AN ASSESSMENT OF THE EFFECT OF HUMAN CAPITAL DEVELOPMENT IN INFORMATION TECHNOLOGY ONPOVERTY REDUCTION IN NIGERIA

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Abstract
Nigeria's ongoing human capital shortages and digital exclusion limit opportunity, productivity, and inclusive economic growth, which drives efforts to reduce poverty. The study examined the effects of human capital development and information technology on poverty in Nigeria from 1990 to 2024. The study employed Augmented Dickey Fuller unit root test, Cointegration, and an ARDL framework for the analysis. The result from the ADF unit root test revealed a mix integration order of I(0) and I(1) and bound tests result establishes the long-run connection among the variables. The result from the long-run model shows that ICT, gross capital formation, and secondary school enrolment are negative with coefficient (-0.509, -5.093 & -0.007) and statistically significant in reducing poverty in the long run with corresponding probability of 0.0205, 0.0009 and 0.0137 respectively, meaning that increase in ICT, capital accumulation, and secondary education enrolment are associated with poverty reduction in the country, while on the other hand, expenditure on education and primary school enrolment increase poverty, and the findings point to underlying inefficiencies or policy inadequacies that hinder anticipated results and reduce the desired socioeconomic effects. In the short run, expenditure on education, GCF and GDP reduce poverty level in the country. The study recommends the government should improve quality education, information technology and investment for infrastructure through effective monitoring of education spending in the country. More so, stakeholders should also strengthen primary education, skills acquisition, and integrate digital education to enhance productivity and employment for poverty reduction.

Keywords: ARDL**,** Human Capital Development, Information Technology, Poverty
JEL Classification Code: C22, J24, 033, I32

1.0 Introduction

In the 1960s and early 1970s, the economy of Nigeria, South Korea, Taiwan, Malaysia, Singapore and Indonesia are under-developed and also maintain similar GDP growth rate, per capita income, (World Bank Development Report, 1994). But despite the abundant human and natural resources, the Nigerian economy has remained static and under-developed for several years. Due to the proper management of their economies the Asian Tigers; today have escaped under-development and poverty and now economically and technologically developed as a result of the sustained and heavy increased in human capital development investment. According to the World Bank's 2017 Human Development Report, Nigeria was placed 157th out of 189 countries. Nigeria does not perform as well as many other developing countries. South Africa is ranked 113th, India is ranked 130th, Malaysia is ranked 57th, Thailand is ranked 83rd, Tunisia is ranked 95th, and Ghana is ranked 140th. In terms of measurable human development indices (HDI) and, by extension, the quality of life of its citizens, Nigeria is only better than 32 countries, according to straightforward analysis (World Bank Human Development Report, 2017). This point out the important of human capital development and information technology in promoting economic and reducing poverty rate.

Extreme poverty increased globally for the first time in over 20 years (World Bank, 2022). Poverty is a general phenomenon that robe peoples particularly in developing nations were human welfare, social stability and economic expansion are remain unstable. Over 1.1 billion people live in multidimensional poverty globally, with Sub-Saharan Africa carrying a disproportionate burden, according to the UNDP Global Multidimensional Poverty Index (MPI) framework. The most populous nation in Africa, Nigeria, makes a substantial contribution to this burden. Despite the United Nations created the Millennium Development Goals in 2000 with the goal of halving severe poverty by 2015. In addition to other projects and programs, the Sustainable Development Goals (SDGs) were unveiled in 2015. The COVID-19 pandemic and unequal outcomes completely stopped any progress toward the first Sustainable Development Goal (SDG), which intended to end poverty in all of its forms by 2030. Nigeria still has some of the worst rates of poverty on the continent despite having the biggest economy in Africa and an abundance of human and natural resources (Adah & Abasilim, 2015). According to the National Bureau of Statistics (NBS, 2022), more than 70% of Nigerians are impoverished. People who live in rural areas are disproportionately affected by multidimensional poverty, which includes problems with access to basic services including healthcare, education, and nutrition. Based on the MPI report 63% of Nigerians, or over 133 million people, are multidimensional poor at the national level. This indicates that 35% of the poor reside in the South and 27% in the North. State level poverty incidence varies from 27% in Ondo to 91% in Sokoto (NBS, 2022).

Human capital development plays a significant role towards economic growth and poverty reduction in every nation. Despite the country having an economic disparity and developmental problems, yet the correlation between economic growths, human capital and poverty is particularly relevant (Asaolu, 2020). Increasing productivity, innovation, and long-term economic development all rely on human capital development, which comprises people's education, abilities, health, and skills. It is generally accepted that human capital is essential to the proper functioning of an economy since people are a nation's most important resource. Moreover, human capital development receives a major concern for economic development by practitioners and policy makers at the national and regional levels, due the changes of the world economy towards knowledge-based sectors which includes research and development (R&D),

ICT devices and ICT based services (OECD, 1996). A growing body of research emphasises how crucial it is to enhance human capital through business, education, healthcare, and skill development in order to reduce poverty (Nwachukwu, 2024). Nigeria's strategy for developing human capital still has several policy gaps (Abasilim, Adelusi, & Mudau, 2025). Inadequate investments in health and education, rising unemployment rates, and differences in access to opportunities for skill development all contribute to the expansion of already existing inequities. On the other hand, information technology transforms the poor countries' economies into high value and technological based economy (Ramanadham, 2019; & Dominguez Castillo et al., 2019).

Information technology and human capital work together to reduce poverty in Nigeria by improving economic participation, employability, and productivity. The development of human capital through education and skill acquisition improves people's access to, adoption of, and proficiency with ICT tools. ICT, in turn, makes information, digital financial services, markets, education, and job possibilities more accessible, especially for marginalized groups. This relationship boosts revenue creation, encourages entrepreneurship, and fosters equitable economic expansion. Higher human capital and greater ICT penetration thereby boost economic resilience and help to sustainably lower poverty levels (World Bank, 2016; &International Telecommunication Union 2021).

The study investigates the impact of human capital development and information technology on poverty in Nigeria.

2.0 Literature Review

Relationship between Human Capital Development, Information Technology and Poverty Rate

In order to reduce poverty, human capital development and the use of information and communication technologies are mutually reinforcing. Investments in health, education, and skills enhance people's capacity to use IT tools effectively, boosting their employability, productivity, and potential for earning money. According to Allahdadi and Aref (2011), human capital is a reflection of people's attitudes and abilities as well as their capacity to acquire and apply outside information. Information technology facilitates this process by expanding access to information, healthcare, and education through platforms like e-learning, telemedicine, and online training. Adoption of information and communication technology and enhanced human capital work together to increase economic activity, job creation, and income growth all of which are crucial paths for reducing poverty and improving living standards.

The UN has officially recognised information technology as a key facilitator of the Sustainable Development Goals (SDGs), particularly in terms of lowering poverty and inequality and advancing well-being and education (Wahlen, 2017; UN, 2019). Information technology also makes it easier for people to access information, financial services, and work opportunities, which mobilises labour and lessens vulnerability for marginalised groups like rural women (Asongu & Nwachukwu, 2018). As poverty declines, households and governments are in a better position to invest in health, education, and digital infrastructure, which further strengthens the building of human capital. Information and communication technologies indirectly contribute to this cycle by increasing access to education and information, promoting skill development, social cohesion, and the empowerment of underprivileged groups (Dominguez Castillo, 2018).

Increased access to financial markets also encourages investment and savings mobilisation, resulting in long-term economic growth that lowers poverty (Pradhan et al., 2018). Information and communication technology, poverty alleviation, and human capital development are thus mutually reinforcing and contribute to sustainable development; in particular, EdTech solutions increase access to high quality education through increased enrolment and remote learning, and better educational results encourage the continued use of digital technologies (Jamil et al., 2020).

Theoretical Underpinning

The Endogenous Growth Theory strengthens the theoretical foundation by emphasising the significance of knowledge, innovation, and human capital as drivers of long-term economic growth (Romer, 1990). ICT increases productivity and efficiency across industries by facilitating innovation and knowledge sharing. This theory holds that investing in human capital enables people to use IT effectively, which encourages entrepreneurship and creates new business opportunities. Thus, by creating jobs, enhancing skills, and ultimately reducing poverty, the combination of IT and human capital fosters economic progress. In nations like Nigeria, where growth has historically been impeded by a lack of access to high-quality education and technology, this theory shows how human capital development and IT can be combined to produce sustainable strategies of reducing poverty (Adebayo et al., 2021). In the context of Nigeria, the theory further emphasis that stimulating information technology, gross capital development and quality education would promote economic growth, generate employment and enhance welfare through innovation and productive activities across varying sector of the economy.

According to endogenous growth theory, internal rather than external forces are what promote steady economic development, which helps to explain poverty reduction. As major forces behind productivity and long-term growth, the theory highlights investments in human capital, innovation, knowledge accumulation, and technical improvement. People become more productive and flexible as their education and skills advance, which raises their employment and income levels. Efficiency, market access, and economic prospects are further improved by technological advancement, particularly the adoption of ICT. Romer, (1990) further emphasis that the combined impacts boost economic capacity, promote equitable growth, and help emerging nations reduce poverty over the long term.

Human Capital Theory

The main justification for the relationship between human capital development, IT, and poverty reduction is human capital theory, which states that investments in education, skills, and health raise people's productivity and earning potential (Becker, 1964). According to this theory, those with greater education and aptitude are better able to embrace and utilise technology like IT, which increases their productivity and economic opportunities. In developing countries like Nigeria, where poverty is still pervasive, improving human capital can help people access IT tools for financial, communication, and educational purposes, increasing their capacity to generate revenue. This indicates the mutually beneficial relationship in which the development of human capital increases the advantages of IT adoption and helps to reduce poverty (Psacharopoulos & Patrinos, 2018).

Empirical Review

Abasilim and Oparah (2025) found that a significant relationship between human capital development and poverty reduction, and the study employ qualitative research in determine the connection in the country. In applying the time series and ordinary least square method by Didiugwu (2024) to examine the effect of human capital development on poverty in Nigeria and found that out-of-pocket expenditure, educational and health expenditure are positive and statistically insignificant to poverty level in Nigeria. Lechman and Popowska (2022) reveal that information technology, school enrolment, and wealth increase contributes towards poverty reduction in developing countries, but digitalisation effects to poverty is immediate. The study uses panel regression and logistic growth model to examine the effect of digital technology on poverty in 40 low-income and lower-middle income countries for the period of 1990 to 2019. Joseph, Jacob, and Kokoh (2025) found a positive association between human capital development and poverty in Nigeria using ARDL techniques in assessing the relationship between human capital and economic growth. Hence the study suggests that heavy investment on education and healthcare increases economic growth and reduces poverty in the country. Sassi and Goaied (2013) in their study using cross-sectional data of seventeen countries to measured ICT diffusion using three indicators and found a positive and significant effect to economic growth.

In a similar vein, Pradhan, Rudra, Mak, Arvin, and Neville (2015) assessed the causal relationship between information technology, financial development and economic growth by employing panel cointegration and the study reveal that ICT infrastructure, financial development are long-run determinant to economic growth in Asian countries.The multiple linear regressions model and ordinary least squares methods was used by Sunny and Osuagwu (2016) the study discovered that capital formation and economic growth is significant and positive in both short-run and long-run and further reveal that saving to economic growth is insignificant in the country. In using Cointegration by Banerjee and Roy (2014) investigates the effect of human capital and technology on growth and found that both domestic and foreign technologies are most much important determinant in Indian's economic growth, while human capital and trade plays crucial roles to economic growth in the country. Consequently, Alani (2012) found that increase in technology, capital stock and labour increases economic growth in Uganda. Sepehrdoust (2018) also discovered that information technology and financial development increases economic growth of petroleum exporting countries (OPEC). That is to say one percent increase in ICT and financial development increased economic growth. Amir, Mehmood and Shahid (2012) using Johansen cointegration and error correction model and found a significant positive relationship between human capital and economic growth.

Therefore,the previous studies focused mostly on the relationship between economic growth, information technology, and human capital development and paid little attention to poverty as a development consequence, the study identifies significant gaps in the body of empirical research. This study builds on growth-centered perspectives and provides a more complete picture by incorporating poverty reduction within the research. Due to the frequent use of cross-sectional methodologies, conventional estimating techniques, and restrictive model specifications that may not accurately depict dynamic interactions, there is also a methodological gap. Thus, this study fills the empirical literature gap by incorporating poverty, data from 1990 to 2024 and the ARDL framework to identifyhow human capital and information technology collaborate to eliminate poverty in the country.

3.0 Methodology

This study employs a quantitative research approach to investigate the relationship between poverty in Nigeria and the development of human capital in information technology. The goal of offering empirical evidence on how differences in human capital development in connection to information technology impact poverty in the Nigerian setting is what led to the selection of this approach. The annual secondary data were sourced from the World Development Indicators (WDI), and the Central Bank of Nigeria (CBN) annual statistical bulleting (2024) for the variables. The study examines the impact of human capital development and information technology on poverty level in Nigeria from 1990-2024. The variables used includes secondary school enrolment and primary school enrolment as proxy of human capital development, gross capital formation, information technology, government expenditure on education, and real consumption expenditure per capita of household as proxies of poverty. Hence, to improve the data distribution and reduces variance for more accurate interpretation, the variables were transformed into natural logarithms.

Unit Root Test

Various unit root tests were employed by the researchers to assess the stationarity level of the time series variables, whose mean and variance are non-stationary. This study used Augmented Dickey-Fuller (ADF) test in order to identify the stationary processes of the variables included the model. Therefore, the following is the specification of ADF regression model as: $\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum_{t=1}^{p} \delta_i \Delta Y_{t-i} + \varepsilon_t$ (3.1)

Model Specification

This study follows the Romer (1990) human capital model, states that growth is not only influence by capita and labor, but also human capital as expressed as:

$Y_t = f(K_t, L_t, H_t)$ (3.2)

Where:

Y_t = out put

K_t = Capital

L_t = Labor

H_t = Human capital

The information technology is explicitly introducing into the model equation; hence the following specification is shown as:

$Y_t = f(K_t, L_t, H_{t,} T_{t,})$ (3.3)

To examine both the short-run and long-run connections between the dependent and independent variable and order of integration the ARDL model was used. The techniques identify the cointegration associations among the variables and also derives the error correction (ECM) to determine the short-run dynamic specification. The model is expressed as:

$Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{j=1}^{k} . \sum_{i=0}^{qj} \beta_{ji} X_{j,t-i} + \varepsilon_t$ (3.4)

Where:

Y_t = dependent variable

$X_{j,t-i}$= independent variables

α_0= constant term

$p, q_{1,} q_{2,} \dots\dots\dots, q_{k,}$= optimal lag lengths

ε_t= white noise error term

Additionally, in order to figure out whether there is a long-term link between the variables; cointegration is explored utilising the ARDL boundaries technique by re-parameterising the ARDL model into an Unrestricted Error Correction Model (UECM) as follows:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p-1} \alpha_i \Delta Y_{t-i} + \sum_{j=1}^{k} \cdot \sum_{i=0}^{qj-1} \beta_{ji} \Delta X_{j,t-i} + \lambda_1 Y_{t-1} + \sum_{j=1}^{k} \lambda_{j+1} X_{j,t-i} + \varepsilon_t \quad (3.5)$$

Furthermore, this study adopted the econometric model from the work of Chindo, et al (2015) and Emran, et al (2007), with addition of poverty and information technology in the model as:

$$POV_t = \alpha_0 + \alpha_1 GCF_t + \alpha_2 EXEDU_t + \alpha_3 IT_t + \alpha_4 PSE_t + \alpha_5 SSE_t + \varepsilon_t \quad (3.6)$$

The econometric model is represented by the equation (3.5), where the error term (ε_t)is introduced to account for the impact of any measurement error that may have an impact on the dependent variable as well as the effect of all other variables that were omitted out of the model.

It is assumed that the error term has a zero mean and constant variance and is distributed normally, independently, and identically[$i.e. \varepsilon_t \sim NIID(0,1)$]. More so, the variables are transformed into natural logarithm for consistent and reliable result. Thus, the empirical equation is formulated as following:

$$InPOV_t = \alpha_0 + \alpha_1 InGCF_t + \alpha_2 InEXEDU_t + \alpha_3 InIT_t + \alpha_4 InPSE_t + \alpha_5 InSSE_t + \varepsilon_t \quad (3.7)$$

Where

$InPOV_t = Poverty\ Reduction$
$InGCF_t = Gross\ Capital\ Formation$
$InEXEDU_t = Government\ Expenditure\ on\ Education$
$InIT_t = Information\ Technology$
$InPSE = Primary\ School\ Enrolment$
$InSSE = Secondary\ School\ Enrolment$
$\varepsilon_t = is\ the\ error\ term$

α_0, α_1, α_2, α_3, $\alpha_{4,}\alpha_{5,}$ and α_6 are the parameters to be estimated whereas, the a priori expectations are <> 0.

Diagnostic and Robustness Checks

Tests for serial correlation, heteroscedasticity, and normality are among the diagnostic and robustness checks carried out in order to ensure the validity of the empirical findings.

4.0 Results and Discussion

Descriptive Statistics

The descriptive statistics help detect possible outliers and offer fundamental insights into the distribution and connections among the studied variables.

Table 1:
Descriptive Statistics

Variable	POV	LIT	LEXEDU	LGCF	LSSE	LPSE	LGDP
Mean	3.415	5.170	3.043	1.443	1.573	1.725	3.282
Std. Dev.	3.265	5.606	3.201	1.440	1.528	1.950	3.305
Min	2.971	1.469	1.558	1.173	1.358	-0.070	3.143
Max	5.858	6.227	3.961	1.725	1.967	2.009	3.412
Skewness	2.445	-2.160	-0.555	-0.136	1.169	-2.417	-0.204
Kurtosis	7.731	6.164	2.051	1.693	3.737	6.858	1.410
Obs.	35	35	35	35	35	35	35

Source: Authors' computation (2026).

Table 1, descriptive statistics show significant variance among the variables. Poverty (POV) has a mean of 3.415, with a minimum of 2.971 and a maximum of 5.858, and the standard deviation of 3.265, which indicates significant variations in poverty levels over the study period. The information technology (LIT) has mean score of 5.170 and a range of maximum value of 6.227 to the minimum value of 1.469, with 5.606 standard deviation, which indicates unequal IT growth. While gross capital formation (LGCF) average mean is 1.443 and the standard deviation value of 1.440, with the corresponding minimum and maximum values ranges from 1.173 to 1.725, expenditure on education (LEXEDU) has a mean of 3.043 and standard deviation of 3.201 with maximum and minimum values between 3.961and 1.558. Primary school enrolment (LPSE) has a mean and standard deviation values of 1.725 and 1.950, and has the minimum and maximum values ranging from –0.070 to 2.009, whereas secondary school enrolment (LSSE) has a mean of 1.573, with a minimum of 1.358 and a maximum of 1.967. Economic growth (LGDP) maximum and minimum values ranges from 3.1412 to 3.143, with a mean of 3.282 and the standard deviation of 3.305.

Table 2:
Correlational Matrix

Variable	POV	LIT	LEXEDU	LGCF	LSSE	LPSE	LGDP
POV	1.000						
IT	-0.938	1.000					
EXEDU	0.563	-0.450	1.000				
GCF	0.104	-0.282	-0.602	1.000			
SSE	0.892	-0.846	0.775	-0.176	1.000		
PSE	-0.966	0.974	-0.438	-0.299	-0.841	1.000	
GDP	0.420	-0.315	0.875	-0.723	0.696	-0.278	1.000

Source: Authors' computation (2026).

The correlational output presented in Table 2 reveals the evidence of strong correlations between the variables is shown in the correlation matrix. Technology (-0.938) and primary school enrolment (-0.966) have a significant negative relationship with poverty, suggesting that advancements in basic education and access to modern technology are linked to a decrease in poverty. Poverty has a positive relationship with secondary school enrolment (0.892) and GDP (0.420). Information technology indicates a significant positive relationship with primary school enrolment (0.974) but a negative correlation with secondary school enrolment (-0.846) and GDP

(-0.315). Expenditure on education has a negative correlation with gross capital creation (-0.602) and a high positive correlation with GDP (0.875). These results demonstrate considerable interdependencies across human capital, ICT, and macroeconomic variables.

Table 3:
Unit Root Tests

Variables	ADF @ Level		ADF @ First Diff.		Order of Integration
lnPOV	1.141881	(0.9971)	-6.154351	(0.0001)	I(1)
lnIT	-2.759352	(0.0759)	-3.131143	(0.0339)	I(1)
lnEXEDU	-3.008018	(0.0445)	-7.645067	(0.0000)	I(0)
lnGCF	-1.791804	(0.3781)	-3.354034	(0.0203)	I(1)
lnSSE	-0.137400	(0.9371)	-5.731713	(0.0000)	I(1)
lnPSE	-3.098527	(0.0364)	-4.475737	(0.0012)	I(0)
lnGDP	-0.980164	(0.7487)	-3.220605	(0.0276)	I(1)

Source: Authors' computation (2026).

The table 3 results for the Augmented Dickey Fuller unit root test reveals that expenditure on education and primary school enrolment are stationary at level because their probability values indicates rejection of null hypothesis, while, poverty, gross capital formation, information technology, secondary school enrolment and economic growth are statistically significant and stationary at first difference, hence the results establishes the mixture of I(0) and I(1).

ARDL Cointegration Bound Test Results

ARDL Cointegration Bound test is used to examine the presence of a long-run relationship among the variables included in the model.

Table 4:
Result of Cointegration Bounds test of ARDL

Statistics	Value		Critical bounds		
F-statistics	5.406821		1%	5%	10%
		I(0) Bound	3.65	2.79	2.37
		I(1) Bound	4.66	3.67	3.2

Source: Authors' computation (2026).

The table 4 found that the F-statistic value is greater than the lower and upper bound tests at all level of percentage and confirmed the existence of the long-run association between the dependent and the independent variables used in this study.

Estimation Result

Table 5:

ARDL Long-Run and Short-Run Estimate Parameters

ARDL Long-Run Model				
Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Constant	0.161613	0.412280	-0.391998	0.7006
lnIT	-0.509072	0.188204	2.704901	0.0205
lnGCF	-5.093238	1.261064	4.038843	0.0009
lnEXEDU	0.946611	0.302337	3.130978	0.0061
lnSSE	-0.007692	0.002755	-2.792200	0.0137
lnPSE	0.014766	0.004323	3.415418	0.0038
lnGDP	3.250750	3.072985	1.057848	0.3049
ARDL Short-Run Model				
ΔlnPOV(-1)	-0.470407	0.208301	-2.258306	0.0393
ΔlnLIT(-1)	-0.220974	0.114004	-1.938305	0.0716
ΔlnLIT(-2)	-0.010250	0.090839	-0.112832	0.9117
ΔlnGCF(-1)	-3.742675	1.057716	-3.538449	0.0025
ΔlnGCF(-2)	-2.350954	1.266692	-1.855979	0.0809
ΔlnEXEDU(-1)	-1.499959	0.661131	-2.268776	0.0366
ΔlnEXEDU(-2)	-1.105587	0.562041	-1.967094	0.0657
ΔlnSSE(-1)	0.008332	0.004147	2.008972	0.0629
ΔlnSSE(-2)	-0.004080	0.003705	-1.101132	0.2882
ΔlnPSE(-1)	-0.008321	0.004002	-2.079230	0.0552
ΔlnPSE(-2)	-0.007521	0.003995	-1.882888	0.0793
ΔlnGDP(-1)	-10.39628	3.412999	-3.046084	0.0073
ECM	-0.135254	0.020290	-6.666011	0.0000
R-squared		0.984451		
Adjusted R-squared		0.975449		
BP Serial Correlation Stat		0.4805		
BPG Hetroskedasticity Stat		0.7899		
Normality Test (J-bera Statistics)		0.727237		
CUSUM and CUSUM of Squares		Stable		

Source: Authors' computation (2026).

The table 5 presents the long-run ARDL results, poverty is influenced by information technology, gross capital formation, education spending, school enrolment, and economic growth. With a coefficient value of -0.509 and a corresponding probability of 0.02, information

technology is statistically significant and negative, that means any increase in information technology will reduces poverty rate in the country and finding corroborates with the a priori expectations and that of Abasilim and Oparah (2025) and Lechman and Popowska (2022), whose found that increased information technology reduces poverty in the country. Furthermore, gross capital formation has a negative and significant impact on poverty rate in the country, with coefficient and probability value of -5.093 and a corresponding probability of 0.000, positing reduction of poverty in the long-run, and this is as a result of heavy investment-led growth in the country and the findings consistent with the theoretical expectations, suggesting that increase in gross capital formation has to do with economic growth expansion, income and employment generation and poverty reducing effects that are linked to investment and inclusive economic policies that reduces poverty. More so, expenditure on education and primary school enrolment as proxies of human capital development reveals positive impact of on poverty level in the long-run, with coefficient and probability values of (0.947; & 0.006) and (0.014 & 0.003), respectively meaning that human capital development increases poverty significantly and contrary with theoretical expectation states that human capital development is generally expected to increases economic growth and reduces poverty. While on the other hand, the result is corroborating with findings Didiugwu's (2024), who also found that human capital development increases poverty level in the long-run, this is a result of inefficient spending on education and delayed returns on human capital in the country. However, secondary school enrolment has a negative and significant coefficient and probability value of -0.0077 and 0.013, which is consistent with the theoretical expectation that poverty declines as educational level increases. Economic growth (lnGDP) is positive but statistically insignificant, meaning that GDP in an ideal situation economic growth tend to reduces poverty in the long-term, and this study found that its impact does not affect poverty level in the country. Most likely issues that are associated with income inequality, unemployment, corruption and unequal distribution of resources that retrogressed increase in economic growth that translate into better welfare or income for the impoverished. Hence, without employment opportunities, and just resource allocation, economic growth could not serve as engine of poverty reduction in the long-term.

The poverty (ΔlnPOV(-1)) results at lag one indicates significant and negative relationship in the short-run and suggest that the dynamic present in poverty. Information technology at lag one affects poverty in the short-run, but the effects is slightly significant and at lag two is does not meaningful reduces poverty in the short-term, rather any increase in information technology is associated the increase in poverty rate in the country. Also, the short-run results for gross capital formation is statistically significant at lag one but the outcomes differ at lag two with insignificant relationship found in the model, that is gross capital formation reduces poverty at lag one and increases poverty at lag two based on the short-run result. Moreover, the results from table also indicates that education spending are statistically significant at lag one and insignificant at lag two, meaning that there is varying impacts of educational spending to poverty level in the short-run, that in the short-term expenditure on education do perform well in reducing poverty at lag one and increases poverty at lag two. While secondary school enrolment found insignificant relationship in the short-run at lag one and lag two, meaning that does not in any way affects poverty level in the country at all lags. The primary school enrolment on the other hand, reveals that at lag one is significant and lower poverty level in the country, while at lag two increases poverty level in the short-run. Economic growth reduces poverty level in the short-run indicating transient trickle-down effects. Lastly the speed of adjustment to the long-run

is confirmed by the results of error correction term with coefficient -0.135 and the probability values of 0.0000, while the R-squared and robustness of the model are confirmed by the post-estimation tests.

5.0 Conclusion and Recommendations

In conclusion, therefore, the study examined the effects of information and human capital development on reducing poverty from 1990 to 2024. The study employed ADF unit root test, Cointegration, and an ARDL framework for the analysis. The results from both short-run and long-run models reveal that information technology, secondary school enrolment, and gross capital formation reduce poverty in the long run; that is, an increase in IT, SSE, and GCF contributes heavily towards poverty reduction in the country. More so, technological improvement, access to education, and improved investment play a significant role in promoting economic growth that affects individual welfare and inclusive sustainable poverty reduction in the country. However, the study further concludes that both primary school enrolment and educational expenditure are positive and statistically insignificant and hence increase the poverty rate; this is the result of variation in educational funding and weak educational policy implementation in the country. The study also concludes that information technology, expenditure on education, and gross capital formation exhibit a short-run effect on poverty reduction under the period of investigation.

The study recommends that the government formulate and implement policies aimed at improving information and communication technology, quality access to education at all levels, and investment in gross capital formation for infrastructural development through appropriate economic policies to ensure effective allocation and monitoring of educational expenditure to strengthen quality education. Also, the government should integrate digital technology into the educational system; encourage vocational and skills acquisition programs; strengthen quality primary education; enhance effective policy implementation for poverty reduction; and benefit from human capital development; improve productivity, income, and employment generation; and achieve inclusive, sustainable economic growth in the long-run.

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