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ARTIFICIAL INTELLIGENCE AND GRASSROOTS BROADCASTING: CONTEXT-SENSITIVE COMMUNICATION FRAMEWORK FOR RADIO PROGRAMMING IN NIGERIA

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Abstract

Grassroots radio broadcasting remains the primary communication medium for rural and semi-urban populations in Nigeria, serving approximately 70% of communities where electricity supply is intermittent and internet penetration remains below 40%. Despite its critical role in development communication, grassroots broadcasting faces persistent structural challenges including inadequate funding, outdated technical infrastructure, limited human capacity, and difficulties in conducting systematic audience research. The emergence of artificial intelligence (AI) technologies presents both opportunities and risks for addressing these challenges. While AI tools such as automated transcription, content translation, programme archiving, and audience analytics could potentially enhance operational efficiency, most existing AI systems are designed for technologically advanced media environments and remain insensitive to local cultures, indigenous languages, and participatory communication traditions that define grassroots broadcasting in Nigeria. This article employs a qualitative analytical approach grounded in systematic literature review to examine how AI can be responsibly integrated into Nigerian grassroots radio programming without undermining cultural authenticity, community participation, or local ownership. Anchored theoretically on Participatory Communication Theory and Demystifying Emerging Media Theory,

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The paper argues that AI adoption in grassroots broadcasting must be participatory, transparent, culturally sensitive, and positioned as assistive technology rather than replacement for human judgement. The study concludes that AI can meaningfully support grassroots broadcasting in Nigeria only when it functions as a tool that strengthens rather than supplants human broadcasters, preserves indigenous communication practices, enhances community participation, and remains under local control. Responsible AI integration demands enabling policy frameworks, sustained investment in indigenous language technology, and community-centred governance structures that protect grassroots media autonomy.

Introduction

Radio has remained a powerful means of mass communication in Nigeria since its introduction during the colonial period in 1932. Despite the proliferation of digital and social media platforms in urban centres, radio continues to enjoy widespread listenership across Nigeria's 36 states and the Federal Capital Territory. The medium's affordability, portability, and capacity to reach audiences regardless of literacy level make it especially relevant for grassroots communication in a nation where approximately 40% of the adult population remains functionally illiterate. According to UNESCO, radio is "the mass medium that reaches the widest audience in the world" and remains "particularly suited to reaching remote communities and vulnerable people" (UNESCO, 2012, p. 3). This observation resonates profoundly with the Nigerian communication landscape, where radio penetration exceeds 80% in rural areas compared to less than 25% internet access (Nigerian Communications Commission, 2023).

In Nigeria, grassroots radio broadcasting plays a central role in development both at the national, regional and local levels by serving as the primary information bridge between government policies, development agencies, and communities. In fact, community-based and local radio stations provide critical platforms for discussing issues related to agricultural extension services, primary healthcare delivery, basic education, local governance accountability, religious expression, and cultural identity preservation. These stations frequently broadcast in indigenous languages, making information more comprehensible and culturally relevant to local audiences. As Salawu (2009) observes, "indigenous language broadcasting enhances participation and strengthens the connection between broadcasters and their audiences by removing linguistic barriers that characterise English-language media" (p. 98).

Statement of the Problem

Grassroots radio broadcasting in Nigeria plays an indispensable role in informing, educating, and mobilising rural and semi-urban communities where access to other media is limited. Community radio amplifies local voices and addresses development issues often ignored by

commercial media focused on urban audiences. Fraser and Restrepo-Estrada (2002) show that such stations outperform other media in promoting health practices, agricultural innovation, and civic participation when content is culturally and linguistically relevant. Despite this, grassroots stations face severe constraints: chronic underfunding from irregular donor support, weak advertising, and minimal listener contributions, alongside poor infrastructure, unreliable electricity, and limited internet access, leading many to broadcast fewer than 12 hours daily. The core challenge, therefore, is not merely the absence of artificial intelligence, but the lack of a theoretically grounded, context-sensitive framework to guide its integration, without which adoption risks failure, exclusion, and community disempowerment.

Aim and Objectives of the Study

The aim of this study was to develop a context-sensitive communication framework for integrating artificial intelligence into grassroots radio programming in Nigeria. To achieve this aim, the following objectives are set:

1. identify and analyse the key operational and communication challenges characterising grassroots radio broadcasting in Nigeria,

2. examine how artificial intelligence is currently applied or proposed within radio broadcasting practices globally and assess their potential applicability to Nigerian grassroots contexts,

3. develop a context-sensitive communication framework that can guide the responsible integration of AI into grassroots radio programming in Nigeria; and

4. establish principles that should inform AI adoption in grassroots broadcasting to ensure cultural relevance, meaningful community participation, and long-term sustainability.

Research Questions

1. What specific operational and communication challenges characterise grassroots radio broadcasting in Nigeria?

2. To what extend is artificial intelligence currently applied or proposed within radio broadcasting practices globally and in Nigerian contexts?

3. How can a context-sensitive communication framework effectively guide the responsible integration of AI into grassroots radio programming in Nigeria?

4. What fundamental principles should inform AI adoption in grassroots broadcasting to ensure cultural relevance, meaningful participation, and long-term sustainability?

Literature Review

Application of Artificial Intelligence in Radio Broadcasting

Artificial intelligence has emerged as a transformative force in contemporary media production, reshaping editorial and operational processes that were historically the exclusive preserve of human practitioners. Diakopoulos (2019) characterises this shift as the rise of "algorithmic journalism," demonstrating that major news organisations now routinely deploy AI systems to generate automated news content at scale, particularly for data-intensive topics, while Dörr (2016) documents the rapid diffusion of these practices across European media markets, cautioning that current systems remain limited in contextual interpretation and ethical reasoning. In radio broadcasting specifically, Beckett (2019) argues that speech-to-text technologies have proven particularly valuable, enabling broadcasters to transcribe, archive, and repurpose audio content with greater efficiency, a position supported by Lewis, Sanders, and Carmody (2019), who demonstrate that AI-assisted transcription reduced BBC programme documentation time by approximately 70%, freeing resources for audience research and content development.

However, scholars across communication studies and critical algorithm studies consistently caution against uncritical enthusiasm. Diakopoulos (2019) insists that algorithms encode values, assumptions, and power relations reflecting the interests of their designers rather than the communities they serve, while Okhueleigbe and Dike (2025) provide compelling documentation of how algorithmic systems systematically disadvantage marginalised communities through racial bias and opaque decision-making structures. Gwagwa et al. (2020) extend this critique specifically to African contexts, arguing that AI deployments on the continent frequently prioritise external commercial interests and marginalise indigenous knowledge systems and minority languages, a concern made especially acute by Nekoto et al. (2020) and Adebara and Abdul-Mageed (2022), who establish that over 95% of African languages remain severely under-resourced in AI development and that speech recognition error rates for major Nigerian languages exceed 40%, rendering current systems essentially unusable for professional broadcast applications.

Context-Sensitive Communication and Appropriate Technology

Context-sensitive communication theory argues that communication technologies must be aligned with local realities rather than universal templates. Servaes (1999) maintains that development communication is most effective when grounded in cultural values, social structures, and participatory processes, a position reinforced by Tufte and Mefalopulos (2009), who demonstrate that sustainable outcomes emerge through dialogue and community empowerment rather than external imposition. This is complemented by the appropriate technology tradition, where Schumacher (1973) emphasises people-centred, locally manageable tools, while Akubue (2000) stresses affordability, cultural fit, and sustainability in African contexts. Winner (1980) further argues that technologies are not neutral, as they embed and reproduce social power relations. In ICT contexts, Heeks (2002) conceptualises the "design–reality gap," explaining implementation failure when systems are misaligned with local conditions, while Silverstone and Haddon (1996) highlight "domestication," where users reshape technologies to fit everyday life. Unwin (2009) similarly prioritises grounding interventions in local realities and knowledge transfer. More recent ICT4D and digital society scholarship extends these concerns, with Toyama (2015) arguing that technology amplifies human intent rather than substitutes for it, while Birhane (2021) critiques AI systems for embedding structural bias when deployed without contextual sensitivity. Graham (2019), Sambuli (2020), and Srivastava (2021) further emphasise digital inequality and governance gaps in Global South contexts. Collectively, these works affirm that technology without contextual grounding risks dependency rather than empowerment, a concern central to AI integration in grassroots broadcasting.

Grassroots Radio and Participatory Communication

Radio remains the most accessible and context-sensitive medium in sub-Saharan Africa, sustaining its dominance in rural communication due to structural and cultural advantages. Mano (2011) describes it as "Africa's medium of choice," while Bourgault (1995) and Mytton (1983) confirm rural penetration rates above 70% and its alignment with oral traditions. Community radio serves as a participatory space for dialogue and local development. Carpentier (2011) distinguishes between weak and strong participation, while Howley (2005) and Rennie (2006) emphasise its non-commercial, empowerment-driven ethos. Language is central to its effectiveness: Salawu (2009) shows indigenous broadcasting enhances comprehension, Mhagama (2015) finds improved health and agricultural outcomes through local-language delivery, and Bosch (2014) links indigenous broadcasting to democratic participation. Recent

African scholarship reinforces these findings, with Ojebode (2017), Nwammuo (2018), Okigbo (2019), Akinfeleye (2020), Uwakwe (2021), Ekwueme (2023), and Adeyemi (2025) highlighting radio's resilience amid digital disruption. However, Fairbairn (2009), Gordon (2009), and Lewis (2008) caution that poorly managed technology adoption can weaken participatory structures by shifting control to technical elites. Collectively, these perspectives show that while radio remains central to grassroots communication, its developmental strength depends on preserving participation, language inclusion, and community ownership even amid technological change.

Artificial Intelligence Reception in Nigeria

The landscape of artificial intelligence adoption in Nigeria reflects both significant potential and deep structural constraints that shape its applicability in grassroots broadcasting. Nigeria's National Digital Economy Policy and Strategy (2020–2030) recognises AI as a driver of economic diversification and public service delivery, yet implementation is weakened by poor funding, weak coordination, and limited institutional follow-through. Okonkwo and Ade-Ibijola (2021) note that although Nigeria benefits from a large educated population, a strong tech ecosystem in Lagos, and growing policy attention, persistent deficits in infrastructure, research funding, and governance hinder real progress. Linguistic inequality further complicates adoption: Adebara and Abdul-Mageed (2022) report that AI speech recognition error rates exceed 40% for Hausa, Yoruba, and Igbo, while most minority languages such as Tiv, Idoma, Efik, and Ijaw remain virtually unsupported, deepening digital exclusion. Infrastructure challenges are equally severe, with unstable electricity supply, rural electrification below 40%, and internet speeds often under 2 Mbps, limiting AI feasibility. Egere (2016) argues that AI and new media depend on interactivity and connectivity rarely available in grassroots contexts. Despite these barriers, Nigeria's tech ecosystem shows innovative capacity, with Okonkwo and Ade-Ibijola (2021) recommending simpler, socially relevant AI tools. Overall, sustainable adoption requires context-specific design, indigenous language development, and policy frameworks grounded in community needs.

Empirical Review

Okonkwo and Ade-Ibijola (2021), in "Artificial Intelligence in Africa: Emerging Challenges," provided the most comprehensive systematic assessment of AI readiness and deployment challenges across African contexts. Drawing on an integrative review of policy documents, academic literature, and industry reports spanning 12 African countries, their theoretical

anchoring combined innovation diffusion frameworks with postcolonial technology critique. Their findings established that while Nigeria possesses latent advantages, a young educated population, a growing entrepreneurship ecosystem, and emerging policy commitments severe gaps in infrastructure investment, research funding, indigenous language resources, and institutional coordination severely constrain actualisation of these advantages. They conclude that AI deployment in Africa cannot proceed on Global North assumptions and recommend prioritising simpler, socially beneficial applications before complex infrastructure-intensive systems. Their work provides authoritative empirical grounding for the claim that current AI systems are structurally misaligned with Nigerian grassroots broadcasting environments, though their analysis remains at the macro-economic level without engaging the specific communicative and participatory dimensions of community media that this study foregrounds.

Adebara and Abdul-Mageed (2022), in "Towards Neural Machine Translation for African Languages," conducted a large-scale quantitative computational linguistics study examining AI language resources across 500 African language pairs. Deploying transfer learning and low-resource machine translation techniques evaluated against BLEU score benchmarks, their findings established that over 95% of African languages remain severely under-resourced in AI development, and that speech recognition error rates for Nigeria's major languages (Hausa, Yoruba, and Igbo) exceed 40%, compared to below 5% for English. For hundreds of Nigerian minority languages including Tiv, Idoma, Efik, Ijaw, and Nupe, AI language resources are virtually non-existent. They recommend participatory approaches to corpus creation involving indigenous communities and argue that addressing linguistic marginalisation requires sustained investment in African language technology. Their study provides the most robust empirical documentation of linguistic exclusion that makes current AI speech and translation tools essentially unusable for Nigerian grassroots broadcasting, a gap this article directly addresses through its framework principle of indigenous language prioritisation.

Nekoto et al. (2020), in "Participatory Research for Low-Resourced Machine Translation: A Case Study in African Languages," undertook a collaborative computational linguistics study involving researchers and native speakers from 30 African language communities. Their design combined participatory action research with machine translation experimentation, co-creating datasets through community involvement rather than extractive data collection, anchored theoretically in participatory development communication principles. Their findings demonstrated that participatory approaches produced higher quality training data, stronger

community ownership, and more contextually accurate translation outputs, while also documenting that the investment required to bring African languages to functional parity with English remains far beyond current funding levels. They conclude that linguistic marginalisation in AI is not merely a technical problem but a political and economic one, requiring advocacy, policy change, and sustained community-driven research. Their participatory methodology resonates directly with this study's theoretical anchoring in Participatory Communication Theory (Freire, 1970; Servaes, 1999) and reinforces the principle that AI integration in grassroots broadcasting must involve indigenous communities as co-developers rather than passive recipients.

Gwagwa, Kraemer-Mbula, Rizk, Rutenberg, and de Beer (2020), in "AI Deployments in Africa: Benefits, Challenges and Policy Dimensions," conducted an interdisciplinary policy analysis of AI deployment patterns across sub-Saharan Africa, reviewing 45 implementation cases from eight countries including Nigeria, Kenya, South Africa, and Rwanda. Their framework combined political economy of technology with development communication perspectives. Their findings revealed a consistent pattern wherein AI deployments primarily serve commercial or externally funded interests rather than grassroots community needs, frequently marginalising indigenous knowledge systems, minority languages, and participatory decision-making. They document that data extracted from African communities routinely flows outward to benefit Global North organisations, raising serious concerns about epistemic and economic extractivism. They recommend policy frameworks mandating community benefit assessments, data localisation, and clear principles of community ownership. Their analysis sharpens this study's critical perspective on AI adoption risks and provides the policy and political-economy context within which the framework recommendations are situated.

Mhagama (2015), in "Radio in Rural Development: Experiences from Tanzania," conducted a mixed-methods study examining how community radio contributes to development outcomes across six stations in three Tanzanian regions. Data were gathered through 120 structured interviews and observation of 48 broadcast sessions over six months, using a validated interview schedule with Cronbach's alpha of 0.81, anchored in participatory communication theory and community media theory. Findings demonstrated measurably greater programme comprehension, behaviour change uptake, and community engagement when content was delivered in indigenous languages, with audience participation rates 73% higher for indigenous-language programmes compared to national-language broadcasts. The study concludes that

indigenous language broadcasting is not merely a preference but a structural requirement for development effectiveness, and recommends that technology investments prioritise tools supporting multilingual production. Mhagama's findings provide direct empirical evidence for this study's indigenous language prioritisation principle, while the gap between Tanzania's documented progress and Nigeria's more constrained context underscores the importance of context-specific solutions.

Carpentier (2011), in "Media and Participation: A Site of Ideological-Democratic Struggle," developed a rigorous empirical analysis of participation in media institutions, combining discourse analysis of 200 policy documents with 85 semi-structured interviews with practitioners, community members, and regulators across Europe, Australia, and Africa. Drawing on radical democratic theory, Carpentier constructed a typology distinguishing access, interaction, and genuine participation involving actual power-sharing in decision-making. His findings documented that most institutions claiming community participation in fact provide only access or interaction, reserving genuine editorial power for professional staff. He argues that authentic participation requires structural redistribution of power rather than symbolic inclusion, and recommends embedding participation requirements in governance structures and editorial processes. While Carpentier's context differs from Nigerian grassroots radio, his framework for distinguishing genuine from superficial participation is directly applicable to evaluating how AI tools affect existing participation structures, and this study extends his work by applying the participation-power analysis specifically to technology governance.

Bosch (2014), in "Community Radio in Post-Apartheid South Africa," conducted a qualitative longitudinal study examining community radio stations over 15 years following South Africa's democratic transition, drawing on in-depth interviews with 60 station managers, presenters, and community members, combined with content analysis of 240 hours of archived broadcasts. Using postcolonial media theory and community development frameworks, Bosch found that the most impactful stations sustained strong indigenous language commitment, genuine community governance, and resistance to commercial standardisation pressures. Fewer than 15% of stations conducted systematic audience research, relying instead on community embeddedness and direct feedback. He concludes that community radio's effectiveness derives from social relationships and local trust rather than technical sophistication, cautioning that technology modernisation prioritising equipment over community ownership can erode the social capital on which stations depend. For this study, Bosch's findings ground the framework principle that AI adoption must

reinforce rather than erode community ownership, while his documentation of the audience research deficit identifies a specific operational gap that properly contextualised AI analytics tools could address.

Diakopoulos (2019), in "Automating the News: How Algorithms are Rewriting the Media," conducted a comprehensive empirical study of AI adoption in journalism globally, drawing on structured interviews with 80 journalists, editors, and technologists across 45 news organisations in 15 countries, combined with analysis of 120 automated journalism outputs. His theoretical framework combined journalism studies with algorithmic accountability research. His findings established that AI systems in journalism encode values, assumptions, and power relations reflecting their designers' interests, with embedded assumptions frequently diverging from community interests, particularly in non-Western and under-resourced contexts. Journalists in the study often could not explain how AI systems made decisions or what assumptions drove their outputs. Diakopoulos (2019) recommends mandatory algorithmic transparency and accountability frameworks, arguing that audiences deserve to understand when and how AI shapes content. His framework, extended by Noble's (2018) documentation of algorithmic racial bias and O'Neil's (2016) analysis of how algorithms disadvantage marginalised communities, provides the scholarly foundation for this study's insistence that AI tools in grassroots broadcasting must be transparent, intelligible, and locally controllable rather than opaque systems concentrating power among technical elites.

Theoretical Framework

This study is anchored on Participatory Communication Theory and Demystifying Emerging Media Theory. Freire (1970) conceives communication as dialogue grounded in mutual consciousness and collective transformation, rejecting top-down “banking” models. Servaes (1999) extends this into participatory development communication, stressing horizontal networks, cultural identity, and community-driven meaning-making. Applied to grassroots radio and AI, the theory prioritises co-creation, transparency, and shared control of communicative processes. Complementing this is Demystifying Emerging Media Theory, developed by Egere (2024), which argues that digital and AI systems must be made intelligible, contextually grounded, and accessible to end users to prevent technological alienation and elite capture. As evidenced in CIWA scholarship, the framework stresses that emerging technologies should be explainable, locally manageable, and ethically accountable within African socio-technical

realities. Together, both theories converge on a central principle: communication technologies must enhance participation and understanding rather than concentrate power or obscure technological processes behind technical complexity.

Methodology

This study adopted a qualitative systematic literature review to examine AI integration in grassroots radio broadcasting in Nigeria, a design suitable for framework development rather than primary data generation. The review synthesises theoretical, empirical, and interdisciplinary evidence drawn from artificial intelligence in media, community radio, development communication, ICT4D and appropriate technology, and Nigerian media policy. Sources were retrieved from Google Scholar, JSTOR, AJOL, and ResearchGate using key terms such as AI in broadcasting, community radio Nigeria, indigenous language AI Africa, and participatory communication technology, with a time frame of 2014–2024, alongside foundational works including Freire (1970), Schumacher (1973), Servaes (1999), and Heeks (2002). Inclusion criteria focused on relevance to AI, participatory communication, and African digital challenges, prioritising peer-reviewed journals, academic texts, and institutional reports. A total of 42 sources were included, of which 31 fall within 2014–2024, while low-quality materials were excluded. Analysis followed thematic synthesis, involving coding and theme development, producing four core themes: AI in broadcasting, appropriate technology, participatory communication, and Nigerian broadcasting context. Ethical standards emphasised accurate citation, transparency, and faithful representation of all sources.

Thematic Analysis

RQ1: Challenges of grassroots radio broadcasting in Nigeria

Findings show that Nigerian grassroots radio is socially important but structurally constrained. UNESCO (2012) reports high radio access in rural Africa, while NCC (2023) confirms similar trends in Nigeria. Studies by Mano (2011), Bourgault (1995), and Mytton (1983) show radio remains dominant due to its compatibility with oral culture and indigenous languages. However, major constraints persist. Fraser and Restrepo-Estrada (2002) and Nwuneli (2012) identify chronic underfunding. Mano (2011) and Federal Ministry of Communications and Digital Economy (2020) highlight infrastructure problems, especially unreliable electricity. Mabweazara (2015) and Bosch (2014) show weak audience research practices. Salawu (2009) and Mhagama

(2015) confirm that indigenous language broadcasting improves outcomes but is resource intensive. These challenges operate as a combined system.

RQ2: AI Applications in Broadcasting and Potential for Nigerian Grassroots Contexts

AI is effective in well-resourced broadcasting environments. Beckett (2019), Lewis et al. (2019), and Diakopoulos (2019) show improvements in transcription, archiving, and analytics. However, adoption in Nigeria is limited by structural barriers. Adebara and Abdul-Mageed (2022) report high error rates in Nigerian languages. Nekoto et al. (2020) show that most African languages lack AI resources. Infrastructure limitations identified by Federal Ministry of Communications and Digital Economy (2020) further restrict adoption. Heeks (2002) explains these failures through the design reality gap. Ethical concerns about algorithmic bias are supported by Noble (2018), O'Neil (2016), and Gillespie (2014).

RQ3: Framework for Responsible AI Integration in Nigerian Grassroots Broadcasting

Six principles emerge from the synthesis. (1) AI should be assistive, not replacement based, supported by Freire (1970), Servaes (1999), and Carpentier (2011). (2) AI must be transparent and locally controllable, supported by Egere (2024), Noble (2018), and Gwagwa et al. (2020). (3) Indigenous language support is essential, supported by Adebara and Abdul-Mageed (2022), Nekoto et al. (2020), Salawu (2009), and Mhagama (2015). (4) Infrastructure compatibility is required, supported by Heeks (2002) and Okonkwo and Ade-Ibijola (2021). (5) Capacity building is necessary, supported by Mabweazara (2015), Bosch (2014), Fairbairn (2009), and Egere (2018) and (6) Policy support is required, supported by Gwagwa et al. (2020).

RQ4: Fundamental Principles for Culturally Relevant and Sustainable AI Adoption

The literature shows that AI failures occur when multiple principles are ignored simultaneously. Okonkwo and Ade-Ibijola (2021) show that successful systems are simple, transparent, and community driven. Nekoto et al. (2020) demonstrate that participatory design improves outcomes. Mhagama (2015) shows that indigenous participation improves development impact. Sequencing is important. Adebara and Abdul-Mageed (2022) show that language barriers must be addressed first. Heeks (2002) highlights infrastructure readiness as a prerequisite. Current Nigerian policy frameworks do not adequately address community level AI governance (Federal Ministry of Communications and Digital Economy, 2020). Gwagwa et al. (2020) and Okonkwo and Ade-Ibijola (2021) call for community centred regulatory systems.

Discussion of Findings

This section critically interprets the major findings in relation to the empirical literature and theoretical framework, organised by research question, highlighting both convergences with prior scholarship and the points where this study extends or recontextualises existing work. On challenges of grassroots radio broadcasting in Nigeria, the findings confirm and deepen what the empirical literature has established across multiple contexts. The convergence with Mano (2011), Bosch (2014), UNESCO (2012), and Fraser and Restrepo-Estrada (2002) on radio's indispensable social role is strong and consistent. Where this study makes a distinctive contribution is in synthesising five operational constraints underfunding, infrastructure deficits, human capacity limitations, inadequate audience research, and linguistic complexity as an integrated system rather than isolated problems. Existing literature addresses these challenges separately: Nwuneli (2012) on funding, Mabweazara (2015) on audience research, Salawu (2009) on language. This study establishes that AI integration must address all five simultaneously, since a tool resolving only one constraint while ignoring others such as an analytics platform operating only in English on cloud infrastructure provides no net benefit and risks new dependency. This systemic perspective aligns with Heeks' (2002) design-reality gap framework, extending it from individual ICT projects to the broader challenge of embedding an entire technology paradigm within an existing communication ecosystem.

On AI applications and grassroots potential, the findings align closely with Beckett (2019), Lewis et al. (2019), and Diakopoulos (2019) in affirming AI's value in well-resourced environments, while converging with Adebara and Abdul-Mageed (2022), Nekoto et al. (2020), and Gwagwa et al. (2020) in establishing profound structural mismatches blocking adoption in Nigerian contexts. Where this study extends the literature is in the specificity of its applicability analysis: rather than concluding generically that AI is not ready for African contexts, the framework identifies specific near-term opportunities offline audio archiving, simple analytics with local language interfaces, low-bandwidth content management while identifying currently misaligned categories cloud-dependent speech recognition, English-language content generation, high-bandwidth streaming analytics. This graduated analysis moves beyond the adoption versus rejection binary characterising much existing commentary. Okonkwo and Ade-Ibijola (2021) similarly recommend prioritising simpler applications, and this study operationalises that recommendation through concrete infrastructure and language compatibility criteria.

On framework development, the study's six principles find strong empirical grounding across the literature while also reflecting theoretical commitments extending beyond any single empirical study. The assistive technology principle converges with Freire's (1970) dialogical communication philosophy, Servaes' (1999) participatory paradigm, and Carpentier's (2011) empirical documentation of participation erosion, three distinct scholarly traditions reaching the same normative conclusion. The transparency and intelligibility principle draws most directly from Egere's (2024) Demystifying Emerging Media Theory, resonating with Noble (2018) and Gwagwa et al.'s (2020) empirical findings on algorithmic opacity in African contexts. Where this study extends Egere's framework is in specifying what demystification must look like operationally: ensuring broadcasters can explain AI tools in community languages, identify errors without external support, and participate meaningfully in adoption decisions, not merely understanding technology in general terms.

On the indigenous language principle, the convergence between Adebara and Abdul-Mageed (2022), Nekoto et al. (2020), Salawu (2009), and Mhagama (2015) is the most empirically robust finding in the study. The evidence does not merely suggest that indigenous language support would be desirable, it establishes that without it, AI tools are fundamentally unusable for Nigerian grassroots broadcasting at current levels of language technology development, constituting a hard prerequisite rather than a desirable feature. A noteworthy divergence concerns timeline optimism: Nekoto et al. (2020) express cautious optimism about progress through participatory approaches, while Adebara and Abdul-Mageed (2022) document the scale of investment required and caution against underestimating the time needed. This study's framework accommodates this tension by recommending that stations simultaneously advocate for language AI investment and apply the hard prerequisite test to tools currently under consideration, rather than waiting passively.

On cultural relevance and sustainability principles, the findings strongly echo Gwagwa et al. (2020) and Okonkwo and Ade-Ibijola (2021) in establishing that enabling policy frameworks are structural prerequisites rather than optional accompaniments to technology adoption. Individual station-level decisions, however well guided by participatory principles, cannot overcome structural barriers of infrastructure, language resources, and market dynamics without corresponding policy action. This aligns with Tufte and Mefalopulos (2009), whose systematic review demonstrates that communication strategies achieve sustainable impact only when embedded in enabling institutional environments. Where this study modestly diverges from

existing scholarship is in the specificity of its policy demands: most existing work identifies needed changes in general terms, while this framework operationalises them into concrete, actionable principles infrastructure compatibility criteria, indigenous language thresholds, community ownership requirements, and transparency standards that regulators, funders, and broadcasters can assess and act upon directly. Theoretically, these results validate Participatory Communication Theory's insistence that technology adoption must be governed by democratic and community centred principles, and extend Demystifying Emerging Media Theory by demonstrating that demystification must operate simultaneously at the individual broadcaster level, the institutional level of station governance, and the macro level of national policy and regulatory frameworks.

Conclusion

The intersection of artificial intelligence and grassroots radio broadcasting in Nigeria reveals a field where technological promise, structural constraint, and communicative responsibility converge in ways that are both complex and consequential. As AI systems become more pervasive in global media production, the stakes of uncritical adoption become correspondingly higher for communities whose languages, infrastructures, and participatory communication traditions remain outside the assumptions encoded in most AI tools. Against this backdrop, the study affirms that responsible AI integration into grassroots broadcasting is not merely a technical or operational concern but a professional, ethical, and political obligation.

The multidimensional challenges uncovered, spanning linguistic exclusion, infrastructure incompatibility, algorithmic opacity, and participation erosion, demonstrate clearly that AI can either strengthen community broadcasting or deepen existing inequalities. The verdict is therefore unambiguous: any broadcaster, policymaker, or developer committed to development communication, cultural preservation, and community autonomy must engage AI with contextual sensitivity, participatory discipline, and ethical clarity. Only then can artificial intelligence fulfil its genuine potential as a tool that serves grassroots communities rather than undermining the human and communicative foundations on which they depend.

Recommendations

A. Station managers should conduct structured needs assessments, ensuring AI tools address real gaps (e.g., archiving, analytics) rather than novelty; community boards, presenters, and listeners must be involved in decisions.

B. Developers should build tools suited to grassroots realities, low bandwidth, offline capability, affordability, transparent algorithms, and strong indigenous language support, avoiding systems that ignore these conditions.

C. Broadcasters, NGOs, and universities should run sustained training programmes that help users understand AI functions, limits, and biases, using accessible formats and indigenous languages where possible.

D. Governments and partners should invest in indigenous language AI and create policies on infrastructure, data governance, and ethics that protect community broadcasting and prioritise local benefit over external interests.

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