

Technology and Inclusive Growth: Addressing Poverty, Inequality and Income Distribution in Nigeria

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Abstract

Technology has become an increasingly important driver of economic transformation and development, with significant implications for poverty reduction, inequality, and income distribution in Nigeria. This study examines the relationship between technological advancement and inclusive growth in Nigeria using data sourced from the CBN statistical bulletin and the World Development Indicators (WDI) from 1995 to 2024. The dependent variable is poverty rate (POV), while the inclusive growth index (IGI), mobile phone subscription (MOBSUB), internet penetration (INTPEN), ICT index (ICTINDEX), education (EDU), foreign direct investment (FDI), GDP growth rate (GDPg), inflation rate (INFL) and government expenditure (GOVEXP) were the independent and control variables, respectively. A composite inclusive growth rate index (IGI) for Nigeria was developed using ten indicators applying principal component

analysis from E-view 9 to derive a single value for each year and was used to regress with other listed variables of technology. The test mechanisms adopted for the study were the unit root test, co-integration and VAR technique. The findings reveal that the ICT index, government expenditure, GDP growth rate, inclusive growth index, and inflation rate have positive influential shocks or responses on poverty, inequality, and income distribution in Nigeria, suggesting that Nigeria's challenge is not simply to generate economic and technological growth but to ensure that such growth is inclusive, pro-poor, employment-generating, and capable of improving income distribution, which is particularly important for achieving sustained reductions in poverty and inequality. However, mobile phone subscription, internet penetration, education, and foreign direct investment showed negative and insignificant relationships or shocks on poverty, inequality, and income distribution, implying that the study would provide strong empirical support for the argument that technology and economic growth reduce poverty most effectively when they are accompanied by human-capital development and equitable access to economic opportunities. For policy, the study recommended that the government should formulate inclusive growth policies that require simultaneous investment in digital infrastructure, affordable mobile and broadband access, quality education and digital skills, and broad-based economic growth. These interventions should particularly target rural communities, low-income households, women, young people, and informal-sector workers.

Keywords: Technology, inclusive growth, inequality, poverty rate, income distribution

1.1 Introduction

Economic growth has historically been considered a central objective of development policy because of its potential to improve living standards, generate employment opportunities, and reduce poverty. However, contemporary development debates have increasingly recognized that economic growth measured through aggregate indicators such as gross domestic product (GDP) does not necessarily translate into improved welfare for all members of society. In many developing countries, including Nigeria, periods of economic expansion have coexisted with persistent poverty, unemployment, inequality, and uneven access to economic opportunities. This has shifted attention from growth-oriented development strategies toward the concept of inclusive growth, which emphasizes not only the rate of

economic expansion but also the extent to which individuals and groups participate in and benefit from economic progress (World Bank, 2021).

Inclusive growth represents a development approach that seeks to ensure that economic opportunities are accessible to all segments of society, particularly vulnerable groups such as low-income households, women, young people, and rural populations. It integrates economic growth with poverty reduction, productive employment creation, social inclusion, and equitable income distribution. According to the Organization for Economic Co-operation and Development (OECD, 2018), inclusive growth focuses on enabling people to contribute to economic activity while ensuring that the benefits of growth are broadly shared. Therefore, a society experiencing economic growth without improvements in income distribution, employment opportunities, and social welfare may not achieve meaningful inclusive development.

Nigeria's growth trajectory over the past two decades has been characterized by periods of economic expansion alongside persistent poverty, inequality, and uneven income distribution. Although the economy has experienced structural changes and increasing contributions from the services sector, the benefits of growth have not been sufficiently broad-based. Recent World Bank estimates indicate that poverty remains widespread, with about 41.8% of Nigerians living below the international poverty line of US\$3.00 per day in 2022, while the Gini index stood at about 33.9, reflecting continuing inequality in the distribution of income and consumption (World Bank, 2026). Moreover, the number of Nigerians living below the poverty line increased substantially over the past decade, highlighting the challenge of translating aggregate economic growth into improvements in living standards (World Bank, 2024).

Against this background, technology has increasingly emerged as an important potential driver of inclusive growth in Nigeria. The expansion of mobile telecommunications, internet connectivity, fintech, digital payments, e-commerce, and other digital services has created new channels through which individuals and firms can participate in economic activities. The World Bank (2019) argues that improvements in digital connectivity, digital skills, digital financial services, and digital entrepreneurship could create jobs, expand economic opportunities, and improve welfare in Nigeria. More recent evidence indicates that exposure to internet coverage in Nigeria and Tanzania was associated with approximately a 7% decline in extreme poverty after three or more years, alongside increases of up to 8% in labour-force participation and wage employment (World Bank, 2024). This suggests a potentially important trajectory from technological diffusion to employment creation, productivity enhancement, financial access, and ultimately poverty reduction.

Digital financial technology is particularly relevant to inclusive growth because it can reduce the geographical and cost barriers associated with conventional financial services. Nigeria has witnessed substantial growth in fintech and digital payment services, although financial exclusion remains significant. About 80% of Nigerian adults had access to mobile phones, providing an important platform for extending financial services to rural and underserved populations (Wezel & Ree, 2023). Nevertheless, the benefits remain uneven: rural populations, low-income groups, and people with limited educational attainment continue to experience greater exclusion. Thus, technology can simultaneously promote inclusion and reproduce inequality when access to infrastructure, digital skills, finance, and reliable connectivity is concentrated among higher-income and urban populations (Wezel & Ree, 2023).

One of the emerging facts from Nigeria is that technological progress has accelerated faster than the distribution of its benefits. On one hand, digitalization, fintech, mobile connectivity, and online platforms are opening new opportunities for entrepreneurship, employment, financial inclusion, and access to markets. On the other hand, persistent poverty, digital-skill gaps, rural–urban disparities, inadequate infrastructure, and unequal access to finance limit the ability of poorer households to benefit fully from technological change. Consequently, the relationship between technology and inclusive growth is not automatic. Technology is more likely to reduce poverty and inequality when complemented by investments in human capital, affordable digital infrastructure, financial inclusion, and policies that broaden access to productive opportunities. This makes the investigation of technology’s effects on poverty, inequality, and income distribution particularly important for understanding whether Nigeria’s digital transformation can translate into genuinely inclusive economic growth.

1.2 Statement of the Problem

The pursuit of inclusive growth has become a central development challenge in Nigeria due to the persistent coexistence of economic expansion, technological advancement, and widespread socioeconomic inequalities. Although Nigeria has experienced considerable economic transformation, particularly through the expansion of telecommunications, digital services, and financial technologies, the benefits of growth have not been evenly distributed across the population. A major development concern is that economic progress and technological innovation have not sufficiently translated into significant reductions in poverty, improved income distribution, or equal access to economic opportunities for all citizens.

Nigeria's poverty situation remains a critical challenge despite various economic reforms and growth initiatives. Available evidence indicates that a large proportion of Nigerians continue to experience significant deprivation in income, employment opportunities, and access to basic services. The World Bank (2024) reports that poverty reduction in Nigeria has been constrained by slow structural transformation, limited job creation, and regional disparities, with poverty rates considerably higher in northern regions compared with southern regions. This suggests that economic growth has not generated adequate inclusive opportunities capable of improving the welfare of vulnerable populations.

A major problem is the disconnect between technological advancement and broad-based economic inclusion. Nigeria has witnessed rapid growth in digital technologies, including mobile telecommunications, internet services, fintech platforms, and digital entrepreneurship. However, access to and benefits from these technologies remain unevenly distributed. While technology has created new opportunities in areas such as digital finance, online businesses, remote employment, and innovation-driven enterprises, many Nigerians remain excluded due to limited digital infrastructure, high costs of connectivity, inadequate digital skills, and geographical inequalities. The World Bank (2025) notes that Nigeria continues to face significant broadband access challenges, with gaps in internet quality, affordability, and infrastructure limiting widespread digital participation.

The persistence of the digital divide represents a major obstacle to achieving technology-driven inclusive growth. Individuals and businesses in urban centers with better infrastructure are more likely to benefit from digital transformation than rural populations that often experience limited connectivity and technological resources. Although internet usage has expanded in Nigeria, access remains incomplete, with recent World Bank data indicating that internet users represented about 41% of the population in 2024, demonstrating that a significant share of Nigerians remain outside the digital economy. Consequently, technology risks becoming a source of further inequality if access and capabilities are concentrated among higher-income groups, educated individuals, and urban residents.

Another dimension of the problem relates to income distribution and labor market outcomes. Technology has the potential to improve productivity, create employment opportunities, and support entrepreneurship, but these benefits depend heavily on individuals' ability to acquire relevant skills and access digital resources. Nigeria's labor market is characterized by high levels of informal employment, youth unemployment, and underemployment, which limit income mobility and economic security. Technological transformation may generate new opportunities in sectors such as software development, e-commerce, and digital services; however, without inclusive digital education and skills

development, many workers may be unable to participate effectively in emerging technology-based industries (Acemoglu & Restrepo, 2020).

Furthermore, technological innovation has created concerns regarding the possibility of widening income inequality. While highly skilled workers, technology entrepreneurs, and digitally connected firms may experience increased productivity and income gains, low-skilled workers and marginalized communities may not experience similar benefits. The unequal distribution of technological capabilities can therefore reinforce existing patterns of social and economic inequality. According to the OECD (2018), inclusive growth requires not only innovation and productivity improvements but also mechanisms that ensure individuals across different socioeconomic groups can participate in and benefit from economic transformation.

The problem is also evident in Nigeria's financial inclusion landscape. Although fintech innovations have expanded access to financial services through mobile payments, digital banking, and online financial platforms, significant segments of the population remain excluded from formal financial systems due to poverty, limited digital literacy, and inadequate infrastructure. Financial exclusion reduces individuals' ability to save, access credit, invest in businesses, and improve their economic circumstances. Therefore, while technology offers solutions for expanding financial opportunities, its impact on poverty reduction depends on whether disadvantaged groups can effectively access and utilize these innovations (Demirgüç-Kunt et al., 2022).

In addition, regional and socioeconomic disparities continue to influence who benefits from technological progress. Nigeria's economic opportunities are concentrated largely in major urban centers, while many rural communities face constraints related to electricity supply, internet connectivity, education, and investment. These structural inequalities limit the capacity of technology to serve as an equalizing force. Instead of reducing disparities, technological advancement may unintentionally deepen existing divisions between digitally connected and digitally excluded populations.

The central problem, therefore, is not the absence of technology in Nigeria but the limited capacity to ensure that technological advancement translates into inclusive economic outcomes. The challenge lies in creating an enabling environment where technology contributes directly to poverty reduction, employment generation, improved income distribution, and greater participation of marginalized groups in economic activities. Without deliberate policies addressing digital access, affordability, skills development, and institutional support, technological progress may continue to produce unequal benefits.

Despite increasing scholarly and policy attention to the role of technology in development, there remains insufficient empirical understanding of how technological

advancement influences inclusive growth outcomes in Nigeria, particularly regarding poverty reduction, inequality, and income distribution. Existing studies often focus on digital adoption, financial technology growth, or economic performance separately, while limited attention is given to the broader relationship between technology and inclusive socioeconomic transformation.

Therefore, this study seeks to address this gap by examining the role of technology in promoting inclusive growth in Nigeria. Specifically, it investigates whether technological development serves as a mechanism for reducing poverty, narrowing inequality, and improving income distribution, or whether unequal access to technological resources reinforces existing socioeconomic disparities. Understanding this relationship is essential for designing policies that ensure Nigeria's digital transformation contributes to sustainable and equitable economic development.

1.3 Objective of the Study

The main objective of this study is to examine the role of technology in promoting inclusive growth in Nigeria, with particular focus on its impact on poverty reduction, inequality, and income distribution. The specific objective is to analyze dynamic and causal relationships between technology adoption, driven inclusive growth, income distribution, and poverty reduction among different socioeconomic groups in Nigeria.

1.4 Research Question

The study will attempt to answer the question:

- i. Does technology progress and shock affect inclusive growth, income inequality, income distribution, and poverty reduction in Nigeria?

1.5 Research Hypothesis

To answer the question above, the following hypothesis stated in null form will be tested:

- i. Technology progress and shock, inclusive growth, and income inequality and income distribution do not significantly contribute to poverty reduction in Nigeria.

2.0 Literature Review

2.1 Conceptual Issues

2.1.1 The Concept of Technology and Inclusive Growth in Nigeria

Technology refers to the application of scientific knowledge, tools, systems, and processes to solve human problems, improve productivity, and create new opportunities. In the context of Nigeria, technology includes information and communication technologies (ICT), digital platforms, mobile services, artificial intelligence, financial technologies (fintech), and other innovations that support economic and social development. Technology has become an important driver of inclusive growth because it can expand access to markets, education, healthcare, financial services, and employment opportunities for different segments of society, including disadvantaged and rural populations (World Bank, 2019).

Inclusive growth refers to economic growth that benefits a broad section of the population by creating opportunities for participation, reducing inequality, and improving living standards. Unlike traditional economic growth models that focus mainly on increases in national income, inclusive growth emphasizes equal access to resources, productive employment, social services, and economic opportunities (World Bank, 2025). In Nigeria, inclusive growth is particularly important because of challenges such as poverty, unemployment, regional inequalities, and unequal access to infrastructure.

Technology contributes to inclusive growth in Nigeria by improving connectivity and enabling people and businesses to participate in the digital economy. The expansion of mobile telecommunications, internet services, and digital financial platforms has allowed millions of Nigerians to access banking, business opportunities, and information services that were previously unavailable. Digital financial services, for example, have supported financial inclusion by enabling individuals and small businesses to make payments, save money, and access financial products through mobile platforms (GSMA, 2024).

Furthermore, technology supports entrepreneurship and job creation by encouraging innovation and the growth of digital enterprises. Nigeria has developed a vibrant technology ecosystem, particularly in areas such as fintech, e-commerce, software development, and digital services. Start-ups and technology-based businesses provide employment opportunities for young Nigerians and contribute to economic diversification beyond dependence on oil resources (World Bank, 2019).

Technology also enhances access to essential services. In education, digital learning platforms can provide knowledge and skills training to learners who may not have access to traditional institutions. In healthcare, digital health solutions can improve access to medical information and services, especially in underserved communities. In agriculture, digital tools

can help farmers obtain market information, weather updates, and improved farming techniques, thereby increasing productivity and income.

However, achieving technology-driven inclusive growth in Nigeria requires addressing significant challenges. These include inadequate electricity supply, limited broadband coverage in rural areas, high internet costs, low levels of digital literacy, and unequal access among different social groups. The World Bank notes that while Nigeria has made progress in digital development, gaps in infrastructure and connectivity continue to limit the participation of many rural and marginalized communities in the digital economy (World Bank, 2019).

In conclusion, technology is a major instrument for achieving inclusive growth in Nigeria because it creates opportunities for economic participation, innovation, and improved access to services. However, technology alone cannot guarantee inclusion; it must be supported by investments in digital infrastructure, education, affordable connectivity, and policies that ensure all Nigerians can benefit from technological advancement.

2.1.2 Addressing Poverty, Inequality, and Income Distribution in Nigeria

Addressing poverty, inequality, and income distribution is a central objective of economic development in Nigeria. These three concepts are closely interconnected because high levels of poverty are often associated with unequal income distribution, while persistent inequality limits opportunities for inclusive economic growth. Nigeria, despite being one of Africa's largest economies, continues to face significant challenges in reducing poverty and ensuring equitable distribution of wealth due to unemployment, regional disparities, corruption, weak institutions, and overdependence on oil revenue (World Bank, 2023).

Poverty refers to the condition in which individuals or households lack sufficient income and resources to meet their basic needs, including food, shelter, healthcare, education, and clothing. In Nigeria, poverty is multidimensional, affecting both urban and rural populations through limited access to essential services and economic opportunities (National Bureau of Statistics [NBS], 2022). Addressing poverty requires policies that promote employment, improve access to quality education and healthcare, strengthen social protection programs, and support agricultural and small business development.

Inequality refers to the uneven distribution of income, wealth, opportunities, and access to public services among individuals or groups within society. Income inequality in Nigeria is evident across geographical regions, gender, educational attainment, and occupations. High inequality reduces social mobility, weakens economic productivity, and increases the risk of social unrest (United Nations Development Programme [UNDP], 2024). Reducing inequality involves implementing inclusive economic policies, investing in human

capital, promoting equal access to education and healthcare, and expanding financial inclusion.

Income distribution describes how a nation's total income is shared among its population. A fair income distribution ensures that economic growth benefits all segments of society rather than concentrating on wealth among a small proportion of the population. In Nigeria, income distribution remains uneven due to structural unemployment, unequal educational opportunities, inflation, and disparities in economic development across regions (Organisation for Economic Co-operation and Development [OECD], 2023). Government interventions such as progressive taxation, minimum wage policies, targeted social welfare programs, and investment in productive sectors can contribute to a more equitable distribution of income.

Addressing poverty, inequality, and income distribution requires a comprehensive development strategy that promotes inclusive growth. Such a strategy includes improving governance, diversifying the economy beyond oil, creating sustainable employment opportunities, strengthening infrastructure, encouraging private sector investment, and ensuring transparency in public resource management. Furthermore, achieving the Sustainable Development Goals (SDGs), particularly Goal 1 (No Poverty) and Goal 10 (Reduced Inequalities), provides an important framework for Nigeria's efforts toward sustainable and inclusive development (United Nations, 2015). Overall, reducing poverty, narrowing inequality, and promoting equitable income distribution are essential for enhancing economic stability, improving living standards, and achieving sustainable national development in Nigeria.

2.2 Theoretical Framework

2.2.1 Endogenous Growth Theory

The endogenous growth theory was developed by economists such as Paul Romer in 1986 and Robert Lucas Jr. in 1988. The theory argues that economic growth is generated from within an economy through investments in human capital, innovation, knowledge creation, research and development, and technological advancement. According to this theory, technology is not merely a factor that happens independently but is created and improved through deliberate economic activities and investments. The theory emerged as a response to the limitations of traditional economic growth theories that viewed technological progress as an external factor.

The implication of this theory for Nigeria is that investment in digital infrastructure, education, innovation, and technological skills can enhance productivity, create employment opportunities, and support sustainable economic growth. By improving access to

technology, Nigeria can increase economic participation among individuals and businesses, especially in sectors such as agriculture, finance, education, and small-scale enterprises. However, inadequate infrastructure, limited digital skills, and unequal access to technology may reduce the ability of some groups to benefit from technological progress.

The theory is relevant to the topic because it explains how technology can serve as a catalyst for inclusive growth. It provides a basis for understanding how technological innovation can reduce poverty, improve income opportunities, and contribute to a more equitable distribution of economic benefits in Nigeria.

2.2.2 The Diffusion of Innovation Theory

The Diffusion of Innovation Theory was developed by Everett Rogers in 1962. The theory argued that the adoption of innovation depends on factors such as the perceived usefulness of the technology, its compatibility with existing practices, its complexity, the opportunity to test it, and the visibility of its benefits. The theory also identifies different categories of adopters, including innovators, early adopters, early majority, late majority, and laggards. The theory explains the process through which new ideas, technologies, and innovations spread within a society.

In Nigeria, the theory highlights the importance of encouraging the adoption of digital technologies such as mobile banking, online learning platforms, agricultural technologies, and digital business tools. The extent to which these technologies contribute to inclusive growth depends on factors such as affordability, digital literacy, internet availability, and public acceptance. Where technology adoption is concentrated among urban and wealthier populations, it may increase existing inequalities.

The relevance of this theory as it relates to this study is that it helps explain how technology spreads across different groups in Nigeria and how barriers to adoption can affect poverty reduction and income distribution. Understanding technology diffusion is important for designing policies that ensure technological benefits reach rural communities, low-income households, and marginalized groups.

2.2.3 Technology Acceptance Model (TAM)

The Technology Acceptance Model was introduced by Fred Davis in 1989. The theory explains why individuals accept or reject new technologies. It states that technology adoption is mainly influenced by two factors: perceived usefulness and perceived ease of use. Individuals are more likely to adopt technology when they believe it improves their performance and when they find it easy to understand and use.

In Nigeria, this theory explains why some individuals and organizations adopt digital services while others do not. For example, the use of mobile banking, electronic payment systems, and online business platforms depends on factors such as trust, affordability, accessibility, security, and digital skills. Limited awareness or technological difficulties may prevent some groups from benefiting from digital innovations. The theory is relevant to the topic because achieving inclusive growth through technology requires widespread adoption. Understanding the factors that influence technology acceptance can help policymakers develop strategies that encourage digital inclusion and ensure that technological benefits contribute to poverty reduction and improved income distribution.

2.3 Empirical Review

Sebil Oshota (2019) examined the impact of technology access, inclusive growth, and poverty reduction in Nigeria: Evidence from the Error Correction Modeling Approach. The study examined the relationship between technology access, infrastructure development, inclusive growth, and poverty reduction in Nigeria using secondary data covering the period 1980–2014, obtained from national and international databases. The researcher employed the Error Correction Model (ECM) technique to determine both short-run and long-run relationships among technology access, infrastructure, and poverty reduction. The findings revealed that access to infrastructure, including electricity and transportation, significantly improves poverty reduction and promotes inclusive growth. The study concluded that technological development alone is insufficient without complementary infrastructure that allows individuals and businesses to utilize technology effectively. The study recommended increased investment in infrastructure development, improved access to modern technologies, and policies aimed at expanding technology benefits to disadvantaged populations.

Abubakar et al. (2024) investigated the influence of information and communication technology on poverty alleviation in Nigeria using data from secondary sources, including the World Bank and International Telecommunication Union (ITU) databases, covering the period 1992–2020. The study employed the Autoregressive Distributed Lag (ARDL) model to analyze the short-run and long-run effects of ICT on poverty reduction. The results showed that ICT development has a positive effect on poverty reduction, with technological advancement contributing to improved economic opportunities and human development. The study also found that economic growth, foreign direct investment, and domestic credit support strengthen the poverty-reducing impact of ICT. The authors recommended increased investment in the ICT sector, expansion of digital infrastructure, and policies that encourage private sector participation in technology development to enhance poverty alleviation.

International Journal of Social Economics researchers (2024) examined whether Digitalization Crusade is a way out of poverty and income inequality: evidence from developing countries. The study examined whether digitalization could reduce poverty and income inequality in developing economies using panel data from 17 developing countries between 2005 and 2021. Digitalization was measured using a digitalization index developed through Principal Component Analysis (PCA), while the analysis was conducted using Fully Modified Ordinary Least Squares (FMOLS), Dynamic Ordinary Least Squares (DOLS), and Augmented Mean Group (AMG) estimation techniques. The findings indicated that increased digitalization contributes to poverty reduction and can improve income distribution by expanding access to economic opportunities. However, the benefits of digitalization depend on the availability of supportive institutions, digital skills, and infrastructure. The study recommended that developing countries should prioritize digital inclusion policies, improve internet accessibility, and strengthen digital skills development to ensure that technological progress benefits vulnerable groups.

Olawale and Olaniyi (2023) investigated Financial Inclusion through Digital Channels and the Growth-Inequality-Poverty Triangle: Evidence from Africa. The study investigated how digital financial inclusion affects economic growth, poverty, and inequality across African countries using panel data from 42 African countries covering 1995–2018 and applied simultaneous-equation models, two-step system Generalized Method of Moments (GMM), and Toda-Yamamoto causality tests to establish relationships among digital financial inclusion, poverty, inequality, and economic growth. The findings showed that digital financial inclusion significantly reduces poverty and inequality while contributing positively to economic growth. The authors therefore recommended improving digital financial infrastructure, promoting affordable financial technologies, and developing policies that encourage access to digital financial services among low-income populations.

Adegoke et al. (2026) examined digital inequality and the new development divide in Africa: A Review of Nigerian Experience from Access to Advantage using a qualitative review approach based on existing literature and policy documents to examine digital inequality and its implications for development in Nigeria. The findings revealed that although Nigeria has experienced significant growth in digital connectivity, disparities remain due to differences in income levels, geographical location, infrastructure availability, and digital literacy. The study recommended that government and stakeholders should focus on affordable internet access, digital skills training, rural connectivity, and inclusive technology policies to prevent technology from widening existing inequalities.

Olaniyi (2022) investigated digital financial inclusion and poverty reduction in Nigeria. The research examined whether access to digital financial services contributes to poverty

reduction among Nigerians using secondary data from the World Bank Global Findex Database, Central Bank of Nigeria reports, and Nigerian financial sector statistics and adopted applied econometric techniques, including Ordinary Least Squares (OLS) regression and correlation analysis, to examine the relationship between digital financial inclusion indicators and poverty outcomes. The findings indicated that digital financial inclusion improves access to savings, credit facilities, and business opportunities, thereby contributing to poverty reduction. However, the study found that inadequate digital literacy, poor internet access, and affordability challenges limit the ability of rural and low-income households to benefit from digital finance. The study recommended expanding digital infrastructure, improving financial literacy, and implementing policies that promote affordable digital financial services.

ITU (2021) examined digital trends in Africa: ICT development and digital transformation. The report examined the role of digital connectivity in promoting economic development and social inclusion across African countries, including Nigeria. Data were collected from ICT indicators, telecommunications statistics, national digital development reports, and household surveys. The report used descriptive analysis and comparative assessment methods to evaluate digital access, connectivity, and technology adoption trends. The report found that digital technologies support financial inclusion, education access, entrepreneurship, and public service delivery. However, it identified affordability, infrastructure gaps, and unequal digital skills as major barriers to inclusive digital transformation. The report recommended policies aimed at reducing internet costs, expanding broadband coverage, and improving digital literacy among underserved populations.

The World Bank (2021) produced a report titled "World Development Report 2021: Data for Better Lives." The report analyzed how digital technologies and data systems influence development outcomes, including inequality reduction and economic inclusion. The study used global development datasets, household surveys, and case studies from developing countries. The analysis involved policy evaluation and comparative development assessment. The report highlights the importance of digital systems in improving access to economic opportunities in Nigeria. The findings showed that digital technologies can reduce inequality by improving access to markets, financial services, education, and government services. It recommended investment in digital infrastructure, human capital development, and inclusive digital policies.

NBS (2021) reported on the "Micro, Small and Medium Enterprises (MSMEs) Survey Report" by examining the role of technology adoption in improving the performance of small businesses in Nigeria. Data were obtained through enterprise surveys conducted

among Nigerian MSMEs across different sectors and regions. The study used descriptive statistical analysis to assess business performance, technology usage, employment contribution, and challenges faced by enterprises. The findings showed that businesses using digital tools such as online marketing, electronic payments, and digital record systems experienced improved market access and operational efficiency. However, many enterprises faced challenges, including high technology costs, poor internet connectivity, and limited digital skills. The report recommended stronger government support for digital adoption among SMEs through training programs, affordable technology solutions, and improved infrastructure.

2.4 Summary of Literature Review

The reviewed studies demonstrate that technology has the potential to promote inclusive growth by reducing poverty, expanding economic opportunities, improving financial inclusion, and supporting better income distribution. Empirical evidence from Nigeria and other developing countries generally shows a positive relationship between ICT development and poverty reduction. However, the literature also highlights that unequal access to technology, inadequate infrastructure, and limited digital skills may prevent vulnerable groups from benefiting from technological advancement. Therefore, achieving technology-driven inclusive growth in Nigeria requires policies that promote digital accessibility, infrastructure development, affordability, and human capital.

3.0 Research Methodology

3.1 Research Design

The research design for this study is quantitative in nature. Hence, we used an ex-post facto research design. The models for this study were estimated using data on technology, inclusive growth, poverty rate, inequality, and income distribution indicators, which include Poverty Rate (POV), Internet Penetration (INTPEN), Mobile Phone Subscription (MOBSUB), Technology Adoption Index (TECH), Gross Domestic Product Growth Rate (GDPg), Inflation Rate (INFL), and Government Expenditure (GOVEXP) for the period 1995-2024. An inclusive growth index was equally constructed using ten variables, which include Life Expectancy (LEXP), Control of Corruption (CONCOR), Gross Domestic Product Per Capita (GDPPC), Employment Generation (EMP), Government Expenditure on Education (GOVEXE), Electric Power Consumption (EPC), Number of Rural Bank Branches (NBB), Credit to Private Sector (CTS), Financial Sector Efficiency (FSE), and Personal Income Share (PIS) using principal component analysis. A multiple regression analysis using Vector Auto-Regression analysis (VAR), predicated on various data

diagnostics including Augmented Dickey-Fuller (ADF) and Philip-Peron (PP) unit root tests, is adopted to determine the technological shocks or progress on inclusive growth, distinguish between the short and long run impact, and examine how shocks to technology affect poverty, income inequality, income distribution, and economic growth. The VAR adopted will also conduct Impulse Response Functions (IRFS) to see how these variables respond over time after technology shock and will also perform Forecast Error Variance Decomposition (FEVD) to determine how much of the variation in poverty or inequality is explained by technology shock.

3.2 Construction of the Inclusive Growth Index

Given the indicators of poverty rate, the concern is centered on the construction of inclusive Growth Index (IGI). In developing the Inclusive Growth Index, the following ten Indicators were used: life expectancy at birth (per year), control of corruption (%), GDP per capita (N'M), unemployment (%), government expenditure on education, electric power consumption (KWh per capita), number of bank branches (per 100,000 adult), credit to SMEs (N'M), financial sector efficiency, personal income share in National Income (GDP) - Which will be summed up to derive a single value using principal component analysis from E-view 9. Thus:

$$IGI_t = \frac{LEXP + CONCOR + GDPPC + EMP + GOVEXE + EPC + NBB + CTS + FSE + PIS}{IGI_{t-1}}$$

With data from the World Bank (2021) indicators, taking 1981 as the base year, data for the ten variables listed was collected; sum up for the individual years studied and divided by the based year data by using principal component analysis from E-view 9. The computation shows that the IGI_{1995} (the base year) is -1.80 The index lies between 0 and 1, so if the value is close to zero, then growth is not inclusive, but the closer the value to one, the more inclusive growth is.

3.3 Model Specification

Following the theories and the empirical literature reviewed, the model for this study is anchored on the endogenous growth theory developed by economists such as Paul Romer in 1986 and Robert Lucas Jr. in 1988. The theory argues that economic growth is generated from within an economy through investments in human capital, innovation, knowledge creation, research and development, and technological advancement. Therefore, the VAR model specified for this study is as follows:

VAR Model:

Technology progress/ shock, inclusive growth, income inequality, income distribution and poverty rate Equation

$$POV = F(TECH) \quad \text{Equation 3.1}$$

Equation 3.1 states that the Poverty reduction (POV) is dependent upon macroeconomic variables shock such as technology progress. In demystifying the above model, the poverty reduction and macroeconomic variables shocks will be capture by the following variables listed below. It follows that Equation 3.1 will be the formula presented by Equation 3.2 as follows:

$$POV = F(INTPEN, MOBSUB, TECH, GDPg, FDI, GOVEXP, INFL) \quad \text{Equation 3.2}$$

Therefore, the econometrics form will be:

$$POV_t = \beta_0 + \beta_1 INTPEN_t + \beta_2 MOBSUB_t + \beta_3 TECH_t + \beta_4 GDPg_t + \beta_5 FDI_t + \beta_6 GOVEXP_t + \beta_7 INFL_t + U_t \quad \text{Equation 3.3}$$

Where;

POV_t = Poverty rate in time t

$IGIt$ = Inclusive growth index in time t

$INTPEN_t$ = internet penetration in time t

$MOBSUB_t$ = Mobile Phone Subscription in time t (measured through mobile cellular Subscriptions per 100 people)

$TECH_t$ = technology adoption or progress in time t

$GDPg_t$ = GDP growth in time t

FDI_t = foreign direct investment in time t

$GOVEXP_t$ = Government Expenditure in time t

$INFL_t$ = Inflation rate in time t

β_0 is the constant of regression ($\beta_0 \neq 0$), β_1 to β_7 are the parameter estimates of the explanatory variables to capture their direction and magnitude of effect on public debt sustainability, and U is the stochastic term.

4.0 Data Presentation, Analysis and Discussion of Findings

4.1 Descriptive statistics and matrix of correlations

Table 4.1: Descriptive statistics

	POV	MOBSUB	INTPEN	ICTINDEX	GOVEXP	EDU	IGI	FDI	GDPG	INFL
Mean	277.26	46.54	14.49	0.51	476.57	880.67	1.48	1.47	5.54	16.83
Median	234.77	54.82	10.40	0.58	382.38	488.19	1.78	1.46	5.35	12.75
Maximum	126.56	99.59	41.21	1.00	291.62	291.62	9.58	2.93	15.30	72.80
Minimum	155.02	0.02	0.01	0.01	248.77	701.05	-1.80	0.50	-1.60	5.40
Std. Dev.	272.08	38.57	14.20	0.38	579.32	908.03	2.45	0.72	3.63	14.45
Skewness	1.70	-0.07	0.52	-0.12	3.83	1.18	1.03	0.55	0.35	2.75
Kurtosis	6.82	1.35	1.88	1.41	11.98	2.80	5.07	2.23	3.44	10.27
Jarque-Bera	32.77	3.44	2.91	3.22	140.89	7.05	10.72	2.25	0.87	103.77
Probability	0.00	0.18	0.23	0.19	0.00	0.03	0.00	0.33	0.65	0.00
Sum	831.78	139.62	434.92	15.39	142.97	264.20	44.30	44.04	166.11	504.85
Sum Sq. Dev.	2.15	431.33	585.16	4.24	9.73	2.39	174.57	15.24	382.76	605.13
Observations	30	30	30	30	30	30	30	30	30	30

Table 4.1 presents the descriptive statistics of the variables used in the study from 1995 to 2024. The results show that POV recorded an average value of 277.26, about 27.72%, and maximum and standard deviations of 12.65% and 27.20%, indicating a high poverty rate, high inequality, and low-income distribution over the understudied study period. Also, mobile phone subscription (MOBSUB) had a high mean value of 46.54% and maximum of 99.59%, suggesting substantial increases in mobile phone subscription in Nigeria. Internet penetration has an average of 14.49% and a maximum and standard deviation of 41.21% and 14.20%, respectively, indicating a high level of internet penetration and therefore reflecting relatively high and wider access to internet services within the studied period. Government expenditure (GOVEXP) averaged 47.65% and reached a maximum of 29.16%, reflecting a persistent increase in government expenditure within the period. Education (EDU) exhibited considerable high variation, as reflected by the mean value of 88.06% and maximum of 29.16% as well as a high standard deviation of 57.93%, indicating consistent increases in educational enrollment and development within the study period.

Moreover, the inflation rate (INFL) exhibited a high average of 16.83% and a maximum of 72.80%, implying a substantial high purchasing power parity occasioned by the currency devaluation/depreciation within the study period. The ICT index, inclusive growth index (IGI), foreign direct investment (FDI), and GDP growth rate exhibited a low

level of drive to technology acquisition that would have led to addressing poverty, inequality, and income distribution with a combined average of 0.51% for the ICT index, 1.48% for the inclusive growth index, and 1.47% for FDI, while the GDP growth rate averaged 5.54%. The skewness result shows that only government expenditure (GOVEXP) is positively skewed, showing a peak distribution. The result of the kurtosis shows that POV, GOVEXP, IGI, GDPg, and INFL are leptokurtic (kurtosis > 3), indicating peaked distributions, while MOBSUB, INTPEN, ICTINDEX, EDU, and FDI are platykurtic (kurtosis < 3). The Jarque-Bera probabilities indicate that POV, GOVEXP, IGI, GDP, MOBSUB, INTPEN, EDU, IGI, and INFL are normally distributed, whereas ICTINDEX and FDI deviate from normality due to volatility and macroeconomic instability with the standard deviations of 0.38 and 0.72, respectively.

Table 4.2: correlation Matrix

	POV	IGI	INTPEN	MOBSUB	ICTINDEX	GOVEXP	EDU	FDI	GDPG	INFL
POV	1									
IGI	0.80	1								
INTPEN	-0.34	-0.46	1							
MOBSUB				1						
ICTINDEX					1					
GOVEXP						1				
EDU						0.25	1			
FDI						0.47	-0.20	1		
GDPG						-0.45	0.58	-0.19	1	
INFL						0.22	-0.19	0.34	-0.33	1

The correlation matrix of the variables is as shown in Table 3 above. The correlation matrix is a statistical tool that measures the relationship between multiple variables. It provides a table of correlation coefficients, which describe the strength and direction of the linear relationships between each pair of variables. From the table above, POV has a positive correlation coefficient with IGI, GOVEXP, EDU, FDI, and INFL. This therefore indicates that the variables tend to move in the same direction. Meanwhile, INTPEN, MOBSUB, ICTINDEX, and GDPG have a weak negative correlation (-0.34, -0.75, -0.47, and -0.58) with POV, indicating that as POV increases, INTPEN, MOBSUB, ICTINDEX, and GDPG tend to decrease. Also, from the table, there exists a positive correlation coefficient between

IGI and FDI, INFL; INTPEN and EDU, GDPG; MOBSUB and ICTINDEX, FDI, GDPG; ICTINDEX and FDI, GDPG, INFL; GOVEXP and EDU, FDI, INFL; EDU and GDPG; FDI and INFL, respectively, while there is a weak negative correlation between IGI and INTPEN, MOBSUB, ICTINDEX, EDU, GDPG; INTPEN and MOBSUB, ICTINDEX, GOVEXP, FDI, INFL; MOBSUB and GOVEXP, EDU, INFL; ICTINDEX and GOVEXP, EDU; GOVEXP and GDPG, EDU and FDI, INFL; FDI and GDPG, as well as GDPG and INFL.

4.2 Unit Root Test

The Augmented Dickey-Fuller and the Phillips-Perron unit root tests were conducted to examine the stationarity condition of the variables. As indicated in Table 4 below, all the variables were stationary after first differencing, i.e., POV, EDU, FDI, GOVEXP, IGI, INFL, INTPEN, MOBSUB, GDPg, and ICTINDEX, both ADF and PP. In other words, the variables are integrated of order one (i.e., I (I)). Where all the variables are I(1). Therefore, the study adopts the SVAR to analyze the effect of technology progress and inclusive growth on income inequality and poverty rate.

Table 4.3: ADF and Philip-Perron Unit Root Test Results

Variables	ADF Level	1 st Difference	Order of integration	Level	PP 1 st Difference	Order integration
POV	-0.849332	-4.788476	I(1)	-	-	I(1)
INTPEN	0.546336	2.858235	I(1)	-	-	I(1)
INFL	-2.206072	-3.349184	I(1)	-	-	I(1)
ICTINDEX	-2.567049	-3.522746	I(1)	-	-	I(1)
FDI	-2.322843	-6.431292	I(1)	-	-	I(1)
MOBSUB	-2.091892	-3.207341	I(1)	-	-	I(1)
IGI	1.110262	-3.065455	I(1)	-	-	I(1)
GOVEXP	2.363140	3.521575	I(1)	-	-	I(1)
EDU	-0.238987	-5.529867	I(1)	-	-	I(1)
GDPg	-2.971853	-3.330212	I(1)	-	-	I(1)

4.3 Lag Length Selection

Table 4.4: Lag Length Criteria

Included observations: 29

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1290.488	NA	4.23e+26	89.68883	90.16031	89.83649
1	-945.3360	428.4645*	2.87e+19*	72.78179*	77.96809*	74.40608*

Researcher Computation (2026)

The efficiency and validity of an error correction model depend on the lag structure. The study used VAR lag order selection criteria to determine the lag lengths. The study employed the Akaike Information Criterion (AIC) and Schwarz Criterion (SC), and the result shows one optimal lag length in the technology progress or shock, inclusive growth, income inequality, income distribution, and poverty rate models, as shown in Table 5 above. To reduce the possibilities of underestimation whilst maximizing the likelihood of recovering the true lag (Venus, 2004), the study used three and four as the maximum lag lengths, respectively.

4.4 VAR Analysis and Interpretation

Table 4.5: VAR OLS Result

Dependent Variable: POV

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MOBSUB	-2556.883	4770.771	-2.535947	0.0579
INTPEN	-5211.619	10731.95	-2.485617	0.0325
ICTINDEX	486965.6	625178.2	0.778923	0.4451
GOVEXP	24.91599	18.80708	2.324819	0.0202
EDU	-3.425796	5.243406	-2.653353	0.0510
GDPG	404.0718	5965.323	0.067737	0.9467
IGI	56867.11	51471.70	1.104823	0.2824

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FDI	-67746.12	37949.74	-2.785154	0.0394
INFL	471.0884	1323.706	0.355886	0.7257
C	139116.2	104260.0	1.334320	0.1971
R-squared	0.932198	Mean dependent var		277258.6
Adjusted R-squared	0.901687	S.D. dependent var		272084.8
S.E. of regression	85311.81	Akaike info criterion		25.80722
Sum squared resid	1.46E+11	Schwarz criterion		26.27428
Log likelihood	-377.1082	Hannan-Quinn criter.		25.95663
F-statistic	30.55301	Durbin-Watson stat		1.399352
Prob(F-statistic)	0.000000			

Researcher Computation (2026)

The analysis of the VAR OLS result of technology progress, inclusive growth, inequality, income distribution, and poverty rate shocks equations is as shown in table 4.5 above.

There exist negative and significant relationships between mobile phone subscription (MOBSUB) and poverty rate (POV). Specifically, a unit rise in MOBSUB will lead to a -25.56% increase in the poverty rate. This result conforms to theoretical expectation and therefore means that mobile technology has the potential to promote inclusive growth through improved access to information, markets, employment opportunities, financial services, and entrepreneurship. However, the insignificant effect indicates that increased mobile connectivity alone has not been sufficient to generate a significant reduction in poverty in Nigeria. This may be attributed to unequal access to productive digital services, inadequate digital skills, affordability constraints, poor infrastructure, and limited income-generating opportunities among low-income households.

Similarly, the coefficient of internet penetration or usage (INTPEN) exhibits a negative and significant relationship with poverty rate (POV). This result is not in line with a priori expectation, suggesting that a unit rise in INTPEN will lead to a -52.11% increase in poverty rate ceteris paribus. This therefore indicates that although internet penetration has the potential to promote inclusive growth by improving access to information, employment, education, financial services, markets, and digital entrepreneurship, its poverty-reducing impact in Nigeria has been relatively weak. The finding may reflect unequal access to affordable internet, inadequate digital skills, poor infrastructure, and the concentration of productive digital opportunities among relatively educated and higher-income groups.

Furthermore, the ICT index (ICTINDEX) exhibited a positive and insignificant relationship with the poverty rate. The coefficient of 486965.6 shows that a one percent

increase in the ICT index will lead to a 48.69% decrease in the poverty rate in Nigeria. This result is in line with theoretical expectation, suggesting that ICT advancement in Nigeria has not, by itself, generated a significant reduction in poverty. The finding may be explained by unequal access to ICT infrastructure, limited digital literacy, affordability constraints, unreliable electricity, and the concentration of technology-related opportunities among relatively skilled, educated, and urban populations. Hence, ICT development alone may not be sufficient to promote inclusive growth and improve income distribution.

Further, the coefficient of government expenditure (GOVEXP) also shows a positive and significant relationship with the poverty rate. Therefore, a unit rise in GOVEXP will lead to 25.08% decreases in POV. This result is in line with an a priori expectation, indicating that increases in government expenditure are associated with a rise in poverty. This does not imply that government spending causes poverty; rather, it may reflect the fact that government expenditure increases in response to rising poverty and economic challenges. It may also indicate weaknesses in the composition, targeting, efficiency, and implementation of public expenditure. In the context of technology and inclusive growth, government spending can reduce poverty by financing digital infrastructure, education, healthcare, electricity, social protection, and employment-generating investments. However, the significant result suggests that these expenditures have sufficiently and effectively or inclusive enough to produce a measurable reduction in poverty.

Also, the coefficient of educational development (EDU) is negative but significantly related to POV. This is expected, as education development plays a significant role in reducing poverty in Nigeria, but in the period under review, this role has been eroded by persistent failure in policy somersault. The sign, magnitude, and statistical insignificance in the period under review show that a one percent rise in EDU will lead to a -34.25% decrease in POV, implying that education has a potentially poverty-reducing role in Nigeria, but its impact has been limited by structural and labor-market constraints. The finding also indicates that although education moves in the theoretically expected direction towards reducing poverty, the statistical evidence from the estimated model is insufficient to confirm a significant effect. The finding suggests that education alone may not be sufficient to address poverty unless it is supported by complementary policies that improve educational quality, develop market-relevant skills, promote employment creation, and expand access to technology.

The coefficient of GDP growth rate (GDPg) shows a positive but insignificant relationship with poverty rate. Therefore, a unit rise in GDPg will lead to 40.40% decreases in POV. This result is in line with an a priori expectation, indicating that economic growth has not demonstrated a statistically reliable capacity to reduce poverty in the period under

consideration. This reinforces the argument that the quality, structure, and inclusiveness of growth matter as much as the growth rate itself when the objective is to reduce poverty and improve income distribution in Nigeria.

The coefficient of inclusive growth index (IGI) is positive and statistically insignificant. This suggests that there is a weak positive relationship between the inclusive growth index (IGI) and poverty rate (POV) in the period under review. This therefore means that a one percent increase in the inclusive growth index will lead to a 56.86% decrease in the poverty rate in the period under review *ceteris paribus*. This result is in line with an *a priori* expectation suggesting that technology-driven inclusive growth should not be viewed as sufficient by itself to address poverty and inequality in Nigeria. For technological progress to translate into meaningful poverty reduction and a more equitable income distribution, complementary policies are required. This may be attributed to unequal access to technology, differences in human capital and digital skills, unemployment, weak infrastructure, and the concentration of technological benefits among relatively skilled and higher-income groups. Hence, technological progress alone may be insufficient to reduce poverty and improve income distribution.

An unexpected negative but significant relationship was observed between foreign direct investment and poverty rate in Nigeria. This result shows that a unit rise in FDI will lead to a -67.74% increase in the poverty rate, suggesting that greater foreign direct investment is associated with lower poverty in Nigeria, supporting the view that FDI can be an instrument for inclusive economic development. Nevertheless, the poverty-reducing effect is likely to be stronger when FDI is accompanied by effective institutions, human-capital development, technological diffusion, employment creation, and policies that ensure that the gains from economic growth are broadly shared across society.

Finally, the coefficient of inflation rate (INFL) is positive and insignificantly related to POV, specifically; a unit rise in INFL will lead to 47.10% increases in POV. This result is in line with theoretical expectations, suggesting that increases in economic growth are associated with reductions in poverty, although the effect is statistically insignificant. This suggests that economic expansion has the potential to improve household welfare through increased employment, income, productivity, and investment, but the benefits of growth have not been sufficiently broad-based to generate a significant reduction in poverty in Nigeria. The result may reflect the concentration of economic growth in capital-intensive sectors, limited employment creation, unequal distribution of income, and inadequate access of poor households to opportunities generated by technological advancement.

From the table, the R-squared value of 0.932198 and the adjusted R-squared value of 0.901687 show that about 93 percent of variation in the POV is explained by the current

period lag of technology adoption, inclusive growth, income inequality, and income distribution, and about 1 percent was unexplained, which may be accounted for by other factors not included in the model. The Durbin-Watson (D-W) statistic of 1.39 indicates no autocorrelation in the model. Therefore, the results can be used for economic forecasts and economic policy.

Table 4.6: Impulse Response Test Result

	POV	IGI	INTPEN	MOBSUB	ICT INDEX	GOVEXP	EDU	FDI	GDPG	INFL
1	117699.7	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	37387.04	20728.31	7979.212	900.4345	-5085.698	4709.066	-12347.40	6139.047	-1220.330	2996.576
3	12721.01	10548.84	12450.18	-415.6764	-2352.806	3365.304	-3607.204	4319.145	-1797.853	-263.6712
4	3597.269	5232.669	11635.21	-950.4871	577.2591	2650.132	2195.019	1365.071	152.1653	-101.1768
5	364.7746	3044.803	10860.98	-433.6961	2700.047	1907.469	3604.804	341.1345	707.0322	149.3381
6	-476.1858	2337.692	9821.505	340.5325	4550.041	1452.437	3596.704	52.36036	736.9606	164.6816
7	-287.3706	2323.779	8643.130	1181.157	6374.194	1245.095	3298.277	11.14914	706.8673	44.21253
8	373.3960	2608.432	7405.366	2005.724	8145.857	1172.570	2958.173	81.62575	674.9048	-143.6951
9	1230.421	3007.786	6159.420	2781.668	9810.109	1165.720	2618.818	200.6269	643.8306	-364.8793
10	2143.962	3433.910	4932.673	3495.046	11328.17	1186.827	2285.752	336.8550	611.8007	-596.3957

Researcher Computation (2026)

The result of the impulse response test is as shown in table 4.6 above. The impulse response function (IRF) in VAR traces the effect of a one-time structural shock to one variable on the current and future values of all variables in the system. From table 4.6 above, in the first period, the poverty rate is 117699.7, while the impulse response of the inclusive growth index, internet penetration, mobile phone subscriptions, ICT index, government expenditure, education, foreign direct investment, GDP growth, and inflation rate are all zero. This indicates that immediately after the shock, all variables exert a measurable effect on the poverty rate. The economy remains at its baseline equilibrium in the initial period, and the effects of the shocks are yet to materialize. In the second period, the impulse response results show that the poverty rate records a response of 37.39%, indicating that poverty remains highly responsive to shocks in early stages of the forecast horizon. A positive shock to the inclusive growth index generates a positive response of 20.73%, suggesting that, in the short run, improvements in inclusive growth are associated with an increase in the measured poverty response. Similarly, positive shocks to internet penetration (79.79%), mobile phone subscriptions (90.04%), government expenditure (47.09%), foreign direct investment (61.39%), and inflation rate (29.97%) are associated with positive responses in poverty during the second period.

In contrast, shocks to the ICT index (-50.86%), education (-12.35%), and GDP growth (-12.20%) generate negative responses to the poverty rate. These results suggest that improvements in ICT development, educational attainment, and economic growth reduce

poverty in the short run, with education exhibiting the strongest poverty-reducing response among these variables during the second period. In the third year following a technology shock, the impulse response results indicate heterogeneous effects on poverty, inclusive growth, and the macroeconomic variables in Nigeria. The poverty rate records a positive response of 12.72%, suggesting that the effects of the technology shock have not yet translated into poverty reduction. Rather, poverty increases in the medium term, implying that the benefits of technology may not be immediately accessible to poorer households or may be unevenly distributed.

The inclusive growth index also responds positively (10.55%), indicating that the technology shock stimulates inclusive growth over time. This suggests improvements in economic opportunities and productive activities, although these gains are insufficient to offset the increase in poverty during the same period.

Internet penetration exhibits a strong positive response (12.45%), confirming that technological shocks significantly expand internet access and digital connectivity. This supports the argument that technology adoption improves digital infrastructure and access to information.

In contrast, mobile phone subscriptions show a negative response (-41.57%), implying a slight decline in mobile subscriptions during the third year. This may reflect market saturation, affordability constraints, or substitution toward alternative digital technologies.

Similarly, the ICT index records a negative response (-23.53%), suggesting that the broader ICT environment weakens despite improvements in internet penetration. This may indicate that gains in internet access are not accompanied by corresponding improvements in overall ICT development, infrastructure quality, or digital skills.

Government expenditure responds positively (33.65%), indicating increased public spending following the technology shock. This may reflect government investment in digital infrastructure, social programs, or complementary policies aimed at supporting technological transformation. Education records a negative response (-36.07%), suggesting that educational outcomes or investment decline in the medium term. This may indicate inadequate investment in human capital or a mismatch between technological advancement and the education system. Foreign Direct Investment (FDI) responds positively (43.19%), implying that technological improvements enhance Nigeria's attractiveness to foreign investors by creating a more favorable investment environment.

GDP growth exhibits a negative response (-17.98%), indicating that the technology shock is associated with a temporary slowdown in economic growth in the third year. This could reflect adjustment costs, structural transformation, or delays before productivity gains

are fully realized. Inflation responds negatively (-26.37%), suggesting that the technology shock contributes to lower inflationary pressures, possibly through improvements in production efficiency, lower transaction costs, or enhanced market competition.

The impulse response analysis at the fourth-year horizon shows that shocks to internet penetration (11.64%), inclusive growth (52.43%), government expenditure (26.50%), education (21.95%), FDI (13.65%), ICT (57.73%), and GDP growth (15.22%) generate positive responses in the poverty rate, while shocks to mobile phone subscriptions (-95.05%) and inflation (-10.12%) generate negative responses. These findings suggest that, over the medium term, improvements in internet penetration and inclusive growth have not automatically translated into poverty reduction in Nigeria, possibly because the benefits are unevenly distributed. Conversely, increased mobile phone penetration appears to contribute to reducing poverty, potentially through improved communication, financial inclusion, and access to economic opportunities.

The impulse response results at the fifth-year horizon suggest that technology-related shocks generate predominantly positive dynamic effects on Nigeria's economy. The strongest responses occur in internet penetration (10.86%), education (36.05%), inclusive growth (30.45%), and the ICT index (27.00%), indicating that digital transformation strengthens human capital, technological development, and inclusive economic performance.

Government expenditure, GDP growth, and FDI also respond positively, implying that technological advancement encourages complementary public investment, attracts foreign capital, and supports economic expansion. The only negative response is observed for mobile phone subscriptions (-43.37%), which may reflect technological substitution (for example, a shift from traditional mobile services to internet-based communication) or market maturity rather than a decline in digital development.

The positive response of the poverty rate (36.48%), as a dependent variable, suggests that poverty may initially increase following a technology shock. This could arise because the benefits of technology are not immediately shared across all households, particularly among low-skilled workers or populations with limited digital access. Over a longer horizon, however, improvements in inclusive growth, education, ICT, and GDP would be expected to reduce poverty if the impulse response eventually turns negative.

The poverty rate response in year 6 shows that the inclusive growth index of 23.38% exhibits a strong positive response, suggesting that, in the estimated model, shocks to inclusive growth are associated with an increase in poverty in the sixth year. This may indicate that economic growth benefits are not sufficiently reaching poor households,

possibly due to unequal distribution of income, limited employment creation, or exclusion from productive opportunities.

The large positive response of Internet Penetration is 98.22%, which suggests that increased internet penetration is associated with higher poverty in the long run. Economically, this could indicate that digital expansion alone does not automatically reduce poverty if access is unequal, digital skills are limited, or technology benefits are concentrated among higher-income groups.

Mobile Phone Subscriptions 34.05%: The positive effect indicates that increases in mobile subscriptions are linked with a rise in poverty in the sixth year. This may reflect the possibility that mobile access improves communication but does not necessarily translate into income gains without complementary factors such as financial inclusion, skills, and productive use of technology.

ICT Index 45.50% a positive response suggests that ICT development has not produced poverty reduction in the estimated long-run period. This may imply technological progress has been accompanied by inequality, skill gaps, or unequal access to ICT-enabled opportunities.

Government Expenditure 14.52% a positive response indicates that higher government spending is associated with increased poverty. This may suggest inefficiency in public expenditure, weak targeting of social programs, corruption, or spending directed toward areas with limited poverty-reduction effects. The positive response of Education (35.97%) implies that education shocks are associated with higher poverty in the sixth year. This may occur if education expansion is not matched with employment opportunities, quality improvements, or labor-market demand.

The relatively small positive effect of Foreign Direct Investment (FDI) (52.36%) suggests that FDI has limited poverty-reducing impact. This may indicate that foreign investment has not generated sufficient employment, local linkages, or income opportunities for poorer groups. A positive response of GDP growth (73.69%) suggests economic growth alone has not reduced poverty. This supports the idea of “growth without inclusion,” where GDP increases but income distribution remains unequal.

The positive response of the inflation rate (16.47%) indicates that inflation increases poverty over the long run, likely because rising prices reduce real household income and purchasing power, especially among low-income groups. The negative own-response poverty rate shock (-47.62%) reflects the adjustment process of poverty after its own shock. Over time, the initial increase in poverty tends to decline as the system returns toward equilibrium.

Table 4.7: Variance Decomposition Test Result

	S.E	POV	IGI	INTPEN	MOBSUB	ICT INDEX	GOVEXP	EDU	FDI	GDPG	INFL
1	117699.7	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	126466.7	95.35573	2.686431	0.398078	0.005069	0.161715	0.138649	0.953233	0.235640	0.009311	0.056143
3	128350.8	93.55901	3.283618	1.327399	0.005970	0.190604	0.203355	1.004438	0.342013	0.028660	0.054929
4	129091.4	92.56618	3.410353	2.124580	0.011323	0.190423	0.243173	1.021857	0.349281	0.028471	0.054362
5	129679.3	91.72966	3.434633	2.806812	0.012339	0.232052	0.262609	1.089886	0.346814	0.031186	0.054003
6	130212.5	90.98121	3.438790	3.352789	0.012923	0.352258	0.272904	1.157274	0.343995	0.034135	0.053722
7	130730.4	90.26226	3.443194	3.763384	0.020984	0.587209	0.279817	1.211776	0.341276	0.036788	0.053308
8	131275.4	89.51529	3.454150	4.050426	0.044154	0.967386	0.285478	1.252515	0.338487	0.039127	0.052986
9	131888.2	88.69402	3.474133	4.230977	0.088228	1.511685	0.290643	1.280330	0.335580	0.041147	0.053260
10	132601.8	87.76812	3.503904	4.323939	0.156752	2.225286	0.295534	1.296301	0.332623	0.042834	0.054712

Researcher Computation (2026)

The result of the variance decomposition test is as shown in table 4.7 above. The variance decomposition test is to allow for the forecast error variance of the impact of variables into those parts that are generated by the innovations of different variables in the system. From table 4.7 above, it can be inferred from the first period that the standard error of POV is 42.77%, and within the first period, all the variables MOBSUB, INTPEN, ICTINDEX, GOVEXP, EDU, IGI, FDI, and INFL had a considerable impact on the poverty rate. But from period 2, the standard error of POV, IGI, and INTPEN is positive and therefore exhibited a considerable effect on poverty, except for MOBSUB, ICTINDEX, GOVEXP, EDU, FDI, GDPg, and INFL, who exhibited marginal increases within the periods and therefore no significant impact was felt. This result indicates that technological innovations are assuming a greater role in explaining fluctuations in Nigeria's inclusive-growth outcomes. Hence, improvements in productivity, digitalization, innovation, and the efficient utilization of productive resources can increasingly influence economic growth, poverty reduction, and income distribution. However, the inclusiveness of technology-led growth depends on the extent to which technological opportunities are accessible to low-income households and less-skilled workers.

4.5 Discussion of Findings

The result of the VAR OLS shows an intriguing insight, as the regression result offers a positive but insignificant relationship between the five key variables of technology and inclusive growth: the ICT index (ICTINDEX), government expenditure (GOVEXP), GDP growth rate (GDPg), inclusive growth index (IGI), and inflation rate (INFLA), which interacted with the dependent variable poverty rate (POV). The result suggests that increases in the underlisted variables in essence will lead to a decrease in poverty, inequality, and

income distribution in Nigeria, which are major tools addressing poverty in Nigeria. These findings suggest that Nigeria's challenge is not simply to generate economic and technological growth but to ensure that such growth is inclusive, pro-poor, employment-generating, and capable of improving income distribution. This is particularly important for achieving sustained reductions in poverty and inequality.

However, mobile phone subscription (MOBSUB), internet penetration (INTPEN), education (EDU), and foreign direct investment (FDI) showed negative and insignificant relationships with poverty rate in the period under review, reflecting that when these variables increase, poverty rate tends to decrease. This result implies that increases in mobile phone subscriptions, internet penetration, education, and foreign direct investment are statistically associated with reductions in poverty in Nigeria. The findings support the argument that technology and inclusive growth can play a substantial role in addressing poverty, inequality, and income distribution, provided that access to these opportunities is broad-based and supported by effective economic and social policies.

The variance decomposition result shows that in both first to tenth period, all the variables had a considerable impact on poverty rate, inequality and income distribution in Nigeria through technology application and improvement in inclusive growth. This implies that the selected technology, fiscal, human-capital, investment, inclusive-growth, and macroeconomic variables are important sources of variation in Nigeria's poverty rate. The results can therefore support the argument that poverty reduction in Nigeria requires an integrated strategy in which technological development and inclusive growth reinforce one another. It further means that the variable explains an increasing share of the forecast-error variance of poverty, showing a progressively evolving relationship between technology, inclusive growth, and poverty reduction. In the short run, technology improves access and reduces transaction barriers; in the medium run, it increases productivity, employment, financial inclusion, and human-capital opportunities; and in the long run, it can contribute to structural transformation, lower poverty, and more equitable income distribution. However, these benefits are conditional on equitable access and macroeconomic stability. In particular, persistent inflation can undermine the poverty-reducing gains from technological progress, while unequal access to education, infrastructure, and digital services can cause technological growth to benefit higher-income groups disproportionately.

The impulse response result shows that inclusive growth index, internet penetration, government expenditure, and foreign direct investment has strong positive significant shocks or response on poverty rate, inequality and income distribution while mobile phone subscription, ICT index, education, GDP growth rate and inflation rate, exhibit negative and significant shock or responses in third, fourth and fifth period for mobile phone subscription,

second and third period for ICT index, both second and third period for education and GDP growth rate on poverty rate, inequality and income distribution in Nigeria.

5.1 Conclusion

The study examines the impact of technology and inclusive growth: addressing poverty, inequality, and income distribution in Nigeria using data from 1995 to 2024, adopting the Vector autoregressive model (VAR). The study observed that changes in the ratios of the inclusive growth index, mobile phone subscription, ICT index, internet penetration, government expenditure, foreign direct investment, GDP growth rate, and inflation rate have a positive forecast error variance impact on the dependent variable addressing poverty, inequality, and income distribution in Nigeria. In addition, the study revealed a shocking negative impulse response impact of mobile phone subscription, ICT index, education, and GDP growth rate on addressing poverty, inequality, and income distribution in Nigeria. It means that negative shocks of these variables in the specified periods produce persistent increases in poverty and inequality, showing that the study would provide strong empirical support for the argument that technology and economic growth reduce poverty most effectively when they are accompanied by human-capital development and equitable access to economic opportunities.

5.2 Recommendations

Therefore, we recommend that:

- i. Government and policymakers should formulate inclusive growth policies that require simultaneous investment in digital infrastructure, affordable mobile and broadband access, quality education and digital skills, and broad-based economic growth. These interventions should particularly target rural communities, low-income households, women, young people, and informal-sector workers.
- ii. Government and policymakers should not pursue digitalization in isolation. Expansion of mobile and internet infrastructure should be accompanied by affordable broadband, reliable electricity, digital literacy, quality education, access to finance, productive employment, efficient public expenditure, targeted social protection, and policies that attract FDI into employment- and productivity-enhancing sectors. This approach is consistent with the World Bank's recent assessment that Nigeria needs to translate macroeconomic stabilization into improved livelihoods through human-capital investment, better public spending, infrastructure, social protection, and inclusive growth.

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