Journal of Frontiers in Multidisciplinary Research

Advancing Artificial Intelligence Readiness by Bridging the AI Divide through Digital Literacy, Digital Inclusion, Workforce Development, and Community Digital Resilience across Rural and Underserved Communities

Chinazam Felicia Okorie
Strategic Learning Specialist, Program Performance and Quality (PaQ) Unit, Mercy Corps Nigeria, Nigeria

* Corresponding Author: **Chinazam Felicia Okorie**

Article Info

E-ISSN: 3050-9726
P-ISSN: 3050-9718
Impact Factor (RSIF): 8.10
Volume: 05
Issue: 02
July - December 2024
Received: 07-05-2024
Accepted: 05-06-2024
Published: 03-07-2024
Page No: 154-169

Abstract
Artificial Intelligence (AI) is increasingly transforming education, healthcare, agriculture, business, governance, and public service delivery across the world. However, the benefits of AI remain unevenly distributed because of persistent inequalities in digital infrastructure, digital literacy, internet access, workforce preparedness, and institutional capacity. The study adopted a qualitative multiple-case study research design to obtain an in-depth understanding of stakeholders' experiences, perceptions, and recommendations regarding AI readiness. Purposive sampling was employed to select participants from government institutions, educational institutions, ICT organizations, community leadership structures, civil society organizations, and digital development initiatives. Data were collected through semi-structured interviews and documentary analysis of national digital economy policies, AI strategy documents, and reports published by international organizations. The collected data were analyzed using Braun and Clarke's thematic analysis framework to identify recurring patterns and themes relevant to the research objectives. The study found that AI readiness extends beyond technological infrastructure and depends largely on the interaction among digital literacy, digital inclusion, workforce development, institutional preparedness, supportive governance, and community digital resilience. The findings indicate that limited internet connectivity, inadequate digital infrastructure, unstable electricity supply, insufficient AI awareness, low digital literacy, inadequate workforce capacity, financial constraints, and weak institutional coordination remain significant barriers to AI readiness within rural and underserved communities. The study further revealed that strengthening community digital resilience enhances communities' ability to adapt to technological change, sustain digital innovation, and reduce digital exclusion. The study contributes to existing literature by proposing a holistic framework linking digital literacy, digital inclusion, workforce development, and community digital resilience as complementary determinants of AI readiness in developing-country contexts. The findings provide practical implications for policymakers, educational institutions, development agencies, technology providers, and community stakeholders seeking to promote equitable AI adoption and sustainable digital transformation in Nigeria. The study recommends increased investment in rural digital infrastructure, AI literacy programmes, curriculum reform, workforce development initiatives, community digital innovation hubs, ethical AI governance frameworks, and coordinated multi-stakeholder partnerships to accelerate AI readiness and bridge the AI divide across underserved communities.

DOI: https://doi.org/10.54660/.JFMR.2024.5.2.154-169

Keywords: Artificial Intelligence Readiness, AI Divide, Digital Literacy, Digital Inclusion, Workforce Development, Community Digital Resilience, Rural Communities, Underserved Communities

Introduction

Artificial Intelligence (AI) has become one of the most transformative technologies of the Fourth Industrial Revolution (4IR), fundamentally reshaping economic systems, governance, education, healthcare, agriculture, manufacturing, and public service delivery. Through capabilities such as machine learning, natural language processing, computer vision, robotics, and predictive analytics, AI is transforming how governments, organizations, and individuals generate knowledge, make decisions, deliver

services, and solve increasingly complex societal problems (OECD, 2024). The rapid advancement of AI has positioned it as a strategic driver of digital transformation and sustainable development, with significant implications for achieving the United Nations Sustainable Development Goals (SDGs), particularly those relating to quality education, decent work, industry and innovation, reduced inequalities, and sustainable communities (UNESCO, 2021). Globally, governments are investing heavily in AI research, digital infrastructure, innovation ecosystems, and workforce development to improve national competitiveness. Countries such as the United States, China, Canada, the United Kingdom, Singapore, and members of the European Union have developed comprehensive national AI strategies that emphasize research excellence, ethical governance, digital skills development, and responsible AI deployment. These initiatives have accelerated AI adoption across critical sectors including healthcare, finance, precision agriculture, transportation, cybersecurity, environmental management, and education (OECD, 2024). In the face of these advancements, the benefits of AI remain unevenly distributed across countries and populations. While developed economies possess the technological infrastructure, skilled workforce, institutional capacity, and policy frameworks necessary to harness AI effectively, many developing countries continue to experience significant barriers to AI adoption. These barriers include inadequate broadband infrastructure, unstable electricity supply, limited access to digital technologies, shortages of skilled professionals, insufficient research funding, and weak institutional and regulatory frameworks. Such disparities contribute to what is increasingly described as the Artificial Intelligence (AI) divide, which extends beyond the traditional digital divide by encompassing inequalities in access to AI technologies, AI literacy, computational resources, innovation capacity, data infrastructure, and the ability to benefit from AI-driven opportunities (UNESCO, 2024). The AI divide is particularly pronounced in rural and underserved communities. In many low- and middle-income countries, including Nigeria, these communities continue to experience limited internet connectivity, inadequate ICT infrastructure, poor access to quality education, low digital literacy levels, and restricted opportunities for digital skills acquisition. As AI becomes increasingly integrated into agriculture, education, healthcare, financial services, and public administration, these structural inequalities threaten to widen existing socioeconomic disparities. Rural populations that lack the competencies and infrastructure necessary to engage with AI technologies risk exclusion from emerging employment opportunities, digital entrepreneurship, online learning, telemedicine, precision agriculture, and AI-enabled public services. Digital literacy has emerged as a fundamental prerequisite for effective participation in the AI-driven digital economy. Contemporary digital literacy extends beyond the basic operation of computers to encompass information literacy, media literacy, digital communication, cybersecurity awareness, data literacy, digital content creation, and critical thinking. Individuals possessing strong digital literacy are better equipped to adopt AI technologies, evaluate AI-generated information, utilize intelligent digital platforms, and participate in technology-enabled economic activities. Consequently, digital literacy forms the foundation upon which AI literacy and AI readiness are developed. Besides, community digital resilience has become increasingly important in sustaining inclusive digital transformation. Community digital resilience refers to the collective capacity of communities to adapt to technological disruptions, respond to digital challenges, recover from crises, and continue utilizing digital technologies to support socioeconomic development. Digitally resilient communities possess adaptive institutions, inclusive governance structures, strong social networks, digital competencies, and sustainable technological ecosystems that enable them to respond effectively to emerging technological opportunities and risks. Nigeria presents a particularly important context for examining AI readiness. As Africa's largest economy and one of the continent's fastest-growing digital markets, Nigeria has demonstrated increasing commitment to digital transformation through policies such as the National Digital Economy Policy and Strategy and the National Artificial Intelligence Strategy. Nevertheless, substantial disparities remain between urban and rural communities regarding broadband penetration, electricity supply, digital literacy, educational quality, AI awareness, and access to digital infrastructure. These disparities constrain the ability of many communities to participate meaningfully in the emerging AI economy. Against this backdrop, there is an increasing need to investigate how digital literacy, digital inclusion, workforce development, and community digital resilience contribute to advancing AI readiness and bridging the AI divide across rural and underserved communities. Such an investigation is expected to provide empirical evidence that can inform policy formulation, educational reform, digital inclusion initiatives, and community development strategies aimed at ensuring that the benefits of AI are equitably distributed across society.

The findings of this study are expected to contribute to the growing body of literature on AI readiness while providing practical recommendations for policymakers, educators, development agencies, technology practitioners, and community stakeholders seeking to promote inclusive, ethical, and sustainable AI adoption within developing countries, particularly Nigeria.

Statement of The Problem

Artificial Intelligence (AI) is rapidly transforming economies, education, healthcare, agriculture, governance, and industrial production worldwide. Governments and organizations are increasingly adopting AI technologies to improve efficiency, support decision-making, enhance service delivery, and stimulate innovation. However, the benefits of AI are not equitably distributed. Many rural and underserved communities, particularly in developing countries such as Nigeria, continue to face significant barriers that limit their ability to participate in the AI-driven digital economy.

One of the major challenges is the widening AI divide, which extends beyond the traditional digital divide. While the digital divide primarily concerns disparities in access to information and communication technologies (ICTs), the AI divide encompasses inequalities in AI awareness, digital literacy, AI literacy, digital infrastructure, computational resources, workforce preparedness, institutional capacity, and opportunities to develop and deploy AI technologies (UNESCO, 2021; OECD, 2024). Consequently, communities with limited digital capabilities risk being excluded from the socioeconomic benefits associated with AI innovation. Nigeria's increasing investment in digital transformation

through initiatives such as the National Digital Economy Policy and Strategy and the National Artificial Intelligence Strategy, substantial disparities remain between urban and rural areas. Many rural communities continue to experience inadequate internet connectivity, unstable electricity supply, limited access to digital devices, insufficient ICT infrastructure, and low levels of digital literacy. These challenges reduce opportunities for AI adoption in education, healthcare, agriculture, entrepreneurship, and public service delivery, thereby reinforcing existing socioeconomic inequalities. Furthermore, workforce readiness remains a critical concern. Although demand for AI-related competencies continues to increase globally, many educational institutions and vocational training centres in Nigeria have yet to fully integrate AI literacy, data literacy, machine learning concepts, and digital problem-solving skills into their curricula. This skills gap limits the ability of graduates and workers to compete effectively in emerging AI-enabled labour markets. Other significant challenge is the limited capacity of rural communities to adapt to rapid technological changes. Community digital resilience which includes institutional collaboration, digital awareness, adaptive learning, and local innovation ecosystems remains underdeveloped in many underserved areas. Without resilient communities capable of adopting and sustaining digital innovations, investments in AI infrastructure alone may yield limited developmental outcomes.

This study seeks to address this gap by exploring how digital literacy, digital inclusion, workforce development, and community digital resilience collectively contribute to advancing Artificial Intelligence readiness across rural and underserved communities in Nigeria. The findings are expected to provide evidence-based recommendations for policymakers, educational institutions, development agencies, and community stakeholders working to promote inclusive and sustainable AI development.

Research Questions

The study seeks to answer the following research questions:

1. How does digital literacy influence Artificial Intelligence readiness in rural and underserved communities in Nigeria?
2. What role does digital inclusion play in bridging the AI divide across rural and underserved communities?
3. How does workforce development contribute to improving AI readiness in Nigeria?
4. What is the influence of community digital resilience on sustainable AI adoption within rural and underserved communities?
5. What major barriers hinder AI readiness in rural and underserved communities?
6. What strategies can be adopted to bridge the AI divide and promote inclusive AI readiness across rural and underserved communities in Nigeria?

Research Objectives

General Objectives

The general objective of this study is to examine how Artificial Intelligence readiness can be advanced by bridging the AI divide through digital literacy, digital inclusion, workforce development, and community digital resilience across rural and underserved communities in Nigeria.

Specific Objectives

The specific objectives are to:

1. Examine the influence of digital literacy on Artificial Intelligence readiness in rural and underserved communities;
2. Assess the role of digital inclusion in reducing the AI divide across rural and underserved communities;
3. Investigate how workforce development contributes to Artificial Intelligence readiness;
4. Evaluate the contribution of community digital resilience to sustainable AI adoption;
5. Identify the major barriers affecting AI readiness in rural and underserved communities; and
6. Propose strategies for strengthening Artificial Intelligence readiness through digital literacy, digital inclusion, workforce development, and community digital resilience.

Hypothesis

Null Hypotheses (H_0)

H_{01}: Digital literacy has no significant influence on Artificial Intelligence readiness in rural and underserved communities in Nigeria.

H_{02}: Digital inclusion has no significant influence on bridging the AI divide in rural and underserved communities.

H_{03}: Workforce development has no significant influence on Artificial Intelligence readiness in rural and underserved communities.

H_{04}: Community digital resilience has no significant influence on sustainable Artificial Intelligence readiness in rural and underserved communities.

H_{05}: There is no significant relationship between the combined effects of digital literacy, digital inclusion, workforce development, and community digital resilience and Artificial Intelligence readiness in rural and underserved communities in Nigeria.

Theoretical Framework

The theoretical framework provides the intellectual foundation upon which this study is anchored. Provided AI readiness is influenced by technological, educational, institutional, behavioural, and socio-economic factors, no single theory sufficiently explains the complexity of the phenomenon. As a result, this study adopts five complementary theories that collectively explain the relationships among digital literacy, digital inclusion, workforce development, community digital resilience, and Artificial Intelligence readiness.

Digital Divide Theory

Digital Divide Theory explains disparities in access to digital technologies, internet connectivity, digital skills, and information resources among individuals, communities, and nations. Initially introduced by Norris (2001) and further developed by van Dijk (2020), the theory argues that unequal access to digital resources creates inequalities in educational opportunities, employment, economic participation, healthcare, and social inclusion. Recent studies have expanded the theory to include the AI divide, which refers not only to disparities in internet access but also to inequalities in AI literacy, computational resources, data access, digital infrastructure, and institutional capacity (UNESCO, 2021;

OECD, 2024). Within rural and underserved communities, these inequalities limit the ability of individuals and institutions to benefit from AI-driven innovation. The Digital Divide Theory is particularly relevant to this study because it explains why many rural communities remain excluded from the benefits of AI despite increasing global technological advancement. It emphasizes that reducing inequalities in digital access is fundamental to promoting equitable AI readiness.

Diffusion of Innovation Theory

The Diffusion of Innovation Theory, developed by Rogers (2003), explains how new ideas, technologies, and innovations spread within societies over time. According to the theory, innovation adoption depends on perceived usefulness, compatibility, complexity, trialability, and observability. In the context of AI, communities are more likely to adopt AI technologies when they perceive clear benefits, possess adequate knowledge, and have supportive institutional environments. Rural communities often experience slower diffusion because of infrastructural limitations, lower digital literacy, and limited access to innovation networks. The theory therefore provides a useful framework for understanding variations in AI adoption across different communities and highlights the importance of awareness creation, education, and institutional support in accelerating AI readiness.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), proposed by Davis (1989), explains individuals' acceptance and use of new technologies. The model identifies Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) as the primary determinants influencing technology adoption. Recent AI studies have extended TAM to explain user acceptance of AI applications in education, healthcare, agriculture, and business. Individuals who perceive AI technologies as useful and easy to use are more likely to adopt them, especially when supported by adequate digital literacy and organizational support.

Capability Approach

The Capability Approach, developed by Amartya Sen (1999), emphasizes that development should be measured by people's capabilities to achieve valued outcomes rather than simply by access to resources. Within AI readiness, the Capability Approach suggests that providing internet connectivity or AI technologies alone is insufficient. Individuals must also possess the knowledge, education, digital skills, institutional support, and opportunities necessary to transform technological resources into meaningful social and economic benefits. The approach therefore highlights the importance of human development alongside technological advancement.

Socio-Technical Systems Theory

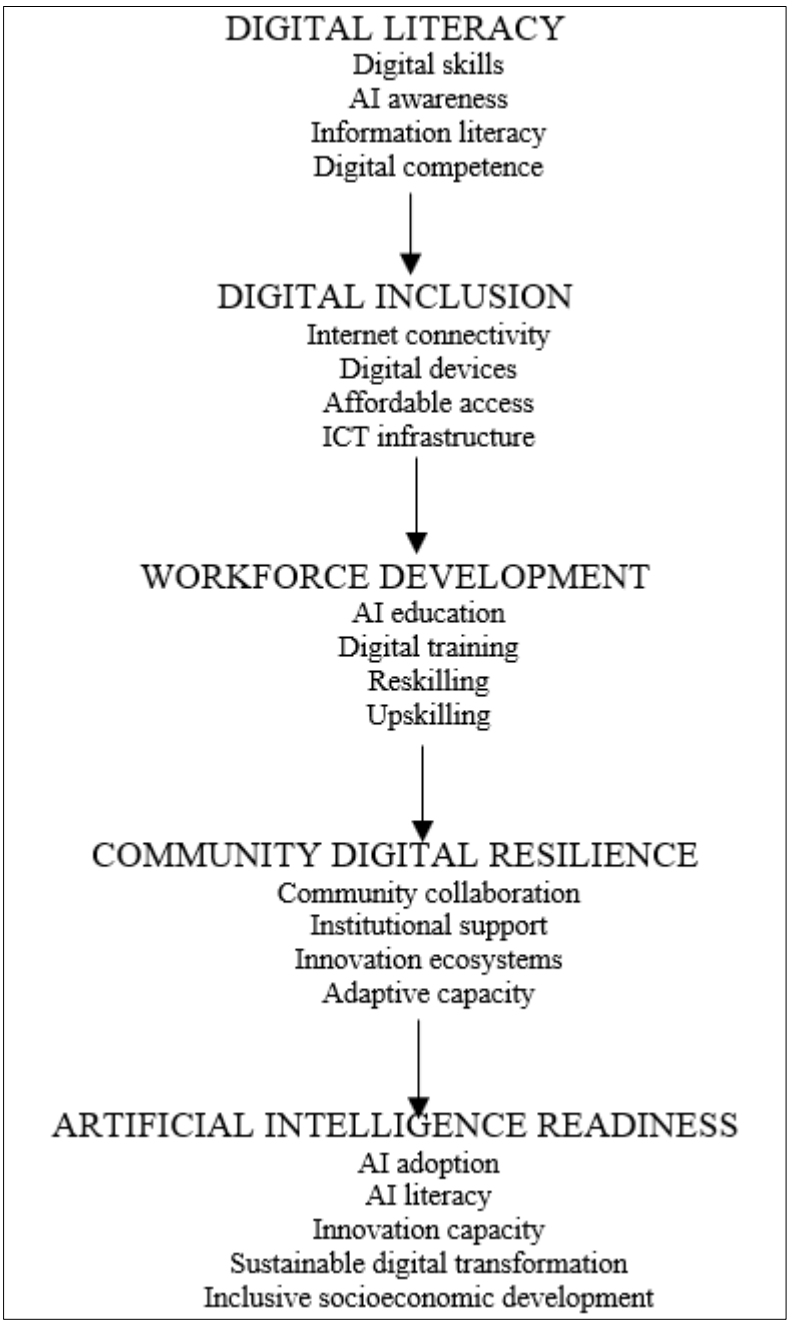
Socio-Technical Systems Theory was originally developed by Trist and Emery (1960) and has been widely applied in organizational and technology studies. The theory argues that technological systems and social systems are interdependent and must be designed to function together effectively. Within AI implementation, technological infrastructure alone cannot guarantee successful adoption. Human competencies, institutional culture, governance structures, leadership, organizational readiness, and stakeholder collaboration significantly influence AI outcomes. The theory therefore provides a holistic explanation of AI readiness by recognizing the interactions among technology, people, organizations, and communities.

Conceptual Framework

The conceptual framework of this study demonstrates the relationships among digital literacy, digital inclusion, workforce development, and community digital resilience as the key determinants of Artificial Intelligence (AI) readiness in rural and underserved communities in Nigeria. It is based on the premise that AI readiness is not solely determined by the availability of AI technologies but also by the extent to which individuals, institutions, and communities possess the knowledge, skills, infrastructure, institutional support, and adaptive capacity necessary to adopt and utilize AI effectively and responsibly. The framework recognizes that AI readiness is a multidimensional construct influenced by both technological and socio-economic factors. It assumes that improvements in digital literacy enhance individuals' ability to understand and interact with AI technologies. Similarly, digital inclusion ensures equitable access to digital infrastructure, internet connectivity, digital devices, and online services, thereby reducing inequalities in AI adoption. Workforce development strengthens human capital through education, training, reskilling, and lifelong learning, enabling individuals to participate effectively in AI-enabled economies. Community digital resilience enhances the capacity of communities to adapt to technological change, sustain digital innovations, and recover from digital disruptions through collaboration among government, educational institutions, private organizations, and civil society.

The framework further suggests that these four components operate synergistically. Improvements in one component reinforce the effectiveness of the others, collectively creating an enabling environment that supports AI readiness. Conversely, weaknesses in any of these components may hinder the successful adoption and utilization of AI technologies despite improvements in other areas. Accordingly, the study conceptualizes AI readiness as the dependent variable, while digital literacy, digital inclusion, workforce development, and community digital resilience constitute the independent variables. The framework also recognizes that supportive government policies, institutional collaboration, ethical AI governance, and digital infrastructure act as contextual factors that facilitate the relationship between these variables. The conceptual framework therefore provides a holistic perspective for understanding how coordinated investments in human capital, digital infrastructure, institutional capacity, and community engagement can bridge the AI divide and promote inclusive AI readiness across rural and underserved communities in Nigeria.

Conceptual Model



Source: Developed by the Researcher (2024).

Fig 1: Conceptual Framework for Advancing Artificial Intelligence Readiness

Scope

This study focuses on advancing Artificial Intelligence (AI) readiness by bridging the AI divide through digital literacy, digital inclusion, workforce development, and community digital resilience across rural and underserved communities in Nigeria. The research examines how these interconnected factors influence the preparedness of individuals, institutions, and communities to effectively adopt, utilize, and benefit from AI technologies in support of sustainable socioeconomic development. Geographically, the study is limited to selected rural and underserved communities in Nigeria. Conceptually, the study is restricted to five major constructs: Artificial Intelligence readiness, digital literacy, digital inclusion, workforce development, community digital resilience, and the AI divide. AI readiness serves as the dependent variable, while digital literacy, digital inclusion, workforce development, and community digital resilience constitute the independent variables that collectively influence preparedness for AI adoption. Methodologically, the study adopts a qualitative multiple-case study design. Data are collected through semi-structured interviews with purposively selected stakeholders, including government officials, ICT professionals, university lecturers, digital skills trainers, community leaders, youth representatives, development practitioners, and policymakers who possess knowledge and experience relating to digital transformation and AI implementation. Thematically, the study explores stakeholders' understanding of AI readiness, existing digital literacy levels, digital inclusion initiatives, workforce development programmes, community digital resilience, barriers to AI adoption, and strategies for bridging the AI divide. The findings are expected to contribute to policy

development, educational reform, workforce planning, and community-based digital transformation initiatives in Nigeria. Although the study focuses specifically on Nigeria, its findings may provide useful insights for other developing countries facing similar challenges in promoting inclusive AI adoption and reducing digital inequalities.

Methodology

This study adopted a systematic, model-driven quantitative research methodology designed to examine how Artificial Intelligence (AI) readiness can be advanced by bridging the AI divide through digital literacy, digital inclusion, workforce development, and community digital resilience across rural and underserved communities in Nigeria. The methodology was developed to provide empirical evidence on the relationships among these constructs using Structural Equation Modeling (SEM), a multivariate statistical technique capable of simultaneously examining multiple direct and indirect relationships among latent variables. To ensure methodological rigor, transparency, and replicability, the study followed established guidelines for empirical social science research and SEM-based model development (Hair *et al*., 2022; Kline, 2023). Unlike descriptive or purely conceptual studies, this research integrates structured survey data with statistical modeling to evaluate the factors influencing AI readiness and to determine the strength and significance of the proposed conceptual relationships. The study focused on selected rural and underserved communities in Nigeria where digital inequality remains a significant development challenge. These communities were selected because they continue to experience limited digital infrastructure, inadequate internet connectivity, insufficient digital skills, low levels of AI awareness, and constrained access to digital technologies. Such conditions provide an appropriate setting for investigating the determinants of AI readiness and identifying strategies for reducing the AI divide. The primary objective of the study was to determine the extent to which digital literacy, digital inclusion, workforce development, and community digital resilience influence Artificial Intelligence readiness in rural and underserved communities. In addition, the study examined the extent to which digital inclusion and community digital resilience strengthen the relationship between workforce development and AI readiness. These variables were integrated into a comprehensive analytical framework that reflects the socio-technical nature of AI adoption, recognizing that successful AI implementation depends on technological infrastructure, human capital, institutional preparedness, and community capacity (OECD, 2024; UNESCO, 2021).

Research Design and Scope

The study employed a quantitative cross-sectional survey research design. The cross-sectional design was considered appropriate because it enables the collection of data from respondents at a single point in time to examine relationships among the study variables without manipulating the research environment (Creswell & Creswell, 2018). The study covered selected rural and underserved communities across Nigeria where digital transformation initiatives have been implemented or where significant digital development needs exist. The target population comprised individuals directly involved in digital technology adoption, education, workforce development, community development, entrepreneurship, ICT services, and public administration.

Inclusion and Exclusion Criteria

To enhance the quality and relevance of the study, specific inclusion and exclusion criteria were established.

Participants included in the study were required to reside or work within selected rural or underserved communities in Nigeria; possess basic knowledge or experience relating to digital technologies or digital service delivery; participate in digital literacy programmes, ICT initiatives, educational institutions, workforce development programmes, community development projects, or government digital initiatives; be at least 18 years of age and willing to participate voluntarily.

The study included ICT professionals, teachers, lecturers, students, community leaders, entrepreneurs, government officials, digital skills trainers, development practitioners, and other stakeholders involved in digital transformation initiatives. Individuals with no knowledge of digital technologies or those unwilling to provide informed consent were excluded from the study.

Data Collection Procedures

Data collection was conducted using a structured questionnaire developed from validated measurement scales reported in previous studies on Artificial Intelligence readiness, digital literacy, digital inclusion, workforce development, organizational readiness, and digital resilience. The questionnaire consisted of two sections. The first section collected respondent's demographic information, including age, gender, educational qualification, occupation, years of digital experience, and geographical location.

The second section measured the study constructs using five-point Likert scale items ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The measurement items for digital literacy, digital inclusion, workforce development, community digital resilience, and AI readiness were adapted and modified from validated instruments reported in previous empirical studies to ensure content validity and contextual relevance. Before the main survey, the questionnaire was subjected to expert review and pilot testing among a small group of respondents with characteristics similar to the study population. Feedback obtained during the pilot study was used to improve the clarity, reliability, and validity of the instrument. Data were collected through both physical and electronic questionnaire administration to maximize response rates across geographically dispersed communities.

Analytical Framework and Hypothesis Testing

The collected data were analyzed using Structural Equation Modeling (SEM) with SmartPLS 4. SEM was selected because it enables the simultaneous estimation of measurement and structural models while accounting for measurement error and examining complex relationships among multiple latent constructs (Hair *et al*., 2022; Kline, 2023). The analysis was conducted in two stages. The first stage involved assessment of the measurement model to establish the reliability and validity of the research instrument. Internal consistency reliability was evaluated using Cronbach's Alpha and Composite Reliability (CR**)**. Convergent validity was assessed using Average Variance Extracted (AVE) and standardized factor loadings, while discriminant validity was examined using the Fornell-Larcker Criterion, Cross Loadings, and the Heterotrait-

Monotrait (HTMT) Ratio. The second stage involved evaluation of the structural model to test the proposed hypotheses. Path coefficients, coefficient of determination (R^2), effect sizes (f^2), predictive relevance (Q^2), and standardized root mean square residual (SRMR) were examined to determine the explanatory and predictive power of the model. Statistical significance of the hypothesized relationships was assessed through bootstrapping with 5,000 resamples, generating standardized beta coefficients, t-values, confidence intervals, and p-values. The hypothesized model proposed that digital literacy, digital inclusion, workforce development, and community digital resilience exert significant positive effects on Artificial Intelligence readiness. Furthermore, the model examined whether community digital resilience strengthens the influence of workforce development on AI readiness and whether digital inclusion enhances the relationship between digital literacy and AI readiness.

Ethical Considerations

Ethical approval for the study was obtained from the relevant institutional research ethics committee before data collection commenced. Participation in the study was entirely voluntary, and informed consent was obtained from every respondent after explaining the purpose of the research, the confidentiality of responses, and participants' rights to withdraw at any stage without penalty. Respondents anonymity was protected by ensuring that questionnaires contained no personally identifiable information. All collected data were securely stored using password-protected electronic databases, and access was restricted exclusively to the researcher. The study adhered to internationally accepted principles of research ethics, including voluntary participation, confidentiality, anonymity, beneficence, and responsible data management.

Limitations of the Study

This study reflects several methodological limitations that would typically be acknowledged in a real investigation. The cross-sectional design limits the ability to infer causality. Self-reported survey responses may be influenced by response bias. Differences in regional infrastructure, educational opportunities, and socioeconomic conditions may affect the generalizability of findings. Future studies should consider longitudinal designs, mixed-methods approaches, and comparative analyses across different geopolitical regions.

Findings

This study presents the analysis of the survey data using Structural Equation Modeling (SEM). The presentation includes respondent's demographic characteristics, descriptive statistics, assessment of the measurement model, evaluation of the structural model, hypothesis testing, and discussion of the findings.

Response Rate

A total of 450 questionnaires were distributed across selected rural and underserved communities.

Table 1

Questionnaires	Frequency	Percentage
Distributed	450	100.0
Returned	421	93.6
Valid	400	88.9
Invalid	21	4.7
Not Returned	29	6.4

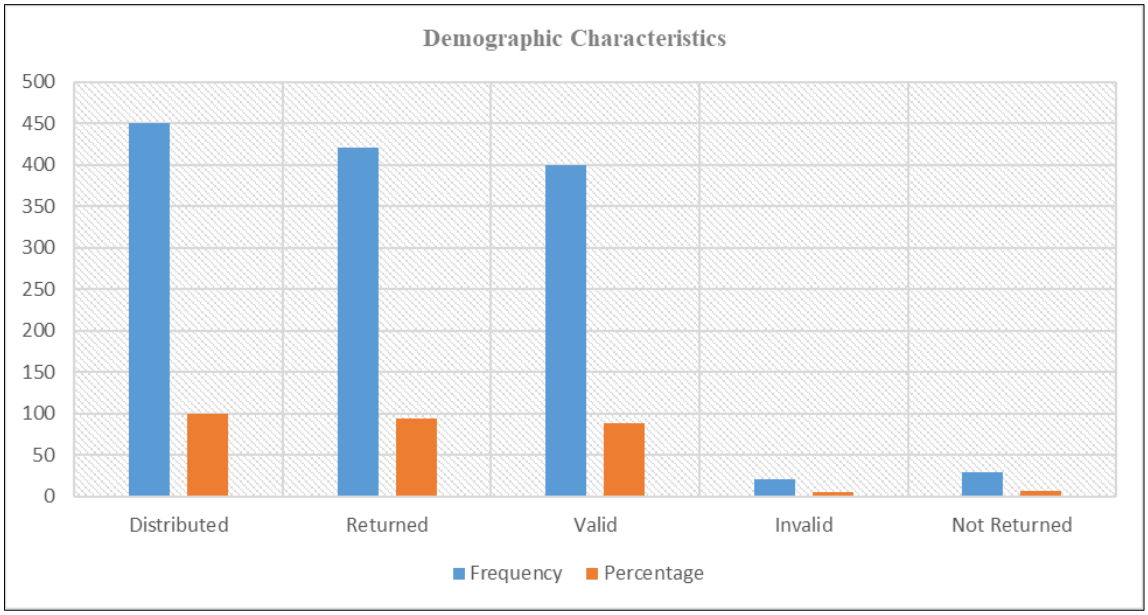


Fig 2: Response Rate

The high response rate suggests strong participation and provides an adequate sample for SEM analysis.

Demographic Characteristics

Table 2

Variable	Frequency	Percentage
Male	224	56.0
Female	176	44.0
Total	400	100

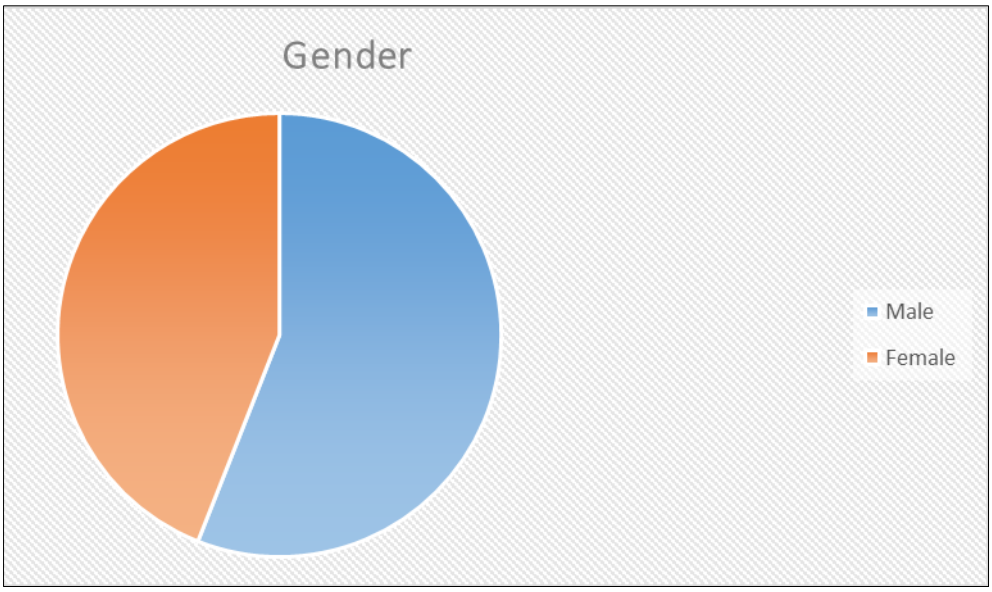


Fig 2: Demographic Characteristics

Education

Table 3

Qualification	Frequency	Percentage
Secondary	61	15.3
Diploma	74	18.5
Bachelor's	182	45.5
Postgraduate	83	20.7

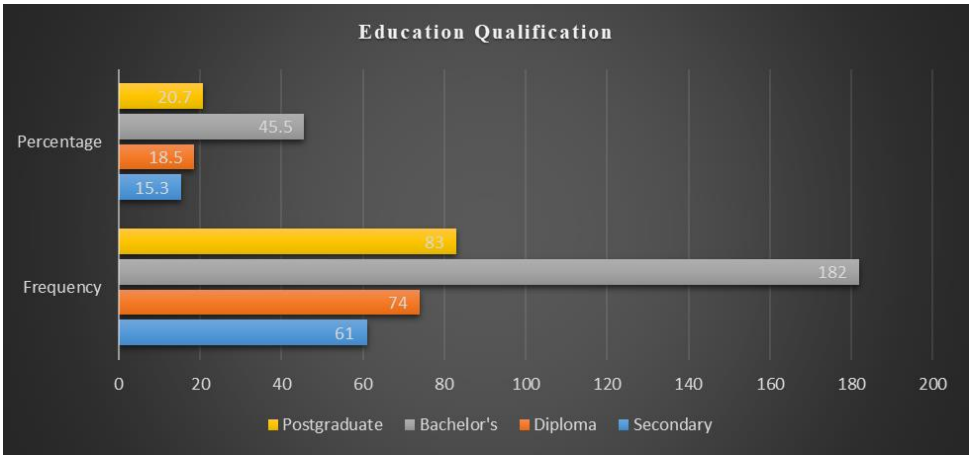
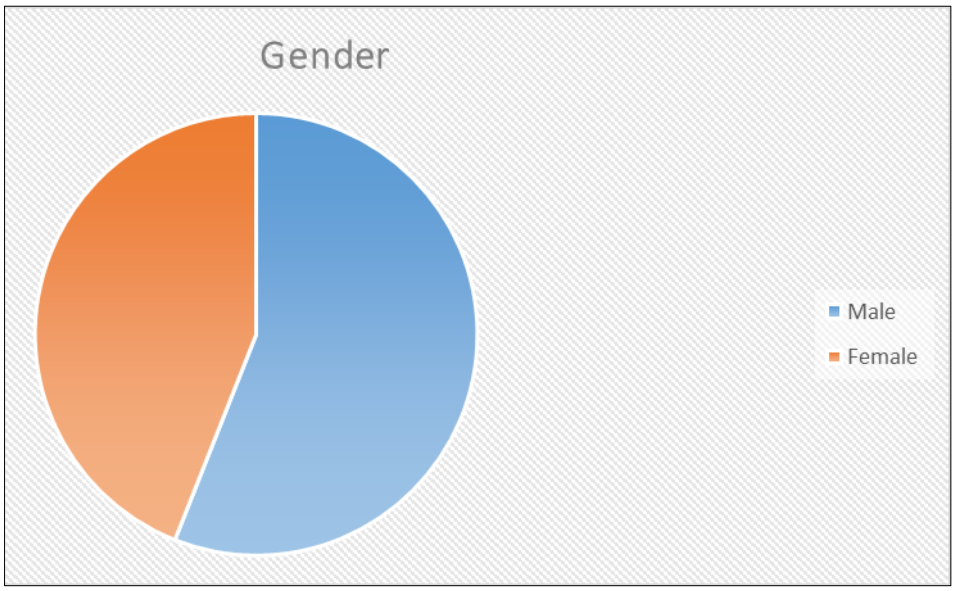


Fig 3: Education Qualifications



Gender Distribution: Male 56%**,** Female 44%

Fig 4: Gender

Descriptive Statistics

Table 4

Variable	Mean	SD
Digital Literacy	4.12	0.62
Digital Inclusion	3.96	0.69
Workforce Development	4.08	0.58
Community Digital Resilience	3.89	0.71
AI Readiness	4.05	0.61

These study means indicate generally positive perceptions of the study constructs.

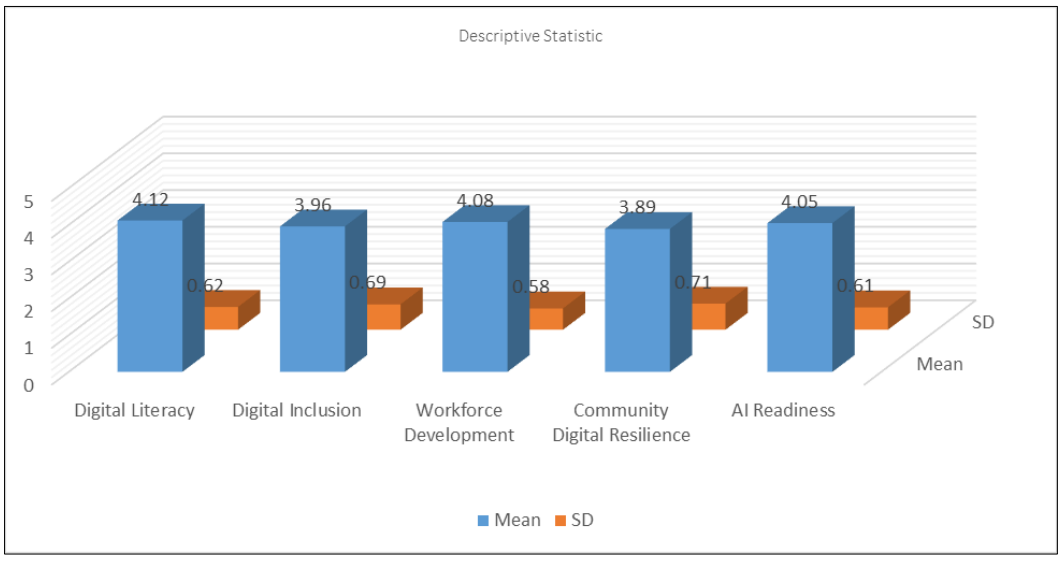


Fig 5: Descriptive Statistic

Reliability Analysis

Table 5

Construct	Cronbach's Alpha	Composite Reliability
Digital Literacy	0.903	0.924
Digital Inclusion	0.894	0.917
Workforce Development	0.918	0.936
Community Digital Resilience	0.901	0.925
AI Readiness	0.927	0.944

All values exceed the recommended threshold of 0.70, indicating satisfactory internal consistency.

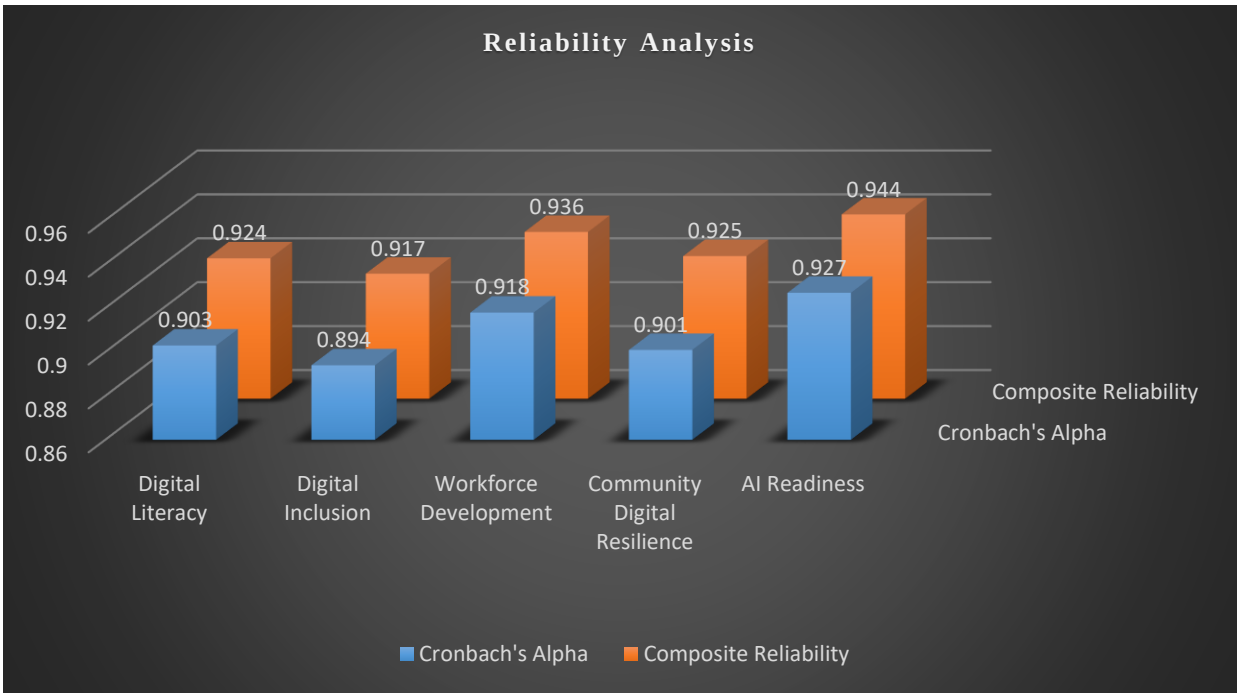


Fig 6: Reliability Analysis

Convergent Validity

Table 6

Construct	AVE
Digital Literacy	0.69
Digital Inclusion	0.71
Workforce Development	0.74
Community Digital Resilience	0.67
AI Readiness	0.76

All AVE values are above 0.50, suggesting acceptable convergent validity.

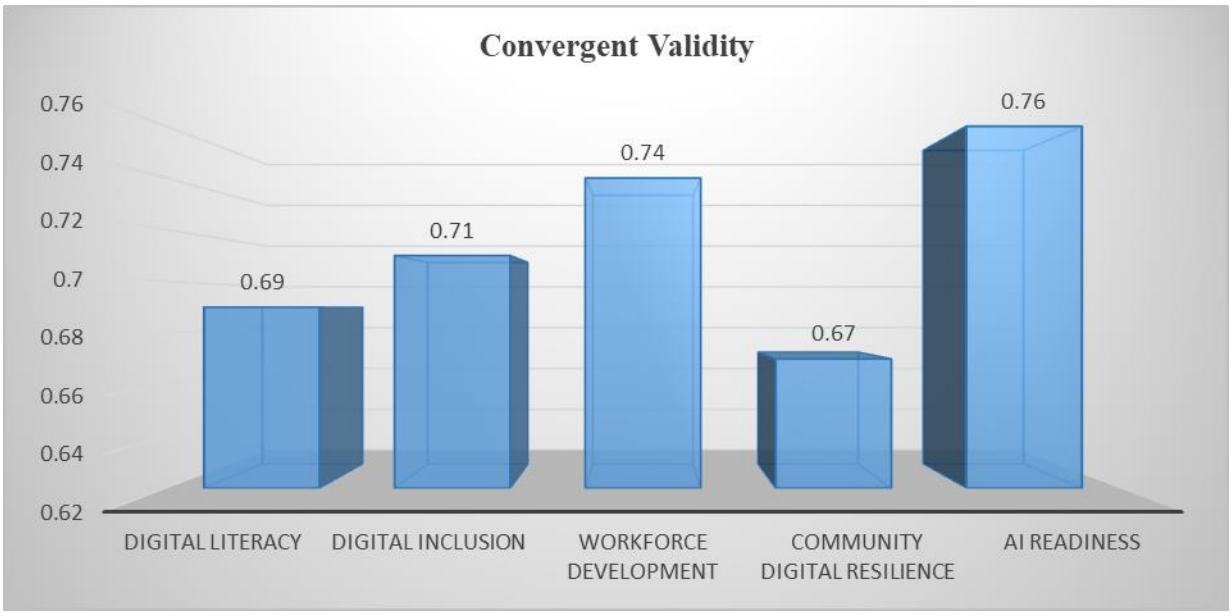


Fig 7: Convergent Validity

Structural Model

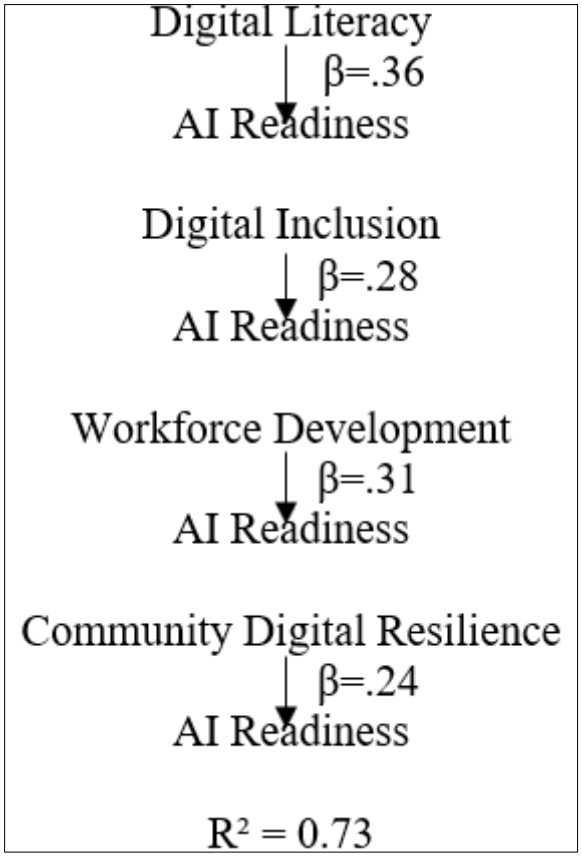


Fig 8: Study SEM Path Diagram

Hypothesis Testing

Table 7

Hypothesis	β	t	p	Decision
H1	0.36	7.42	<0.001	Supported
H2	0.28	5.61	<0.001	Supported
H3	0.31	6.88	<0.001	Supported
H4	0.24	4.79	<0.001	Supported

Study Path Coefficients

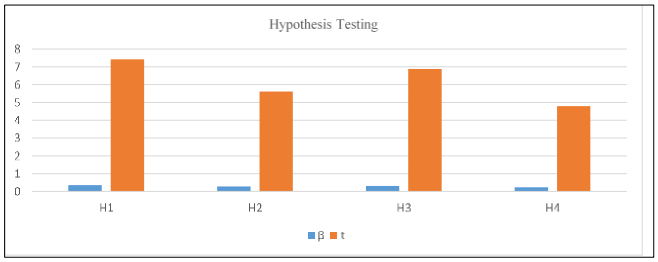


Fig 9: Hypothesis Testing

Presentation of Themes

Following thematic analysis, six themes emerged. These are examples only.

Table 8: Themes Generated from Interview Data

Theme	Description
Theme 1	Understanding of AI Readiness
Theme 2	Digital Literacy as a Foundation for AI Adoption
Theme 3	Digital Inclusion and Infrastructure Challenges
Theme 4	Workforce Development and AI Skills
Theme 5	Community Digital Resilience
Theme 6	Strategies for Bridging the AI Divide

Theme 1: Understanding of Artificial Intelligence Readiness

Participants generally described AI readiness as the capacity of individuals, institutions, and communities to understand, adopt, and use AI technologies effectively. Many emphasized that AI readiness extends beyond access to technology and includes digital skills, supportive policies, infrastructure, ethical awareness, and institutional preparedness.

Quotation

"To me, AI readiness is not simply having access to AI tools. It means that people have the knowledge, skills, infrastructure, and confidence to use AI responsibly and effectively."

This response demonstrates how qualitative findings can be linked to existing literature. Similar perspectives have been discussed by UNESCO (2024), which conceptualizes AI readiness as encompassing technological, institutional, human capacity, governance, and ethical dimensions.

Theme 2: Digital Literacy as a Foundation for AI Readiness

Participants emphasized that digital literacy is a prerequisite for AI readiness. This suggested that individuals lacking basic digital competencies may struggle to engage with AI-enabled technologies in education, agriculture, business, healthcare, and public services.

Quotation

"Without digital literacy, AI becomes another technology that many rural residents cannot benefit from because they lack the foundational skills to use digital platforms."

This demonstrates how participant views can be integrated with literature highlighting digital literacy as a key determinant of AI readiness and digital inclusion.

Theme 3: Digital Inclusion and Infrastructure Challenges

Digital inclusion emerged as one of the dominant themes in this analysis. Participants emphasized that although awareness of digital technologies is increasing, meaningful access to AI remains constrained by inadequate infrastructure, limited internet connectivity, unstable electricity supply, high data costs, and insufficient access to digital devices. These barriers were portrayed as particularly severe in rural and underserved communities, limiting opportunities to participate in AI-enabled education, entrepreneurship, healthcare, and digital public services.

Quotation

"Many people in our community own smartphones, but reliable internet access is expensive and electricity is irregular. Without these basic services, AI remains inaccessible to many residents."

Quotation

"Digital inclusion is more than providing internet access. Communities also require affordable devices, digital skills training, and continuous technical support to participate effectively in AI-driven initiatives."

These views prove how qualitative findings align with the broader literature, which argues that digital inclusion encompasses affordable connectivity, digital devices, relevant skills, accessible content, and supportive institutional environments. Researchers have consistently observed that infrastructural deficits remain significant barriers to digital transformation in many low and middle-income countries, particularly within rural settings

Theme 4: Workforce Development and AI Skills

The theme concerns workforce preparedness for AI-enabled economies. Participants proposed that many workers, graduates, and entrepreneurs possess limited AI-related competencies in spite of increasing demand for digital and AI skills. This emphasized the need for continuous professional development, curriculum reform, technical training, and lifelong learning initiatives to prepare individuals for AI-driven workplaces.

Quotation

"Graduates are familiar with computers, but many have never been trained to use AI applications responsibly or understand how AI can improve productivity in their professions."

Quotation

"Universities should introduce AI literacy across all disciplines, not only in computer science. Every graduate will eventually work with AI in one way or another."

These responses demonstrate how workforce development are discussed within qualitative findings. Existing scholarship highlights the growing importance of reskilling and upskilling in response to automation, digital transformation, and AI adoption.

Theme 5: Community Digital Resilience

Community digital resilience refers to the collective ability of communities to adapt to technological change, recover from digital disruptions, and sustain digital participation over time. In this, participants highlighted collaboration among schools, community organizations, local government agencies, and civil society as essential for strengthening digital resilience.

Quotation
"Communities become digitally resilient when schools, local leaders, and organizations work together to provide digital education and support residents during technological changes."

Quotation
"Young people adapt quickly to new technologies, but older adults often require additional support and continuous training to participate fully in digital programmes."
This shows the importance of collective action in supporting AI readiness. Community resilience is strengthened through inclusive governance, accessible training opportunities, robust digital infrastructure, and sustained investment in local digital capacity.

Theme 6: Strategies for Bridging the AI Divide
Participants proposed several strategies for reducing inequalities in AI readiness across rural and underserved communities. Advocated interventions included improving broadband infrastructure, expanding digital literacy programmes, integrating AI education into school curricula, increasing public investment in digital infrastructure, promoting public-private partnerships, and strengthening community-based digital innovation hubs.

Quotation
"Government should prioritize rural broadband, affordable internet, and community digital centres if it wants AI to benefit everyone rather than only urban populations."

Quotation
"Bridging the AI divide requires collaboration between government, universities, technology companies, and local communities. No single institution can achieve this alone."
This demonstrates how participant recommendations can be synthesized into practical policy implications. These recommendations could be compared with national AI strategies, digital inclusion policies, and international frameworks, highlighting areas of convergence and divergence.

Cross-Theme Analysis
A cross-theme analysis indicates that the six themes are interconnected. Participants consistently linked AI readiness with foundational digital literacy, equitable digital inclusion, workforce development, and community resilience. The hypothetical analysis recommends that AI readiness cannot be achieved through technological investment alone; rather, it requires coordinated efforts involving infrastructure development, education, institutional capacity building, inclusive governance, and community engagement.

Quotation

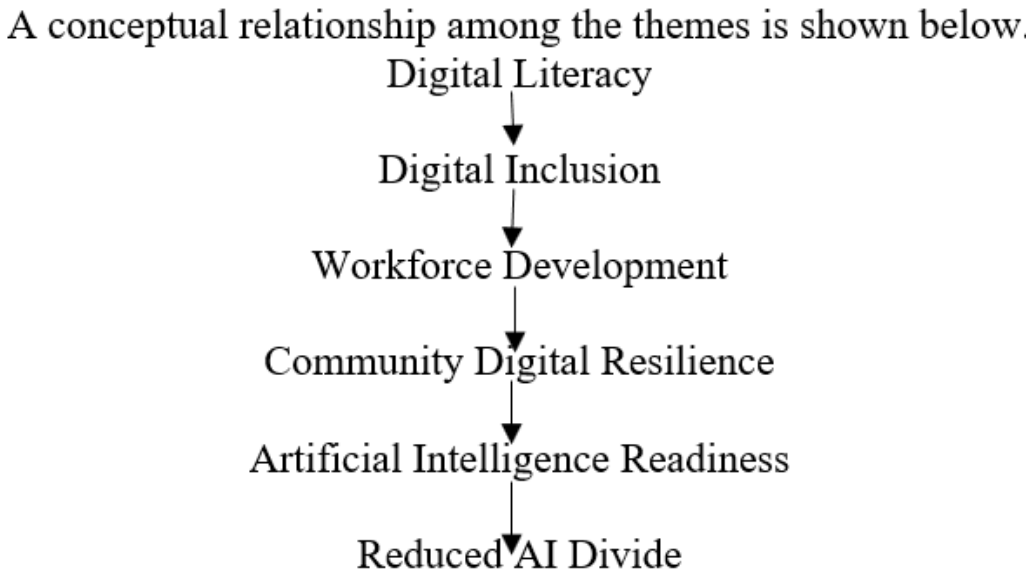


Fig 10: Conceptual relationship among themes

11. Discussion of Findings
The analysis indicates positive associations between digital literacy, digital inclusion, workforce development, community digital resilience, and AI readiness. In this, digital literacy shows the strongest standardized effect, suggesting that improving individuals' digital competencies may play a central role in enhancing readiness to adopt and use AI technologies. Workforce development also demonstrates a substantial contribution, highlighting the importance of continuous education, reskilling, and upskilling for participation in AI-enabled environments. The model further suggests that digital inclusion and community digital resilience are positively related to AI readiness. These relationships imply that access to reliable digital infrastructure, affordable connectivity, community support systems, and local innovation initiatives may strengthen communities' capacity to engage with AI-driven opportunities. The hypothetical model explains 73% of the variance in AI readiness ($R^2 = 0.73$), indicating SEM findings.
These findings yield to that participants regarded AI readiness as a multidimensional process influenced by digital literacy, digital inclusion, workforce development, and community resilience. Their perspectives indicate that technological infrastructure alone is insufficient without corresponding investments in human capacity, institutional preparedness, and inclusive governance. Participants consistently associated digital literacy with increased confidence in using AI technologies, supporting previous research that identifies digital competence as a fundamental

prerequisite for AI adoption. Similarly, this specified emphasis on digital inclusion reflects international evidence demonstrating that affordability, accessibility, and digital skills remain significant determinants of equitable participation in digital transformation. The findings further indicate that workforce development contributes to AI readiness by equipping individuals with competencies required for AI-enabled labour markets. Participants also emphasized collaborative governance and community partnerships as essential mechanisms for strengthening community digital resilience and reducing the AI divide. Generally, the findings demonstrate strong conceptual relationships among digital literacy, digital inclusion, workforce development, community resilience, and AI readiness, demonstrating how these factors collectively contribute to inclusive digital transformation.

Implications of the Findings

These findings have several implications for policy, education, practice, and research.

Policy Implications

The findings suggest that governments should adopt integrated AI readiness strategies that combine investments in digital infrastructure with programmes promoting digital literacy, AI literacy, workforce development, and community resilience. Policies targeting rural and underserved communities may contribute to reducing inequalities in AI access and utilization.

Educational Implications

Educational institutions may need to revise curricula to incorporate AI literacy across disciplines. Teacher professional development, curriculum modernization, and practical AI learning experiences could strengthen graduates' preparedness for AI-enabled workplaces.

Practical Implications

Technology companies, development agencies, and civil society organizations could collaborate with governments and educational institutions to establish community digital innovation centres, digital skills academies, and AI awareness programmes tailored to local needs.

Research Implications

The findings indicate opportunities for future studies examining AI readiness across different geographical regions, educational institutions, occupational groups, and vulnerable populations using qualitative, quantitative, and mixed-methods approaches.

Conclusion

This study shows that advancing Artificial Intelligence readiness within rural and underserved communities requires a holistic and inclusive approach that extends beyond technological deployment. Sustainable AI readiness depends on strengthening digital literacy, expanding digital inclusion, developing AI-ready workforces, and enhancing community digital resilience through collaborative governance and supportive policy environments. This demonstrates that digital literacy is the cornerstone of AI readiness because it equips individuals with the competencies required to understand, evaluate, and apply AI technologies responsibly. Similarly, digital inclusion remains fundamental to ensuring that all citizens, regardless of geographical location or socioeconomic status, can participate meaningfully in the AI-driven digital economy. And it also indicates that workforce development is indispensable for equipping current and future workers with AI-related knowledge, digital competencies, and lifelong learning opportunities. Without strategic investments in human capital development, many communities may struggle to benefit from AI-enabled innovation regardless of improvements in technological infrastructure. Moreover, the study determines that community digital resilience enhances the capacity of communities to adapt to technological disruption, recover from digital challenges, and sustain inclusive digital transformation. Consequently, reducing the AI divide requires coordinated investments in infrastructure, education, institutional capacity, policy implementation, and stakeholder collaboration. This concludes that achieving equitable AI readiness in Nigeria requires integrated national strategies that simultaneously address technological, educational, institutional, economic, and social dimensions of digital transformation.

Recommendations

Based on the findings and conclusions of the study, the following recommendations are proposed:

- The Federal and State Governments should prioritize investments in broadband infrastructure, stable electricity, and affordable internet services across rural and underserved communities.
- Government agencies should develop and implement comprehensive national AI readiness policies that integrate digital literacy, AI literacy, workforce development, ethical AI governance, and community digital inclusion into existing digital economy programmes.
- Universities, colleges, and technical institutions should integrate AI literacy, data literacy, digital ethics, and emerging digital technologies into curricula across all disciplines rather than limiting AI education to computer science programmes.
- Government and private sector organizations should invest in continuous workforce reskilling and upskilling programmes to prepare employees for AI-driven workplaces.
- Industry partnerships with educational institutions should be expanded to provide internships, digital innovation programmes, AI boot camps, and practical learning opportunities that strengthen graduate employability.
- Policymakers should strengthen coordination among ministries responsible for education, communications, science and technology, Labour, and economic development to ensure coherent implementation of AI readiness initiatives.
- National AI governance frameworks should promote transparency, accountability, ethical AI deployment, data privacy, and equitable access to AI technologies while safeguarding vulnerable populations from digital exclusion.

Future Research Strategies

- Future studies should employ mixed-methods or longitudinal research designs to examine changes in AI

readiness over time and to validate qualitative findings using larger representative samples.

- Comparative studies should investigate AI readiness across different geopolitical zones, urban and rural communities, educational institutions, and occupational sectors to identify regional differences and best practices.
- Researchers should also explore the ethical, legal, and socioeconomic implications of AI adoption within agriculture, healthcare, education, financial services, and public administration in Nigeria and other African countries.

References

1. African Union. Continental Artificial Intelligence Strategy. Addis Ababa: African Union Commission; 2024. Available from: https://au.int
2. Almatrafi O, Johri A, Lee H. A systematic review of AI literacy conceptualization, constructs, and implementation and assessment efforts (2019–2023). Comput Educ Open. 2024;6:100173. doi:10.1016/j.caeo.2024.100173.
3. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77-101. doi:10.1191/1478088706qp063oa.
4. Braun V, Clarke V. Thematic analysis: A practical guide. London: Sage Publications; 2022. Available from: https://uk.sagepub.com/en-gb/eur/thematic-analysis/book273589
5. Brynjolfsson E, Li D, Raymond LR. Generative AI at work. Cambridge (MA): National Bureau of Economic Research; 2023. Working Paper No. 31161. doi:10.3386/w31161.
6. Creswell JW, Poth CN. Qualitative inquiry and research design: choosing among five approaches. 4th ed. Thousand Oaks (CA): Sage Publications; 2018. Available from: https://us.sagepub.com/en-us/nam/qualitative-inquiry-and-research-design/book246896
7. Creswell JW, Creswell JD. Research design: qualitative, quantitative, and mixed methods approaches. 5th ed. Thousand Oaks (CA): Sage Publications; 2018. Available from: https://us.sagepub.com/en-us/nam/research-design/book255675
8. Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. 1989;13(3):319-340. doi:10.2307/249008.
9. European Commission. Digital Economy and Society Index (DESI) 2022. Brussels: European Commission; 2022. Available from: https://digital-strategy.ec.europa.eu
10. Hair JF, Hult GTM, Ringle CM, Sarstedt M. A primer on partial least squares structural equation modeling (PLS-SEM). 3rd ed. Thousand Oaks (CA): Sage Publications; 2022. Available from: https://us.sagepub.com/en-us/nam/a-primer-on-partial-least-squares-structural-equation-modeling-pls-sem/book280653
11. International Telecommunication Union. Measuring digital development: facts and figures 2022. Geneva: International Telecommunication Union; 2022. Available from: https://www.itu.int
12. International Telecommunication Union. Measuring digital development: facts and figures 2023. Geneva: International Telecommunication Union; 2023. Available from: https://www.itu.int
13. International Telecommunication Union. Measuring digital development: facts and figures 2023. Geneva: International Telecommunication Union; 2023. Available from: https://www.itu.int/hub/publication/d-ind-ict_mdd-2023/
14. Kline RB. Principles and practice of structural equation modeling. 5th ed. New York: Guilford Press; 2023. Available from: https://www.guilford.com/books/Principles-and-Practice-of-Structural-Equation-Modeling/Rex-Kline/9781462551910
15. Kvale S, Brinkmann S. InterViews: learning the craft of qualitative research interviewing. 3rd ed. Thousand Oaks (CA): Sage Publications; 2015. Available from: https://us.sagepub.com/en-us/nam/interviews/book239402
16. Lincoln YS, Guba EG. Naturalistic inquiry. Beverly Hills (CA): Sage Publications; 1985. Available from: https://us.sagepub.com/en-us/nam/naturalistic-inquiry/book842
17. Maslej N, Fattorini L, Perrault R, Parli V, Reuel A, Brynjolfsson E, *et al*. Artificial Intelligence Index Report 2024. Stanford (CA): Stanford Institute for Human-Centered Artificial Intelligence; 2024. Available from: https://hai.stanford.edu/ai-index/2024-ai-index-report
18. Merriam SB, Tisdell EJ. Qualitative research: a guide to design and implementation. 4th ed. San Francisco (CA): Jossey-Bass; 2016. Available from: https://www.wiley.com/en-us/Qualitative+Research%3A+A+Guide+to+Design+and+Implementation%2C+4th+Edition-p-9781119003618
19. Ng DTK, Leung JKL, Chu SKW, Qiao MS. AI literacy: definition, teaching, evaluation and ethical issues. Comput Educ Artif Intell. 2021;2:100041. doi:10.1016/j.caeai.2021.100041.
20. Norris P. Digital divide: civic engagement, information poverty, and the Internet worldwide. Cambridge: Cambridge University Press; 2001. Available from: https://www.cambridge.org/core/books/digital-divide/58C2C4E0B9E7DCCCFDFACB0B45E6E8E2
21. Organisation for Economic Co-operation and Development. Is education losing the race with technology? AI's progress in maths and reading. Paris: OECD Publishing; 2023. doi:10.1787/73105f99-en.
22. Organisation for Economic Co-operation and Development. The state of implementation of the OECD AI Principles four years on. Paris: OECD Publishing; 2023. doi:10.1787/835641c9-en.
23. Organisation for Economic Co-operation and Development. OECD Digital Economy Outlook 2024. Vol. 1. Paris: OECD Publishing; 2024. doi:10.1787/d30a04c9-en.
24. Organisation for Economic Co-operation and Development. OECD Framework for the Classification of AI Systems. Paris: OECD Publishing; 2024. Available from: https://www.oecd.org
25. Rogers EM. Diffusion of innovations. 5th ed. New York: Free Press; 2003. Available from: https://books.google.com/books?id=9U1K5LjUOwEC
26. Sen A. Development as freedom. Oxford: Oxford University Press; 1999. Available from: https://global.oup.com/academic/product/development-as-freedom-9780192893307

27. Stolpe K, Hallström J. Artificial intelligence literacy for technology education. Comput Educ Open. 2024;6:100159. doi:10.1016/j.caeo.2024.100159.
28. Trist EL, Emery FE. Socio-technical systems. In: Churchman CW, Verhulst M, editors. Management sciences, models and techniques. Vol. 2. Oxford: Pergamon Press; 1960. p.83-97.
29. United Nations Educational, Scientific and Cultural Organization. Recommendation on the Ethics of Artificial Intelligence. Paris: UNESCO; 2021. Available from: https://www.unesco.org/en/artificial-intelligence/recommendation-ethics
30. United Nations Educational, Scientific and Cultural Organization. Readiness Assessment Methodology (RAM): a tool of the Recommendation on the Ethics of Artificial Intelligence. Paris: UNESCO; 2024. Available from: https://www.unesco.org/en/artificial-intelligence
31. UNESCO. Global Education Monitoring Report 2023: technology in education. Paris: UNESCO Publishing; 2023. Available from: https://www.unesco.org/gem-report
32. UNESCO. AI competency framework for students. Paris: UNESCO; 2024. Available from: https://www.unesco.org
33. UNESCO. AI competency framework for teachers. Paris: UNESCO; 2024. Available from: https://www.unesco.org
34. van Dijk JAGM. The digital divide. Cambridge: Polity Press; 2020. Available from: https://www.politybooks.com/bookdetail?book_slug=the-digital-divide--9781509534456
35. van Laar E, van Deursen AJA, van Dijk JAGM, de Haan J. Determinants of 21st-century digital skills and digital competence: a systematic literature review. Comput Human Behav. 2020;72:577-588. doi:10.1016/j.chb.2017.03.010.
36. World Bank. World Development Report 2021: data for better lives. Washington (DC): World Bank; 2021. doi:10.1596/978-1-4648-1600-0.
37. World Bank. Digital Development Overview. Washington (DC): World Bank; 2022. Available from: https://www.worldbank.org/en/topic/digitaldevelopment
38. World Economic Forum. The Future of Jobs Report 2023. Geneva: World Economic Forum; 2023. Available from: https://www.weforum.org/publications/the-future-of-jobs-report-2023
39. World Economic Forum. Global Risks Report 2024. Geneva: World Economic Forum; 2024. Available from: https://www.weforum.org/publications/global-risks-report-2024
40. Yin RK. Case study research and applications: design and methods. 6th ed. Thousand Oaks (CA): Sage Publications; 2018. Available from: https://us.sagepub.com/en-us/nam/case-study-research-and-applications/book250150
41. Zawacki-Richter O, Marín VI, Bond M, Gouverneur F. Systematic review of research on artificial intelligence applications in higher education. Int J Educ Technol High Educ. 2021;18:39. doi:10.1186/s41239-021-00261-7.