more vulnerable to marginalization when it is not digitally visible.

The AI Ethics Framework also highlights the importance of developing and using AI systems in a way that is fair, transparent, accountable, inclusive, culturally diverse, and respectful of human rights (UNESCO, 2021). In multilingual societies, ethical AI must ensure that the indigenous language communities are not left behind by technological developments due to lack of digital materials or historical inequalities. The framework thus requires the representation of minority languages in AI systems to be balanced and equitable, and the preservation of community control over linguistic data, cultural knowledge and intellectual heritage.

The language policy plays a pivotal role in this discourse. The Nigerian government has been paying attention to indigenous languages since independence, with a number of educational and cultural policies implemented to support them. Federal Republic of Nigeria's (2013) National Policy on Education recommends that the mother tongue or the language of the immediate environment be used

in the early years of primary education and indigenous languages be seen as a means of national integration and cultural preservation. Despite all this, however, implementation has not been uniform due to lack of funding, inadequate teaching materials, limited teacher preparation, lack of political commitment and the continued dominance of English (Bamgbose, 2011). Most importantly, these policies were developed prior to the advent of AI-based communication, and thus offer little guidance on digital language planning, computational linguistics, language datasets, speech technologies, and multilingual AI governance.

The UNESCO, African Union, and United Nations, among others, have increasingly highlighted the need for AI to foster linguistic diversity and not to exacerbate inequalities globally. Their policy frameworks promote inclusive technological innovation that empowers speakers of minority and indigenous languages to meaningfully engage in digital economies and to protect their cultural and linguistic heritage (UNESCO, 2021; UNESCO, 2024; African Union, 2024). The developments indicate that a language policy can no longer be limited to educational planning; it is also a policy for digital language development, AI governance and technological inclusion. While there is plenty of literature on multilingualism, language planning, language endangerment, computational linguistics and artificial intelligence, few studies combine these areas in the context of Nigeria. Past studies have either studied educational language policy without taking into account the emergence of AI technologies or explored computational innovations without adequately addressing their policy implications in the context of multilingual societies. This is especially noticeable in the debates on the potential of AI to transform language policy agendas, digital language rights, and the revitalisation of indigenous languages in Nigeria.

In this context, this paper explores the connection between artificial intelligence, language policy and the future of indigenous Nigerian languages in a multilingual Nigeria. It examines how AI can both present opportunities and pose challenges for the development of indigenous languages, assess the effectiveness of Nigeria's current language policies in addressing technological change, and suggest policy directions that will enable equitable digital participation for all linguistic communities, guided by the Digital Language Vitality Framework and the AI Ethics Framework. The paper concludes that the preservation of Nigeria's linguistic diversity in the digital age demands an intersection of good language policy, ethical AI governance, interdisciplinary cooperation, long-term funding of technology and inclusive digital language planning. The global language ecology is being transformed by Artificial Intelligence.Artificial Intelligence is changing the global language ecology.

Artificial Intelligence has revolutionized the global language ecology—the intricate relationship between languages in social, political, economic, technological and cultural settings—by changing it in fundamental ways. While demographic power, institutional support, educational policy, and socioeconomic power have been the traditional factors that measure the vitality of language, the digital age has added technological representation as a new factor that measures linguistic survival. A language's capacity to engage in digital communication, online learning, e-governance, e-commerce, and AI-based knowledge creation is becoming a key determinant of its future viability. This has resulted in a new aspect of language endangerment, namely digital exclusion, especially for indigenous and low-resource languages.

The advent of artificial intelligence, particularly with the progress in natural language processing (NLP), machine learning, neural machine translation, automatic speech recognition, optical character recognition, and generative AI, has driven this change forward in recent years. Today, foundation models and large language models are capable of complex functions like multilingual translation, automated summarization, conversational interaction, question answering, speech synthesis and intelligent content creation. These have opened up many opportunities for multilingual communication and digital knowledge exchange (Bommasani et al., 2021; Bender et al., 2021; UNESCO, 2024). The technological advances,

however, have also revealed deep disparities, since AI systems are highly dependent on large digital resources such as annotated corpora, bilingual lexicons, speech databases, standardized orthographies, and quality multilingual data.

The unevenness of digital resources has created a technological hierarchy of languages, as many scholars put it. Continuous computational improvement is of benefit to languages with large digital infrastructure and significant commercial investment (English, Mandarin Chinese, Spanish, French, German and Arabic). However, thousands of indigenous and minority languages are historically important, yet remain underrepresented in the computational space (Joshi et al., 2020; Nekoto et al., 2022; Mager et al., 2021). Many researchers are now suggesting that this imbalance is not a language problem, but a historical injustice in how research is funded, how technology is developed and invested in, and how digital infrastructure is built. Therefore, if not handled carefully, AI can perpetuate linguistic inequalities, unless it is designed to be more inclusive of low-resource languages.

These concerns are especially relevant when considering digital presence as a key measure of language vitality in today's society as described in the Digital Language Vitality Framework. Based on this framework, languages that can be used effectively on digital platforms by using machine translation, speech technologies, educational software, digital publishing, and conversational AI have better prospects for long-term sustainability. On the other hand, languages without sufficient computational representation are increasingly put aside as communication, governance, commerce and education increasingly move to the digital world. Digital vitality is not just about the number of speakers or the literacy rate, but also about computational accessibility, online visibility and technological functionality. In this sense, AI is not just a technological advancement but a potent sociolinguistic force that can help to redefine global language hierarchies. Non-English languages not included in AI ecosystems face lower rates of engagement in digital citizenship, online education, health information, financial literacy, knowledge creation in science and culture. This exclusion can speed up language change in younger generations who are growing up in a digital world and using it for their education, work and social interactions.

The AI Ethics Framework also offers a valuable context to these developments. UNESCO's Recommendation on the Ethics of Artificial Intelligence calls for AI to be designed and developed to foster fairness, inclusiveness, transparency, accountability, human rights and cultural diversity, with the least possible amount of discrimination and digital exclusion (UNESCO, 2021). These ethical principles must be applied to multilingual societies, where indigenous language communities must be given fair opportunities to enter into technological innovation. Ethical AI necessitates more than just technical effectiveness; it involves deliberate measures to mitigate algorithmic bias, safeguard indigenous linguistic assets, uphold community control over language data, and curtail the perpetuation of historical inequities through technological progress.

Recent scholarship increasingly reflects two contrasting perspectives regarding AI and linguistic diversity. One perspective views AI as a significant threat to endangered languages because commercial technologies naturally prioritize languages with large digital markets, thereby reinforcing English and other dominant global languages. Another perspective argues that recent advances in multilingual foundation models, transfer learning, open-source language technologies, and community-driven corpus development have created unprecedented opportunities for indigenous language revitalization. Rather than replacing minority languages, AI can facilitate automated transcription, multilingual translation, digital lexicography, speech recognition, pronunciation modelling, intelligent language learning applications, and large-scale documentation of oral traditions. The eventual outcome depends largely on policy choices, institutional investment, interdisciplinary collaboration, and ethical governance rather than on technological innovation alone.

For multilingual countries such as Nigeria, these

debates possess particular urgency. Nigeria's remarkable linguistic diversity represents one of Africa's richest repositories of indigenous knowledge, oral literature, ecological wisdom, and cultural heritage. Yet the overwhelming majority of its indigenous languages remain digitally under-resourced. Most lack standardized computational corpora, extensive digital dictionaries, annotated datasets, speech repositories, and AI-compatible linguistic resources necessary for participation in contemporary language technologies. Without deliberate intervention, this digital invisibility may gradually translate into reduced educational relevance, diminished economic participation, and declining intergenerational transmission.

Nevertheless, AI also presents unprecedented opportunities for reversing these trends. Automated speech recognition can facilitate the documentation of endangered languages through efficient transcription of oral narratives and community archives. Machine translation can improve multilingual communication across education, healthcare, agriculture, governance, and disaster management. Intelligent tutoring systems can support indigenous language learning among younger generations, while generative AI can assist researchers in developing dictionaries, educational materials, annotated corpora, and multilingual digital archives. Collectively, these innovations demonstrate that AI can become a catalyst for linguistic revitalization when supported by inclusive language policies, ethical AI governance, sustainable funding, and meaningful partnerships among governments, universities, technology companies, and indigenous language communities. Ultimately, the future of global linguistic diversity will depend not simply on technological advancement but on whether artificial intelligence is developed as an inclusive public resource that reflects the world's linguistic plurality rather than its historical inequalities. The challenge before policymakers, researchers, and technology developers is therefore to ensure that AI contributes to digital language justice by enabling all languages, including indigenous Nigerian languages—to participate meaningfully in the emerging knowledge society.

Language Policy and Indigenous Languages in Nigeria

Language policy remains one of the most significant instruments through which multilingual societies regulate language use, promote social inclusion, preserve cultural heritage, and facilitate national development. In linguistically diverse countries, language policy extends beyond communication to encompass issues of identity, educational equity, political participation, cultural continuity, economic opportunity, and linguistic rights. As artificial intelligence increasingly mediates communication, education, governance, and knowledge production, language policy must evolve beyond its traditional educational orientation to incorporate digital language development, computational inclusion, and ethical AI governance. Nigeria represents one of the world's most linguistically diverse nations, with over 500 indigenous languages belonging to the Niger-Congo, Afro-Asiatic, and Nilo-Saharan language families (Eberhard et al., 2024). This extraordinary linguistic diversity constitutes one of the country's greatest cultural assets, preserving centuries of oral literature, indigenous philosophies, ecological knowledge, historical memory, and communal identity. However, this diversity also presents significant policy challenges regarding language choice in education, governance, media, technology, and public administration.

Since independence, successive Nigerian governments have acknowledged the importance of indigenous languages in national development. The National Policy on Education (Federal Republic of Nigeria, 2013) advocates the use of the mother tongue or the language of the immediate environment during the early years of schooling and encourages the study of one of Nigeria's major indigenous languages alongside English. These provisions reflect the recognition that multilingualism contributes to national integration, cognitive development, and cultural preservation. Nevertheless, scholars have consistently observed a considerable gap between policy formulation and implementation (Bamgbose, 2011). In practice, English continues to dominate formal education, governance, judicial proceedings, scientific

communication, digital technologies, and socioeconomic mobility, largely because of inadequate funding, insufficient instructional materials, limited teacher preparation, weak political commitment, and societal perceptions that English provides greater economic opportunities.

In recent scholarship, there are two opposing viewpoints about AI and linguistic diversity.There are two conflicting viewpoints in recent scholarship on AI and linguistic diversity. A different perspective sees AI as a major danger to endangered languages as the commercial technologies naturally favour the use of English and other global dominant languages, whilst marginalising other languages. A different view is that recent breakthroughs in the field of multilingual foundation models, transfer learning, open-source language technologies, and corpus construction based on community efforts have enabled unprecedented opportunities for revitalization of indigenous languages. Instead of replacing minority languages, AI can be used to support automatic transcription, multilingual translation, digital lexicography, speech recognition, pronunciation modelling, intelligent language learning applications, and documentation of oral traditions on a large scale. The final result is as much a question of policy decisions, institutional investments, interdisciplinary work, and ethical governance as it is technological innovation.

These debates have special significance for multilingual nations like Nigeria. Nigeria's immense linguistic diversity is one of the richest sources of indigenous knowledge, oral literature, ecological knowledge and cultural heritage in Africa. But most of its native languages are still under-resourced in the digital realm. Most are not equipped with a standardized computational corpus, a large-scale digital dictionary, an annotated corpus, a speech repository or linguistic resources that are suitable for participation in modern language technologies. If left unchecked, this digital invisibility can slowly become a loss of educational relevance, economic engagement, and intergenerational passing.

However, AI also offers unparalleled opportunities to turn these trends around. Automated Speech Recognition (ASR) can be used to efficiently transcribe oral narratives and community archives, thus helping to document endangered languages. Multilingual communication in the field of education, healthcare, agriculture, governance and disaster management can be enhanced with machine translation. Intelligent tutoring systems can help the younger generation learn indigenous languages, and generative AI can be used by researchers to create dictionaries, educational resources, annotated corpora, and multilingual digital archives. Together, these innovations illustrate how AI can be a tool for revitalization of indigenous languages, provided that it is accompanied by inclusive language policies, ethical governance of AI, sustainable funding, and meaningful partnerships between governments, universities, technology companies, and indigenous language communities. The future of linguistic diversity around the world is not only about technology but whether AI is created as an open, public good that is representative of the linguistic diversity of the world, or the legacy of linguistic history. The task for the policy makers, researchers and technology developers is therefore to ensure that AI is part of digital language justice, and that all languages, including indigenous Nigerian languages, are able to meaningfully participate in the emerging knowledge society.

Language Policy and Indigenous Languages in Nigeria.

Language policy continues to be one of the most important tools for the management of language in a multilingual society, for social inclusion, for the continuity of culture, and for national development. Language policy in a linguistically diverse country goes beyond communication to issues of identity, educational equity, political participation, cultural continuity, economic opportunity, and linguistic rights. Language policy needs to shift from its educational focus to include digital language development, computational inclusion and ethical AI governance, as AI becomes more and more a part of communication, education, governance and knowledge production. Nigeria is one of the world's most linguistically diverse countries, with more than 500 indigenous languages, including those from the

Niger-Congo, Afro-Asiatic and Nilo-Saharan language families (Eberhard et al., 2024). This incredible linguistic variety is one of the nation's cultural assets, and is an oral legacy, indigenous philosophies, ecological knowledge, historical memory and communal identity that have been preserved for centuries. This diversity, however, poses great policy problems in the field of language in education, governance, media, technology and public administration.

The Nigerian governments, both pre and post-independence, have recognized the role of indigenous languages in the country's development. The National Policy on Education (Federal Republic of Nigeria, 2013) recommends the use of the mother tongue or language of the immediate environment in the early years of education, and promotes the learning of one of the major indigenous languages of Nigeria in addition to English. The provisions are based on the understanding that multilingualism promotes national integration, cognitive development and the preservation of culture. However, the implementation of the policies has been found to be far from the formulation of the policies (Bamgbose, 2011). In practice, the use of English remains prevalent in formal education, governance, judicial proceedings, scientific communication, use of digital technologies, and socioeconomic mobility, due in part to the lack of funding, insufficient instructional materials, limited teacher preparation, weak political commitment, and societal perceptions that English offers greater economic opportunities.

With the rise of Artificial Intelligence, new aspects of language policy have come into the picture that were not even thought of in the past. The majority of the language policies in Nigeria have been designed prior to the advent of the machine learning, natural language processing, speech technologies and generative AI. They therefore offer little advice on the creation of a digital corpus, computational lexicography, multilingual datasets, speech recognition systems, language digitization, and ethical governance of AI. This policy void is more noticeable as communication and public services are increasingly being transferred to AI-powered platforms, and worryingly, indigenous Nigerian languages are still left out of digital space.

The Digital Language Vitality Framework offers a valuable perspective on these issues. The framework proposes that language survival in the digital era not only relies on intergenerational transmission, but also on the digital features of the language, its technological visibility, its computational readiness and its accessibility on digital platforms. The languages that already have digitized corpora, standardized orthographies, electronic dictionaries, speech databases, and AI-enabled resources are more likely to be able to engage in education, governance, commerce, healthcare, and knowledge production. On the other hand, languages without such digital infrastructures face progressive marginalisation, even if they have a long history or many speakers. This view suggests that language policy needs to go beyond literacy policy to include full-fledged digital language policy.

Digital language planning is a conscious process of government and institutional activities aimed at preparing languages to be used in the creation of meaningful technologies, including corpus development, orthographic standardization, terminology modernization, language digitization, speech-resource creation and natural language processing. The importance of such planning has grown in recent years due to the need for large, high-quality linguistic datasets for machine translation, automatic speech recognition, intelligent tutoring systems, conversational agents, and other AI applications. If these basic resources are not sustained, the indigenous Nigerian languages will continue to be unnoticed in the global AI ecosystem. The AI Ethics Framework also calls for inclusive language policy. UNESCO's Recommendation on the Ethics of Artificial Intelligence (2021) calls for AI systems to be fair, transparent, accountable, culturally diverse, respectful of human rights and inclusive of social inclusion.

When implemented in a multilingual context like Nigeria, the framework suggests that the government should not neglect to ensure that indigenous language communities are not disadvantaged in technological innovations due to historical injustices

or lack of digital media. Ethical AI requires fair representation of indigenous languages in AI applications, and the protection of the community's ownership of linguistic data, traditional knowledge, and cultural heritage.

International experiences show that a proactive language policy has the potential to make a significant contribution to technological inclusion. New Zealand has used AI to revitalise Māori, and Canada has scaled up its digital efforts for Indigenous languages by establishing joint partnerships between governments, universities and community groups. Government investment in Wales has ensured that Welsh is embedded in many digital technologies, while in Finland, the development of corpora and research into language technologies have continued to reinforce digital support for Sámi languages. The examples show that the size of a language community is not the most important factor for successful digital language development, consistent policy commitment, institutional cooperation and long-term investment are more important.

Nigeria has a significant capacity in terms of intellectual and institutional resources to undertake similar programs. Documentation projects have been done in many Nigerian languages by universities, language centres, research institutes, cultural organisations and indigenous communities. These efforts, however, are not coordinated, underfunded and fragmented. A national policy that incorporates language policy, artificial intelligence, computational linguistics, digital humanities, and indigenous knowledge preservation would greatly enhance Nigeria's preparedness for the new AI economy and boost the sustainability of the indigenous languages in the country.

Moreover, language policy should acknowledge the presence of indigenous language speakers as digital citizens whose linguistic rights are not confined to the traditional education context, but also to the virtual space. Government services, health information, legal information, online learning, financial technologies, electoral information, and emergency communications should not be limited to English language skills. AI policies that are inclusive and support multilingual communication would, therefore, enhance democratic participation, social justice and equitable national development.

Finally, the future relevance of Nigeria's language policy will rely on its ability to be proactive in the face of the swift change in technology. AI is not only a technology but also a policy problem that demands a rethinking of traditional multilingual governance. It is important, therefore, that digital language planning, ethical AI governance and computational language development are incorporated into Nigeria's national language policy to ensure the viability of Nigeria's indigenous languages in the 21st century in terms of their technological relevance and visibility.

AI Opportunities for Indigenous Nigerian Languages

This swift development of AI is creating unparalleled opportunities for the preservation, revitalization, and sustainable development of indigenous Nigerian languages. While the fear is that AI tools will inevitably contribute to linguistic uniformity, new tools are now showing how AI can be a great asset in supporting linguistic diversity, as long as it is being used within the context of inclusive language policies and ethical governance. The potential of language documentation, language education, cultural preservation, corpus development and indigenous knowledge management has been enriched by recent advances in natural language processing (NLP), speech technologies, machine translation, generative AI and digital humanities, which were previously unimaginable (Bird, 2020; Nekoto et al., 2022; UNESCO, 2024; Moshagen et al., 2024). AI plays a role in supporting language vitality from the Digital Language Vitality Framework in three ways: increasing digital visibility, computational accessibility, and technological functionality. The languages that can interact with AI-powered systems are more likely to be relevant in education, governance, commerce, healthcare and digital communication. AI, therefore, presents opportunities for indigenous Nigerian languages to be more than just technological tools; it also provides opportunities for social inclusion,

cultural continuity, and sustainable development (UNESCO, 2024; Lewis et al., 2025). The course is dedicated to machine translation and multilingual communication.

A major breakthrough of modern AI has been the tremendous advancement of neural machine translation. Large multilingual language models have recently become more successful in communicating across many languages and with more context sensitivity than previous rule-based systems (Bommasani et al., 2021; Wolf et al., 2020; Pinhanez et al., 2024). While there are still some commercial platforms that support a small number of African languages, recent developments in multilingual foundation models suggest a great potential for extending translation technologies to indigenous Nigerian languages (Nekoto et al., 2022; UNESCO, 2024). AI translation services can help bridge the language barrier between Hausa, Yoruba, Igbo, Ibibio, Anaañ, Efik, Tiv, Kanuri, Nupe, Idoma, Izon, Andoni, Oro, Ikwerre, and numerous other Nigerian languages. The use of such technologies would enable better access to health information, agricultural extension services, electoral information, judicial information, emergency communication, government policies, and financial services to citizens who do not speak English well (UNESCO, 2024; Pinhanez et al., 2024). In addition to enhancing the delivery of public services, multilingual AI translation can foster intercultural communication, national unity, and increase engagement in democratic processes within Nigeria's multilingual society.

Speech Recognition and Speech Technologies

Another breakthrough field of AI innovation is automatic speech recognition (ASR) and text-to-speech (TTS). These technologies can be used to convert spoken language into written text and to generate natural-sounding speech from written materials (Romero et al., 2024). Speech technologies have great potential to enhance the accessibility of indigenous Nigerian languages, particularly in communities where oral communication is still the primary means of communication. Endangered languages can be documented in a faster time using AI-assisted speech recognition, which can automatically transcribe oral interviews, folktales, oral history, traditional songs, praise poetry, and ritual performances (Romero et al., 2024; Moshagen et al., 2024). Similarly, text-to-speech programs can aid in pronunciation learning, literacy, language learning, and accessible education for children and adult learners. Voice-enabled interfaces can also help to improve digital inclusion for people who do not speak English as their native language, as it makes it easier for them to interact with digital services.

Language Documentation and Digital Archiving

Lack of documentation is one of the greatest challenges facing many indigenous Nigerian languages. Many minority languages have very little literature in written form, few dictionaries, little or no grammar description, and little digitized linguistic material. The knowledge and cultural practices of older, fluent speakers are at risk of being lost forever as they continue to die out (UNESCO, 2024). AI offers innovative solutions to solve this challenge. AI-driven transcription tools, handwriting recognition, metadata creation, semantic indexing, and multimedia search capabilities streamline the processing of vast amounts of linguistic data, making this more efficient than manual transcription (Junker, 2024; Pinhanez et al., 2024). AI-driven digital archives can archive folktales, myths, legends, riddles, proverbs, moonlight stories, traditional songs, praise poetry, oral histories, indigenous medicinal knowledge, ecological knowledge and ritual performances. These archives serve to preserve valuable linguistic and cultural resources for future generations, and to enhance research in linguistics, anthropology, history, literature, and digital humanities.

The impact of AI on Indigenous Language education.The role of AI in Indigenous Language education.

AI has a tremendous potential to revolutionize the teaching and learning of indigenous languages in Nigeria. Intelligent tutoring systems can tailor

instruction to the needs of individual learners and offer adaptive exercises for pronunciation, grammar acquisition, words learning, reading comprehension, writing and conversational competence (UNESCO, 2024; Pinhanez et al., 2024). Learner engagement can also be further improved by using gamification, conversational chatbots, speech feedback and interactive storytelling in the context of AI-powered educational applications. Mobile learning platforms are important, as mobile phones are becoming more common in Nigeria. Language-learning applications that use artificial intelligence can motivate younger generations to learn heritage languages outside of the classroom, thus supplementing the formal education system and helping to reinforce language transmission between generations (Moshagen et al., 2024). AI-enabled language laboratories for corpus development, pronunciation analysis, computational linguistics, lexicography and interdisciplinary research in the fields of linguistics, computer science, education and digital humanities are also available at universities.

The preservation of the Oral Literature and Cultural Heritage.

The indigenous languages of Nigeria are a repository of vast oral traditions which hold community memory, values, indigenous philosophies, and historical experiences. Oral traditions such as folktales, myths, legends, praise chants, masquerade performances, riddles, songs, proverbs and oral poetry are important elements of the country's intangible cultural heritage (UNESCO, 2003; UNESCO, 2024). AI provides innovative solutions for protecting these traditions, such as automated transcription, multilingual translation, multimedia indexing, semantic annotation, digital storytelling and searchable cultural databases (Junker, 2024; Pinhanez et al., 2024). Generative AI can also be used to create multilingual children's literature, annotated collections of oral literature, pronunciation guides, dictionaries, and educational materials to help make indigenous cultural knowledge more accessible to younger generations for the purposes of research, education, and cultural organizations.

The course focuses on the principles and practices of sustainable development and Indigenous Knowledge Systems.

Artificial Intelligence offers significant opportunities in addition to language preservation, such as the documentation and dissemination of indigenous knowledge systems within Nigerian languages. Indigenous vocabularies and oral traditions can capture traditional ecological knowledge, indigenous agricultural practices, medicinal knowledge, conflict-resolution mechanisms, environmental conservation strategies, architectural practices, and philosophical concepts (Lewis et al., 2025; UNESCO, 2024). By using AI to assist in documentation, these knowledge systems can be preserved for future studies, learning, policy decisions, and sustainable development efforts.

Opportunities within the AI Ethics Framework

The AI Ethics Framework also highlights the importance of responsible development of AI applications for indigenous languages. To ensure ethical AI, it is crucial to ensure fairness, inclusiveness, transparency, accountability, and meaningful engagement with indigenous communities in data collection, corpus development, system design, and technological deployment (UNESCO, 2021; Lewis et al., 2025; Kwok, 2026). The principles of community ownership of linguistic resources, protection of intellectual property rights, informed consent and respect for cultural heritage are key tenets of AI-assisted language development.

Ethically governed AI also contributes to technological innovation and social justice by giving indigenous language communities a voice in the digital transformation process, not merely a subject. These developments, put together, underscore the need to see the use of artificial intelligence not as an enemy to the indigenous Nigerian languages. Instead, with the support of inclusive language policies, the Digital Language Vitality Framework and the AI Ethics Framework, AI has the potential to be an extraordinary tool for preserving linguistic diversity, revitalizing endangered languages, strengthening indigenous knowledge systems, expanding educational opportunities, and supporting equitable participation in the global digital

knowledge economy (UNESCO, 2024; Kwok, 2026).

Challenges to AI Development for Indigenous Nigerian Languages

However, even with the potential of AI, there are still a number of structural, technological, institutional, economic and policy-related barriers to the meaningful integration of indigenous Nigerian languages into AI ecosystems. While AI can help democratize knowledge production, enhance multilingual communication, and increase digital participation, these benefits are currently limited to high-resource languages that have well-developed computational infrastructures (Joshi et al., 2020; Mager et al., 2021; Nekoto et al., 2022; Bommasani et al., 2021; UNESCO, 2024). As a result, many indigenous Nigerian languages are now marginalized in the new AI systems and this further perpetuates the existing linguistic inequalities instead of minimizing them (Bird, 2020; UNESCO, 2021; Eberhard et al., 2024).

Low-Resource Language Status

The biggest challenge that indigenous Nigerian languages face is being classified as low-resource languages. For the effective training of machine-learning algorithms, contemporary AI systems require vast amounts of digitized texts, annotated corpora, lexical databases, bilingual dictionaries, speech recordings, phonological descriptions, and standardized orthographies (Joshi et al., 2020; Wolf et al., 2020; Bommasani et al., 2021; Mager et al., 2021). Sadly, most of the native languages of Nigeria have few of these computational resources.

Additionally, many languages are not represented in computational terms due to lack of digital data and limited language engineering efforts, including those of UNESCO (2024) and the African Union (2024), which are also minority languages such as Anaañ, Ibibio, Efik, Oro, Andoni, Izon, Ikwerre, Gbagyi, Jukun, Bachama, Tiv, Nupe, and others. This means that commercially viable languages (English, French, Spanish, Mandarin Chinese, Arabic) are more likely to be developed than other languages, resulting in an increasing technological gap between global and indigenous languages (Bender et al., 2021; Mager et al., 2021; UNESCO, 2025). This computational invisibility is a huge blow to language vitality from the point of view of the Digital Language Vitality Framework, where digital participation has become a key measure of language survival. Even though languages have cultural significance, they become increasingly irrelevant in education, governance, trade, digital communication and in the creation of knowledge when they are not included in the technologies of AI (UNESCO, 2024; Lewis et al., 2025).

The lack of adequate Digital Corpora and Language Resources.

Another related low-resource challenge is the lack of large digital corpora and computational language resources. The foundation of NLP is still corpus development, as AI models need to be trained on large, properly annotated datasets for tasks such as machine translation, automatic speech recognition, information retrieval, sentiment analysis, question answering, conversational interaction, and text summarization (Wolf et al., 2020; Bommasani et al., 2021; Joshi et al., 2020; Pinhanez et al., 2024). There is a lot of valuable documentation projects in Nigeria which have been carried out by universities, language centres and individual researchers but they are fragmented, institution specific and poorly funded (Bamgbose, 2011; Bird, 2020; UNESCO, 2024). Very few national repositories of indigenous language corpora, pronunciation databases, multilingual lexicons, electronic dictionaries, speech datasets, and parallel texts exist. This poses a great challenge for AI developers when creating dependable language technologies for Nigerian indigenous languages (Nekoto et al., 2022; Mager et al., 2021; African Union, 2024).

Weak Policy Implementation

Nigeria's language policies acknowledge the importance of indigenous languages in education and national development. But implementation has

always been below policy goals (Bamgbose, 2011; Federal Republic of Nigeria, 2013). Policy frameworks have been developed prior to the advent of large language models, generative AI, and modern NLP tools. As such, they offer limited support in digital language planning, computational linguistics, AI governance, language digitisation and multilingual technological development (UNESCO 2021; UNESCO 2024; African Union 2024). A lack of a national language strategy for AI has led to underinvestment in corpus development, speech technologies, computational lexicography, and digitisation of indigenous languages. Unless intentional government action is taken, Nigeria is likely to further deepen the technological gap between English and indigenous languages and limit equitable digital participation (UNESCO, 2024; OECD, 2024; Lewis et al., 2025).

The availability of funding and digital infrastructure are constrained.

The creation of AI technologies demands ongoing financial investment, high-performance computing infrastructure, cloud computing facilities, broadband internet connection, and specialized technical expertise. Nigeria's universities and research institutes still face serious financial and infrastructure challenges, which hinder their ability to engage in advanced research in computational linguistics (World Bank, 2024; UNESCO, 2023; African Union, 2024). These constraints have an adverse impact on indigenous language research where funding is often directed at marketable technologies rather than towards the preservation of endangered languages. Moreover, the lack of consistent electricity supply, low internet penetration and limited availability of advanced computing facilities still presents a challenge in the collection of large-scale data, speech recording and experimentation with AI in many communities in Nigeria (United Nations, 2015; UNESCO, 2024; World Bank, 2024).

Lack of interdisciplinary expertise.

Collaboration among linguists, computer scientists, software engineers, AI experts, digital humanists, anthropologists, educators, and indigenous language communities is essential for the successful development of indigenous language technologies (Bird, 2020; Bommasani et al., 2021; Nekoto et al., 2022). However, interdisciplinary cooperation in Nigeria is still rather limited. Many linguists have deep expertise in indigenous languages and little computational training, and many AI developers have advanced technical skills and little knowledge of the diversity of languages or orthography development, language documentation, or sociolinguistics. This disciplinary deficit hinders innovation and the creation of culturally relevant applications of AI (Mager et al., 2021; Bird, 2020; UNESCO, 2024). Interdisciplinary programmes that combine linguistics, artificial intelligence, computational linguistics, software engineering and digital humanities are, therefore, needed at the university level to produce a new generation of experts who can contribute to the advancement of indigenous language technologies (African Union, 2024; UNESCO, 2024).

Algorithmic Bias and Linguistic Inequality

One of the most pressing ethical issues of modern AI is algorithmic bias. Machine-learning systems always have traits and biases of the data they are trained on (Bender et al., 2021; UNESCO, 2021; OECD, 2024). However, the majority of LLM's are mainly trained on English and other high-resource languages, making them ineffective in processing indigenous African languages (Joshi et al., 2020; Mager et al., 2021; Nekoto et al., 2022). These biases are evident in incorrect translations, incorrect speech recognition, grammatical errors, semantic errors, cultural inaccuracies, and even missing out on AI services. These shortcomings restrict indigenous language speakers' participation in digital education, e-governance, healthcare communication, financial technologies, scientific research, and online knowledge production (UNESCO, 2021; UNESCO, 2024; Lewis et al., 2025). The AI Ethics Framework thus places a strong focus on fairness, accountability, transparency, inclusiveness, explainability and respect for cultural diversity. Ethical AI is a matter of conscious action to remove algorithmic bias, of

equitable representation of minority languages, and of protecting the ownership of linguistic and cultural resources by the community (UNESCO, 2021; Gebru, 2023; Mitchell et al., 2023; OECD, 2024).

Ethical, Cultural and Intellectual Property Concerns

A new challenge is ownership and governance of indigenous linguistic resources. The demand for large-scale textual and speech corpora is growing among AI developers, as they strive to build multilingual language models.AI developers are increasingly in need of large textual and speech corpora to train multilingual language models. But there are still some indigenous groups that are worried about unauthorized collection, commercialization, and exploitation of their language without proper consultation and benefit sharing (UNESCO, 2021; Lewis et al., 2025; Pinhanez et al., 2024). A number of questions have emerged about informed consent, intellectual property rights, cultural ownership, data sovereignty, benefit-sharing mechanisms, and the protection of indigenous knowledge, which have become key concerns in the current governance of AI (UNESCO, 2021; OECD, 2024; African Union, 2024). To guarantee that technological innovation does not compromise community values and cultural integrity, indigenous communities should be engaged and active participants in corpus development, language documentation, and AI deployment.

Digital Divide and Unequal Access

Last, but not least, general socio-economic disparities persist in access to AI in Nigeria. Many indigenous language communities are severely limited in their capacity to take advantage of AI innovations due to unequal access to electricity, broadband internet, digital devices, technical education, digital literacy, and research funding (United Nations, 2015; UNESCO, 2023; World Bank, 2024; UNESCO, 2024). If structural inequalities are not tackled alongside broader language policy reform, AI could inadvertently exacerbate disparities between urban and rural communities, dominant and minority languages, as well as digitally connected and digitally excluded communities (African Union, 2024; Lewis et al., 2025; UNESCO, 2024).

In general, the hurdles to the development of AI in indigenous Nigerian languages are not only technical, but also institutional, economic, ethical, educational and political. The solutions to these challenges lie in coordinated national policies, sustained investments in computational language resources, enhanced interdisciplinary collaboration, ethical governance of AI, and meaningful partnerships between governments, universities, technology companies, international organizations and indigenous language communities (UNESCO, 2021; UNESCO, 2024; African Union, 2024; OECD, 2024; Lewis et al., 2025). This is a comprehensive strategy that can never be overlooked to ensure that AI is a tool for digital language justice, equitable technological engagement, and the sustainability of Nigeria's indigenous languages.

AI-driven language development in Nigeria: Policy Directions.

To effectively address the fast-evolving landscape of artificial intelligence, Nigeria's language policy and digital development strategies need to be rethought. Indigenous languages need to be valued as digital assets that can enhance innovation, national development, knowledge production and competitiveness, not just as cultural symbols. The digital age has brought new and emerging issues into the language policy discourse, such as the issues of digital language planning, computational linguistics, ethical AI governance, and technological inclusion (UNESCO, 2021; UNESCO, 2024; African Union, 2024; OECD, 2024).

Revising National Language Policy

The Federal Government of Nigeria should conduct a thorough review of the National Policy on Education and other language policies to include AI, digital language planning, NLP and computational language in the national development agenda

(Federal Republic of Nigeria, 2013; Bamgbose, 2011; UNESCO, 2024). Policy changes should clearly define the institutional roles for language digitization, research on AI, corpus development, speech technology, and multilingual digital inclusion. The updated policy should also take into account the digital language rights as a part of linguistic human rights, including the right to access services from the government, healthcare services, legal information, education, and public services in the indigenous language (UNESCO, 2021; Lewis et al., 2025; OECD, 2024).

Creating a National Indigenous Language Digital Resource Centre

Nigeria should create a National Indigenous Language Digital Resource Centre to facilitate the collection, preservation, digitization and computational development of indigenous languages. The Centre should be responsible for corpus development, speech database creation, computational lexicography, terminology modernization, orthographic harmonization, language documentation and digital archiving (Bird, 2020; Nekoto et al., 2022; UNESCO, 2024).

The Centre should collaborate with universities, research institutes, language centres, the National Institute for Nigerian Languages, National Council for Arts and Culture, indigenous communities and technology companies. This cooperation would not only help prevent waste of research resources but also speed up the creation of AI-enabled language resources.

The creation of National Digital Language Corpora.The construction of National Digital Language Corpora.

Quality language data are the backbone of today's AI. Nigeria should, therefore, make it a top priority to create large-scale, open access multilingual corpora reflecting the nation's linguistic diversity. Such corpora should contain literary texts, newspapers, oral narratives, folktales, parliamentary debates, educational texts, legal texts, dictionaries, speech recordings, parallel translations, and conversational corpora (Joshi et al., 2020; Wolf et al., 2020; Bommasani et al., 2021; Mager et al., 2021). The availability of open access computational resources would greatly contribute to research in natural language processing and would incentivize local and global tech firms to create indigenous Nigerian language AI applications (Nekoto et al., 2022; UNESCO, 2024).

Strengthening Interdisciplinary Research and Capacity Building

Collaboration in various fields is essential for artificial intelligence. Therefore, interdisciplinary programmes that combine linguistics, computer science, artificial intelligence, computational linguistics, digital humanities, anthropology, education and software engineering should be established in universities (Bird, 2020; Bommasani et al., 2021; African Union, 2024). Research grants for collaborative projects on language documentation, speech technology, AI translation, conversational agents, digital lexicography, and indigenous language education should also be made available to government agencies. Capacity building activities should encompass post graduate scholarships, international research partnerships and professional development on AI and language technologies (UNESCO, 2024; OECD, 2024).

Promoting Public-Private Partnerships

Private sector technology needs to be a key player in the development of indigenous languages. Technology firms should be incentivized by government grants and support, tax breaks, innovation funds, and public-private partnerships to incorporate Nigerian indigenous languages into machine translation, voice assistants, educational software, search engines, and conversational AI platforms (African Union, 2024; UNESCO, 2024). There is a great need for collaboration between technology firms and academic institutions to foster innovation and ensure that AI systems are not just diverse linguistically but also representative of Nigeria's linguistic diversity, which would help to

reduce global linguistic inequalities (Nekoto et al., 2022; Lewis et al., 2025).

Ethical AI Governance

Any policy for AI needs to be based on strong ethical standards. Nigeria should establish national standards for the ethical collection, storage, processing and deployment of indigenous linguistic data (UNESCO, 2021; OECD, 2024), consistent with the AI Ethics Framework. These guidelines should highlight transparency, accountability, fairness, inclusiveness, informed consent, cultural sensitivity, intellectual property protection and community ownership of linguistic resources. Indigenous language communities and communities of interest should be actively involved in the development of all AI systems, starting from the creation of the AI corpus, language documentation, through to the deployment and evaluation of the AI system, to ensure that the AI system reflects the linguistic reality of the community and is respectful of its cultural values (Gebru, 2023; Mitchell et al., 2023; UNESCO, 2021).

Collaborate with other regions and countries.

Nigeria should further engage with UNESCO, the African Union and international research networks, technology companies and global universities in the field of multilingual AI and low-resource language technologies (UNESCO, 2024; African Union, 2024). These partnerships would allow the exchange of knowledge, technical support, funding, and access to computational resources abroad. Engagement in global AI projects would also help increase the representation of Nigerian indigenous languages in international language technology projects, and increase Africa's contribution to multilingual AI research (Nekoto et al., 2022; Lewis et al., 2025).

Monitoring and Evaluation

The implementation of language policies with the support of AI demands ongoing monitoring and evaluation. Government agencies should be able to measure the development of the corpus, the readiness of the community to use AI, the digitisation of indigenous languages, the impact on education, the inclusion of indigenous language speakers in the digital world, and the technological accessibility of the community within the indigenous language communities (UNESCO, 2024; OECD, 2024). The regular review of policies could facilitate timely adjustments and ensure that the use of technologies has a positive impact on linguistic diversity, social inclusion and sustainable national development.

Recommendations

Taking account of the above discussion, this paper suggests that:

- The Federal Government of Nigeria (FGN), 2013; UNESCO, 2024) should review the National Policy on Education and related language policies comprehensively with the inclusion of artificial intelligence, digital language planning, computational linguistics and multilingual AI governance.
- It is recommended that a National Indigenous Language Digital Resource Centre (NILDRC) is created to facilitate the development of indigenous Nigerian language corpora, speech database, language documentation, computational lexicography, digital archiving, and indigenous language AI research.
- Large, open access corpora, annotated data, pronunciation databases, e-dictionaries, and multilingual language resources are needed for the development of AI systems, and efforts should be made by government agencies, universities, research institutes, and indigenous communities to create these resources.In order to develop AI systems, it is essential to have large, open access corpora, annotated datasets, pronunciation databases, electronic dictionaries, and multilingual language resources, and efforts should be made to create these resources by government agencies, universities, research institutes, and indigenous communities.

- It is recommended that research in the area of natural language processing, computational linguistics, digital humanities, speech technologies and multilingual AI systems for Nigerian indigenous languages be encouraged through increased investment by both the public and private sectors (Bommasani et al., 2021; African Union, 2024).
- To produce a class of specialists who can build indigenous language technologies, it is recommended that Nigerian universities set up interdisciplinary programmes that integrate linguistics, artificial intelligence, computer science, software engineering, and digital humanities. (Bird, 2020; UNESCO, 2024).
- The government should incentivize technology firms to incorporate Nigerian indigenous languages into machine translation solutions, speech recognition software, conversational AI, virtual assistants, and educational technologies, as well as provide grants, innovation funds, and tax breaks for such initiatives (OECD, 2024; Lewis et al., 2025).
- The collection of language data, the development of language corpora, protection of intellectual property, community participation, cultural preservation, transparency, accountability and equitable representation of indigenous languages should be subject to ethical guidelines (UNESCO, 2021; Gebru, 2023).
- Nigeria should increase partnerships with UNESCO, the African Union, international universities, research institutions, and technology firms to foster multilingual AI, digital language integration, and sustainable language development (UNESCO, 2024; African Union, 2024).
- To support the long-term vitality of Nigeria's indigenous languages, continuous monitoring and evaluation mechanisms should be put in place to gauge the country's AI readiness, the process of language digitization, policy implementation, and digital inclusion (OECD, 2024; UNESCO, 2024).

Conclusion

Artificial Intelligence has become one of the most influential technologies of the twenty first century, changing the way people communicate, learn, govern and create knowledge worldwide. The AI revolution is both a promising opportunity and a daunting challenge for multilingual societies like Nigeria. The use of AI-driven technologies for language documentation, multilingual communication, speech recognition, digital archiving, indigenous language education, and knowledge preservation is innovative and can address linguistic inequalities, but if indigenous languages are not integrated into the emerging digital ecosystems, it can also exacerbate linguistic inequalities (Bommasani et al., 2021; Nekoto et al., 2022; UNESCO, 2024).

This paper has suggested that in the era of artificial intelligence, the survival of indigenous Nigerian languages is more and more reliant on their computational accessibility, their digital visibility and the meaningful involvement that they have in AI-powered environments, guided by the Digital Language Vitality Framework. Languages without digital corpora, speech datasets, computational lexicons, and technological infrastructure are likely to be increasingly marginalised, even if they are historically important and culturally rich (Mager et al., 2021; Lewis et al., 2025). In the same way, the AI Ethics Framework shows that technology innovation should go hand in hand with fairness, inclusiveness, transparency, accountability and respect for linguistic and cultural diversity. Ethical AI should involve indigenous communities as active partners in the collection, management and application of linguistic resources, as well as ensuring the protection of intellectual property rights, cultural heritage and data sovereignty (UNESCO, 2021; Gebru, 2023; OECD, 2024).

The study has also shown that Nigeria's current

language policies, while beneficial in supporting multilingual education and cultural identity, need to be significantly revised to meet the challenges of artificial intelligence, computational linguistics, and digital language planning. National policies, digital infrastructure, interdisciplinary research, open access language resources, ethical governance of AI and strategic investments in indigenous language technologies are all essential to ensure sustainable language development in the AI era (Federal Republic of Nigeria, 2013; Bamgbose, 2011; African Union, 2024; UNESCO, 2024).

The fate of Nigeria's indigenous languages will not just be decided by technological innovation but by the policies adopted, institutional investments made, and the partnerships formed in the evolution and application of AI. AI can be a great enabler of Nigeria's linguistic diversity and the revival of endangered languages, the enhancement of indigenous knowledge systems, and equitable access to the global digital knowledge economy, provided it is supported by visionary language policies, adequate funding, interdisciplinary collaboration, and responsible AI governance. Finally, it is important to note that the inclusion of artificial intelligence in language planning is not a choice but a necessity to protect Nigeria's multilingual heritage and ensure the continuity of its indigenous languages in the coming decades, technologically relevant and visible in the international world.

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