ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul736

The Future of Rural ICT Development Through Digital Inclusion: Insights from Kebbi State, Nigeria

Musa Tanimu Karatu[1]; Ibrahim Musa Mungadi[2]; Anas Shehu[3]

[1,2,3]Department of Computer Science, Federal University Birnin Kebbi, 860222, Nigeria

Publication Date: 2026/07/15

Abstract: Digital inclusion has emerged as a critical component of sustainable development, enabling individuals and communities to access and benefit from Information and Communication Technology (ICT). However, significant disparities in digital access and utilization persist between urban and rural areas in Nigeria. In Kebbi State, where a large proportion of the population resides in rural communities, limited ICT infrastructure, inadequate internet connectivity, low digital literacy levels, unreliable electricity supply, and economic constraints continue to restrict meaningful participation in the digital economy. These challenges hinder access to essential services such as education, healthcare, agricultural information, e-governance, and financial inclusion. This study examines the current state of digital inclusion and explores the future of ICT development in rural communities across Kebbi State, Nigeria. The research aims to assess the level of digital access, identify barriers to ICT adoption, and evaluate the potential impact of emerging digital technologies on socio-economic development. Using a survey-based approach complemented by interviews and secondary data analysis, the study investigates the experiences of rural residents, students, farmers, entrepreneurs, and community leaders regarding ICT usage and accessibility. The study highlights the importance of expanding broadband infrastructure, improving digital literacy, promoting affordable internet services, and strengthening policy interventions to bridge the digital divide. The findings are expected to provide valuable insights for policymakers, development agencies, and ICT stakeholders seeking to leverage digital technologies to enhance economic opportunities, social inclusion, and sustainable rural development in Kebbi State and similar regions across Nigeria.

Keywords: *Digital Inclusion, ICT, Rural Communities, Kebbi State, Nigeria, Digital Literacy, Digital Divide, Sustainable Development.*

How to Cite: Musa Tanimu Karatu; Ibrahim Musa Mungadi; Anas Shehu (2026) The Future of Rural ICT Development Through Digital Inclusion: Insights from Kebbi State, Nigeria. *International Journal of Innovative Science and Research Technology*, 11(7), 138-142. https://doi.org/10.38124/ijisrt/26jul736

I. INTRODUCTION

Information and Communication Technology (ICT) is a key driver of modern socio-economic development, improving communication, governance, education, healthcare, and financial services. It is now widely regarded as essential infrastructure for economic growth and innovation [6].

Despite global digital advancement, access to ICT remains uneven. Many developing countries, including Nigeria, face a persistent digital divide, particularly between urban and rural areas. Rural communities often experience poor internet connectivity, weak infrastructure, high service costs, and low digital literacy [16].

In Nigeria, ICT development is concentrated in urban regions, while rural areas remain underserved due to inadequate electricity, limited ICT facilities, and affordability challenges [8]. This situation is more pronounced in Kebbi State, where most communities are rural and still rely on traditional systems of communication, limiting access to digital services in education, agriculture, healthcare, and governance.

Digital inclusion therefore becomes essential, as it ensures that all individuals have access to affordable ICT tools and the skills needed to use them effectively [3]. Beyond access, it promotes meaningful use of technology for social and economic development.

Without digital inclusion, rural communities risk further exclusion from opportunities in the digital economy. Inclusive ICT systems, however, can enhance productivity, reduce poverty, and improve service delivery [11].

This study therefore examines the future of ICT development in rural Kebbi State, focusing on digital inclusion, barriers to adoption, and opportunities for sustainable rural transformation.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul736

II. LITERATURE REVIEW

Digital inclusion has become a central concept in contemporary development studies, referring to equitable access to ICT resources, digital skills, and meaningful usage of technology. [10] Argues that digital inequality is multidimensional, extending beyond access to include skills, usage, and outcomes. This view is supported by recent ICT4D literature, which emphasizes that digital exclusion mirrors broader socio-economic inequalities in society [13].

From a development perspective, ICT has been widely recognized as a driver of socio-economic transformation. [15] and later studies emphasize that technology improves education, communication, and economic participation, but only when combined with human capacity development. Similarly, [4] introduces the concept of "adverse digital incorporation," arguing that digital inclusion alone may still reproduce inequality if power imbalances are not addressed.

The rural digital divide remains a major issue globally, particularly in developing regions. Research shows that rural communities often face infrastructural deficits, poor connectivity, and limited digital literacy [14, 17]. In Sub-Saharan Africa, ICT adoption is further constrained by affordability issues, weak electricity supply, and limited institutional support [1].

In the agricultural and rural development context, [2] found that ICT adoption in Africa is still dominated by basic mobile services, while advanced digital tools remain underutilized due to infrastructure and skill limitations. Similarly, [7] report that rural entrepreneurs struggle with ICT adoption due to high costs, lack of awareness, cybersecurity concerns, and poor infrastructure.

In Nigeria, although mobile penetration has increased significantly, rural ICT development remains limited. Studies show that digital services are concentrated in urban areas, while rural communities continue to experience weak connectivity and low digital literacy [8,9]. This situation is similar to other African contexts where ICT benefits are unevenly distributed.

Several studies have identified key barriers to digital inclusion in rural areas. These include inadequate infrastructure, low ICT skills, high cost of data and devices, poor electricity supply, and weak policy implementation [11, 10]. These barriers collectively reduce the ability of rural populations to fully participate in the digital economy.

The theoretical foundation of this study is based on the Digital Divide Theory, which conceptualizes inequality in ICT access as a result of socio-economic and geographic disparities [12]. The Technology Acceptance Model (TAM) is also relevant in explaining how perceived usefulness and ease of use influence ICT adoption in rural communities.

Overall, the literature indicates that while ICT has strong potential for rural development, structural inequalities continue to limit its impact. This reinforces the need for targeted digital inclusion strategies in rural areas such as Kebbi State, Nigeria.

III. METHODOLOGY

This study adopts a mixed-methods research design, combining quantitative and qualitative approaches to examine digital inclusion and ICT development in rural communities of Kebbi State, Nigeria. The study focuses on rural residents of Ambursa (Birnin Kebbi Local Government Area), Kuka (Kalgo Local Government Area), Tunga (Bunza Local Government Area) and Rafin Zuru (Zuru Local Government Area), including students, farmers, traders, and community leaders. The total population is estimated at 200 respondents, from which a sample of 120 respondents was selected using stratified random sampling. The sample consists of 30 responses from all the four communities to ensure balanced representation across selected participants groups.

Data were collected using structured questionnaires, semi-structured interviews, and secondary sources such as ICT-related reports and government publications. Quantitative data were analyzed using descriptive statistics such as frequencies and percentages, while qualitative data were analyzed thematically to identify key patterns and challenges related to ICT access and digital inclusion. The results from both methods were combined to provide a comprehensive interpretation of findings.

IV. RESULTS AND FINDINGS

This section presents and analyses the data obtained from respondents on digital access, barriers to ICT adoption, socio-economic impacts, and future ICT potential in rural communities of Kebbi State, Nigeria. The data were analyzed using frequency counts and simple percentages, and results are presented in tables for clarity and interpretation.

- *Level of Digital Access*

The findings indicate that mobile phone usage is highly prevalent among respondents (n = 120), while access to computers and broadband internet remains significantly low. This shows that digital access in the study area is largely dependent on mobile-based technology rather than advanced ICT infrastructure.

Table 1 Level of Digital Access Among Respondents

ICT Tool	Yes (Access)	No Access	Percentage Access (%)
Mobile Phone	105	15	87.5%
Internet (Mobile Data)	70	50	58.3%
Computer/Laptop	25	95	20.8%
Broadband Internet	18	102	15.0%

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul736

The table shows that mobile phones have the highest level of access at 87.5%, indicating strong penetration of mobile technology in rural Kebbi communities. However, access to computers (20.8%) and broadband internet (15.0%) is very low, suggesting limited availability of advanced ICT infrastructure. This implies that most digital activities are performed through mobile devices, which may restrict users from engaging in more complex digital tasks such as academic research, software usage, and data processing.

➢ *Barriers to ICT Adoption*

The study identified several factors limiting ICT adoption among respondents. These barriers are mainly infrastructural, economic, and skill-related.

Table 2 Barriers to ICT Adoption

Barrier	Frequency	Percentage (%)
Poor network coverage	95	79.2%
High cost of data services	88	73.3%
Lack of electricity	92	76.7%
Limited ICT skills	80	66.7%

The findings reveal that poor network coverage (79.2%) is the most significant barrier to ICT adoption, followed closely by lack of electricity (76.7%) and high cost of data services (73.3%). Limited ICT skills (66.7%) also contributes significantly to low digital participation. These challenges collectively hinder effective access to ICT services and slow down digital development in rural areas. The Bar chart below also capture those Barriers.

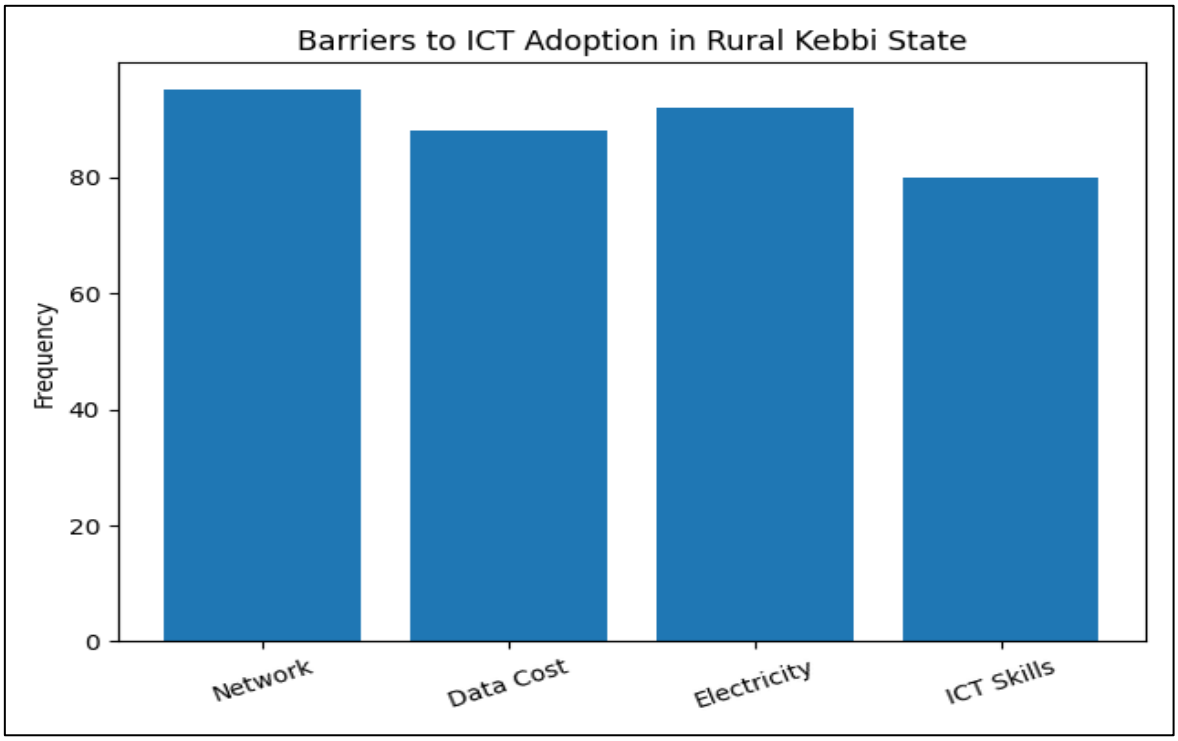

Fig 1 Barriers to ICT Adoption in Rural Kebbi State

➢ *Socio-Economic Impact of Limited ICT Access*

The study further examined how limited ICT access affects socio-economic activities in rural communities

Table 3 Effects of Limited ICT Access

Impact Area	Frequency	Percentage (%)
Agricultural productivity	85	70.8%
Online education access	90	75.0%
Healthcare information	78	65.0%
Financial inclusion	82	68.3%

The results show that limited ICT access has significant negative effects across key socio-economic sectors. Online education is the most affected area (75.0%), followed by agricultural productivity (70.8%) and financial inclusion (68.3%). Healthcare information access is also affected (65.0%). This indicates that inadequate ICT infrastructure directly limits development opportunities and access to essential services in rural communities.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul736

➢ *Future ICT Potential*

Most respondents expressed optimism that improved infrastructure, affordable internet, and government intervention could significantly enhance rural development.

Table 4 Perception of Future ICT Development

Response Type	Frequency	Percentage (%)
Positive view	98	81.7%
Neutral	12	10.0%
Negative view	10	8.3%

The findings reveal a strong optimism among respondents regarding future ICT development, with 81.7% expressing a positive outlook. Only a small proportion (8.3%) expressed a negative view. This suggests that despite current challenges, there is strong belief that improved infrastructure, government support, and affordable internet services can significantly enhance ICT adoption and rural development.

V. DISCUSSION

The results show that digital inclusion in the selected rural communities of Ambursa, Kuka, and Tunga in Kebbi State is still at a low level despite high mobile phone ownership (87.5%). Access to computers (20.8%) and broadband internet (15.0%) remains very limited, indicating that ICT usage is mainly mobile-based rather than productivity-driven, consistent with observations by International Telecommunication Union [6].

Key barriers to ICT adoption across Ambursa, Kuka, and Tunga include poor network coverage (79.2%), lack of electricity (76.7%), high data costs (73.3%), and limited ICT skills (66.7%). These findings show that infrastructural and economic constraints remain the dominant challenges, aligning with the [16,5], which emphasize infrastructure and affordability as key determinants of digital access.

The socio-economic effects are also significant in Ambursa, Kuka, and Tunga, particularly in education (75.0%), agriculture (70.8%), financial inclusion (68.3%), and healthcare access (65.0%). This confirms that digital exclusion affects key development sectors, as supported by [3] and [4], who argue that lack of digital access deepens inequality and limits access to essential services.

Despite these challenges, most respondents (81.7%) across the selected communities expressed optimism about future ICT development, suggesting strong readiness for digital transformation if infrastructure, affordability, and digital skills are improved. Overall, the findings highlight a clear and persistent digital divide in Ambursa, Kuka, and Tunga driven by structural limitations, consistent with the multidimensional digital inequality perspective of Organisation for Economic Co-operation and Development [9, 12].

VI. CONCLUSION

The study concludes that digital inclusion in Ambursa, Kuka, and Tunga is still low despite high mobile phone ownership. Limited access to computers, broadband internet, and poor ICT infrastructure, along with economic and skill-related barriers, continue to restrict meaningful ICT use in the area. However, there is strong optimism for future improvement if these challenges are addressed.

RECOMMENDATIONS

- Improvement of ICT Infrastructure: Government and telecommunication providers should expand and strengthen network coverage and broadband internet services in Ambursa, Kuka, and Tunga.
- Provision of Stable Electricity Supply: Reliable electricity, including renewable energy solutions such as solar systems, should be prioritized to support consistent ICT usage in rural communities.
- Affordable Internet Services and Digital Inclusion Support: Internet service providers should reduce data costs, while government interventions such as subsidies and digital inclusion programs should be introduced to enhance access.
- ICT Skills Development Programs: Regular digital literacy and ICT training should be implemented to improve the ability of rural residents to effectively use digital technologies.

REFERENCES

[1]. Arakpogun, E. O., Elsahn, Z., Nyuur, R. B., & Olan, F. (2020). Threading the needle of the digital divide in Africa: The barriers and mitigations of infrastructure sharing. *Technological Forecasting and Social Change, 179*, 121637. https://doi.org/10.1016/j.techfore.2020.120263

[2]. Ayim, C., Kassahun, A., Tekinerdogan, B., & Addison, C. (2020). Adoption of ICT innovations in the agriculture sector in Africa: A systematic literature review. *arXiv*. https://arxiv.org/abs/2006.13831

[3]. Broadband Commission for Sustainable Development. (2023). *State of broadband 2023: Digital connectivity a transformative opportunity*. ITU/UNESCO. https://broadband.itu.int Accessed: 15 March 2026

[4]. Heeks, R. (2021). From digital divide to digital justice in the global South: Conceptualising adverse digital incorporation. *arXiv*. https://arxiv.org/abs/2108.09783

[5]. International Telecommunication Union. (2022). *Global connectivity report 2022*. ITU Publications. https://www.itu.int. Accessed: 15 March 2026. pp. 10–38

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul736

[6]. International Telecommunication Union. (2023). *Facts and figures 2023: Measuring digital development*. ITU Publications. https://www.itu.int. Accessed: 15 March 2026. pp. 1–45
[7]. Kamutuezu, E. U., Winschiers-Theophilus, H., & Peters, A. (2021). An exploration of factors influencing ICT-enabled entrepreneurship applications in Namibian rural communities. *arXiv*. https://arxiv.org/abs/2108.09789
[8]. Nigerian Communications Commission. (2023). *Annual broadband penetration report*. NCC Nigeria. https://www.ncc.gov.ng. Accessed: 15 March 2026
[9]. OECD. (2021). *Bridging digital divides: Inclusive internet access*. OECD Publishing. https://www.oecd.org Accessed: 15 March 2026. pp. 12–64
[10]. Sey, A., & Hafkin, N. (2021). *Gender and ICT policy in Africa*. International Development Research Centre.
[11]. United Nations Development Programme. (2022). *Digital transformation and inclusive development in Africa*. UNDP. https://www.undp.org Accessed: 15 March 2026. pp. 15–52
[12]. Van Dijk, J. (2020). *The digital divide*. Polity Press.
[13]. Vassilakopoulou, P., & Hustad, E. (2023). Bridging digital divides: A literature review and research agenda for information systems research. *Information Systems Frontiers, 25*(3), 955–969. https://doi.org/10.1007/s10796-020-10096-3
[14]. Warren, M. (2007). The digital vicious cycle: Links between social disadvantage and digital exclusion in rural areas. *Telecommunications Policy, 31*(6–7), 374–388. https://doi.org/10.1016/j.telpol.2007.04.001
[15]. Warschauer, M. (2003). *Technology and social inclusion: Rethinking the digital divide*. MIT Press.
[16]. World Bank. (2022). *Digital development in Sub-Saharan Africa: Overview report*. World Bank Group. https://www.worldbank.org Accessed: 15 March 2026. pp. 20–75
[17]. Zheng, J. J., Yang, D., Li, E., Ma, Y., & Wang, Y. (2024). Bridging the digital divide: Leveraging new media for rural development. *Journal of the Knowledge Economy*. https://doi.org/10.1007/s13132-024-02130-5