A PUBLICATION OF WORD ASTRA
wordastrajournals@gmail.com
www.wordastrajournals.com

International Journal of Public Relations
and Social Sciences (IJPRSS)
Vol. 2, Issue 5, October 2026 - ISSN: 1595-0778

Technology and Employment Dynamics: Opportunities and Challenges for Labour Market in Nigeria

Benson Edet Ekpenyong, PhD[1]; Victor Edet Ebiefie, PhD[2]; Blessing Anietie Udoakpan[3]

[1&3]Department of Economics, Federal College of Education, Ididep Ibiono Ibom L.G.A, Akwa Ibom State, Nigeria.

[2] Department of Economics, Edo State University, Iyamho, Edo State, Nigeria.

[1] benson.ekpenyong@fceididep.edu.ng, +234 8023033122

[2] ebiefie.victor@edouniversity.edu.ng, +234 8034122357, +234 8082096503

[3] blessing.udoakpan@fceididep.edu.ng, +234 8066168342

DOI: https://doi.org/10.67487/ijprss.v2i5.344

Citation: Ekpenyong, B. E., Ebiefie, V. E., Udoakpan, B. A. (2026). Technology and Employment Dynamics: Opportunities and Challenges for Labour Market in Nigeria. *International Journal of Public Relations and Social Sciences, 2(5).* https://doi.org/10.67487/ijprss.v2i5.344

Abstract

The rapid advancement of digital technologies and artificial intelligence (AI) is reshaping labor markets, creating new employment opportunities while presenting challenges for job creation and workforce sustainability, particularly in developing economies such as Nigeria. This study examines the relationship between technological advancement and employment dynamics in Nigeria, with particular emphasis on the extent to which digital skills adoption influences the relationship between technological advancement and employment outcomes. Specifically, the study investigates the effects of artificial intelligence, digital technology adoption, and foreign and domestic investment in technology on employment outcomes, while accounting for the role of economic growth. The study employs the Autoregressive Distributed Lag (ARDL) technique to examine the short-run and long-run relationships among the variables. The empirical findings reveal that artificial intelligence and foreign and domestic investment in technology adoption have positive and statistically significant relationships with employment outcomes in Nigeria, suggesting that AI-driven innovation and investment in technological infrastructure can create employment opportunities. Conversely, digital technology adoption and the economic growth rate exhibit a shocking negative and statistically significant relationships with the employment rate, indicating that technological displacement effects and the limited employment-

generating capacity of economic growth may outweigh job creation in certain sectors. These findings highlight the complex and potentially divergent effects of technological advancement on labor market performance. The study underscores the importance of strengthening digital skills development, promoting inclusive technology adoption, and encouraging investment in employment-generating technological innovations. For policy therefore, the study recommends policies that align digital transformation with workforce training, human capital development, and sustainable job creation to ensure that technological progress translates into improved employment outcomes in Nigeria.

Keywords: artificial intelligence, digital skills adoption, technological advancement, employment dynamics, foreign investment, domestic investment, ARDL, Nigeria

1.1 Introduction

The global economy is undergoing a profound structural transformation driven by the Fourth Industrial Revolution. Technologies such as Artificial Intelligence (AI), financial technology (Fintech), robotics, cloud computing, and big data analytics are reconfiguring production functions and employment systems worldwide (World Economic Forum [WEF], 2025). In developing economies, particularly in Sub-Saharan Africa, the rapid integration of digital technologies presents a double-edged sword: it offers unprecedented opportunities to leapfrog structural bottlenecks while simultaneously raising critical concerns regarding job displacement and labor market polarization (Oyegoke, 2021). As Africa's most populous nation, Nigeria sits at the epicenter of this economic transition. Understanding the dynamics between technological adoption and labor outcomes is essential for shaping sustainable macroeconomic policy in Nigeria.

Nigeria's technological adoption path exhibits a sharp divergence between rapid digital consumption and slow industrial modern technology absorption. Over the last two decades, mobile phone penetration and internet usage have expanded rapidly, laying the groundwork for a thriving digital ecosystem notably across Lagos, Abuja, and Port Harcourt. According to data from the National Bureau of Statistics (NBS, 2021), digital service sectors such as telecommunications and financial intermediation have maintained strong growth trajectories, consistently outperforming traditional real-sector industries like agriculture and manufacturing. However, macro-level indicators reflect a structural mismatch: while the technology sector expands, national headline and youth unemployment rates have historically climbed, reflecting an economy struggling to translate technological adoption into broad-based, high-quality formal employment (NBS, 2021).

Technological innovation generates non-uniform labor effects across sectors. In service-oriented industries particularly Fintech, e-commerce, and digital logistics technology acts predominantly as a catalyst for productivity and job creation. Conversely, in low-tech and rural production sectors, technological absorption remains low, leaving traditional workers vulnerable to technological displacement without adequate safety nets (Yakubu & Krisztián, 2022). Technological adoption in Nigeria has accelerated the growth of flexible, platform-based gig work (e.g., ride-hailing, micro-tasking, e-logistics). While platform work provides quick income opportunities for unemployed youth, it often lacks structured pension frameworks, job security, and health protection (Igwe, 2025).

A significant gap exists between the output of traditional educational institutions and the digital skill set required by high-growth tech firms. While over 60% of the global workforce requires reskilling to adapt to AI and automated workflows, Nigeria faces acute shortages in specialized technical skills, which restricts high-value employment absorption (WEF, 2025). The theoretical and empirical relationship between technological progress and employment in Nigeria reflects a complex interplay between labor-displacement effects and labor-reinstatement (compensating) effects. Grounded in Schumpeterian creative destruction and Keynesian theories of technological unemployment, technology displaces labor in routine, manual, and administrative functions (Oyegoke, 2021). In the short run, the displacement effect dominates, generating friction and structural unemployment as workers lack the digital literacy to transition quickly. In the long run, however, technological innovation stimulates output growth, lowers transactional costs, and generates entire sub-industries such as mobile payment processing, digital agency banking, and software design thereby creating new labor demand (Kindberg-Hanlon, 2021; WEF, 2025).

Nigeria stands at a critical demographic and technological crossroads. With the working-age population projected to expand significantly over the coming decades, failing to align human capital development with technological trends could worsen youth underemployment, broaden income inequality, and fuel socio-economic unrest (WEF, 2025). Conversely, if supported by targeted public policy such as digital infrastructure investment, legal reforms for flexible work, and modernized technical education technological dynamics can convert Nigeria's youth bulge into a powerful driver of economic prosperity (Anushiem, 2025). A balanced policy response requires harnessing the productivity gains of digital transformation while mitigating structural displacement through active labor market interventions and universal reskilling frameworks.

It is against this background; the central problem is whether technological advancement in Nigeria is generating sufficient productive employment opportunities to offset potential job displacement and whether the country's labor market institutions and skills-development systems are adequately prepared for the changing world of work. Therefore, this study examines Technology and Employment Dynamics: Opportunities and

Challenges for the Labor Market in Nigeria, with particular attention to the channels through which technological change affects employment creation, job displacement, skills demand, productivity, and the quality of work.

1.2 Objective of the Study

The main objective of this study is to examine the impact of technology and employment dynamics: opportunities and challenges for labor market in Nigeria, the specific objective is:

i. To determine the extent to which digital skills adoption moderate the relationship between technological change and labor market absorption in Nigeria.

1.3 Research Question

To analyze the above objective, the study will attempt to answer the question:

i. What role do digital skills play in facilitating labor market transitions amid technological advancements in Nigeria?

1.4 Research Hypothesis

To answer the question stated above, the study will test the hypothesis state in null form below:

i. Digital skills adoption does not significantly moderate the relationship between technological advancement and employment rates in Nigeria.

2. Literature Review

2.1 Theoretical Literature:

2.1.1 Schumpeterian Theory of Innovation

The Schumpeterian Theory of Innovation was developed by Joseph Alois Schumpeter, whose work The Theory of Economic Development was originally published in German in 1911 and translated into English in 1934. The theory emphasizes the role of innovation and entrepreneurship in promoting economic development. According to Schumpeter, economic growth is driven by the introduction of new products, production methods, markets, sources of supply, and organizational structures. These innovations transform existing economic activities and create opportunities for new businesses and industries.

The theory assumes that innovation is a major driver of economic development, entrepreneurs play a significant role in introducing new technologies, and technological advancement continuously changes the structure of production and employment. It further assumes that innovation can create new economic opportunities while making some existing production methods and occupations less competitive. The theory is relevant to this study because technological advancement has contributed to the growth of telecommunications, financial technology, e-commerce, digital marketing, software development, and other

technology-related activities in Nigeria. These developments have created employment opportunities for software developers, digital marketers, data analysts, and technology entrepreneurs. However, the adoption of digital technologies may also reduce the demand for labor in certain traditional occupations.

In practical terms, the theory can be applied by examining how technological innovation, internet penetration, ICT investment, and digital entrepreneurship influence employment generation in Nigeria. Government policies that encourage innovation, support technology-based businesses, improve digital infrastructure, and facilitate access to finance can help expand employment opportunities. Therefore, the Schumpeterian Theory of Innovation provides a foundation for understanding how technological advancement can stimulate employment creation and transform the Nigerian labor market.

2.1.2 Skill-Biased Technological Change Theory

The Skill-Biased Technological Change Theory was developed through several contributions to labor economics, particularly the empirical work of Berman, Bound, and Griliches (1994), as well as the work of Goldin and Katz (1998) to explains how technological advancement affects the demand for workers with different levels of skills and education. It argues that technological advancement often increases the relative demand for skilled workers because such workers are better equipped to operate, manage, and complement modern technologies.

The major assumptions of the theory are that technological change affects workers differently, skilled workers can complement advanced technologies in many occupations, and employers increasingly demand workers with relevant technical and analytical competencies. The theory also assumes that differences in education, training, and digital literacy influence workers' ability to benefit from technological advancement. The theory is relevant to this study because the adoption of artificial intelligence, automation, digital platforms, and other modern technologies is changing the skills required in Nigeria's labor market. Workers with digital competencies may gain access to better employment opportunities, while those without the necessary skills may experience unemployment, underemployment, or difficulties transitioning into emerging occupations. This situation can widen income and employment inequalities between skilled and less-skilled workers.

The practical application of the theory involves examining the relationship between technological advancement, educational attainment, digital skills, and employment outcomes in Nigeria. Policies such as digital literacy programs, technical and vocational education, retraining initiatives, and partnerships between educational institutions and industries can help workers acquire the skills required by technology-driven sectors. The theory therefore explains why the employment benefits of technological advancement

depend partly on the availability and distribution of relevant skills within the Nigerian labor force.

2.2 Empirical Review

The relationship between technological advancement and employment dynamics has received considerable attention in recent economic literature. For instance, Somoye (2024) examined the relationship between technological innovation and unemployment in Nigeria over the period 1991–2021. The study employed the Autoregressive Distributed Lag (ARDL) technique, Fully Modified Ordinary Least Squares (FMOLS), Dynamic Ordinary Least Squares (DOLS), Canonical Cointegrating Regression (CCR), and frequency-domain causality analysis. The findings indicated that technological innovation increased unemployment in both the short run and the long run. Specifically, the ARDL results suggested that a 1% increase in technological innovation was associated with a 0.15% increase in unemployment in the long run and a 0.02% increase in the short run. The frequency-domain causality results also indicated that technological innovation Granger-caused unemployment over short-, medium-, and long-term horizons. The study recommended policies that strengthen education, training, and human capital development to improve workers' ability to adapt to technological change. This study is directly relevant to the present research because it provides evidence that technological advancement may create unemployment challenges when workers lack the skills required by changing production systems. However, the study's findings do not imply that all forms of technology necessarily increase unemployment, since the employment effects may differ according to the type of technology adopted, the sector concerned, and the economy's capacity to generate new jobs.

Ogunwole et al. (2024) investigated the effects of ICT and debt servicing on employment and productivity in Nigeria. The researchers employed the Autoregressive Distributed Lag technique to distinguish between short-run and long-run relationships. Their findings revealed that ICT had a positive but statistically insignificant relationship with employment in the short run, while its relationship with employment was positive in the long run. The study also found that ICT was positively associated with productivity in the short run and had a positive long-run relationship with output. In contrast, debt servicing was negatively associated with employment in both the short run and long run, while its long-run relationship with productivity was negative. The authors concluded that ICT could complement labor rather than simply substitute for workers and recommended policies to improve the economic environment for employment and productivity growth. The study is relevant to the present research because it demonstrates that the employment effects of technological advancement may depend on the period considered. Although ICT adoption may not immediately generate additional jobs, its longer-term benefits may emerge through

increased productivity, business expansion, and the creation of new economic activities. Nevertheless, the aggregate nature of the study means that further research is required to determine how technology affects particular occupations, employment categories, and skill groups in Nigeria.

Bahia et al. (2024) examined the effects of mobile broadband coverage on household welfare and labor market participation. The study used longitudinal household survey data combined with information from Nigerian mobile operators on the deployment of mobile broadband coverage between 2010 and 2016. The researchers exploited differences in the timing and geographical availability of broadband coverage to estimate its effects on household outcomes. Their findings indicated that mobile broadband coverage increased household consumption, reduced poverty, and improved labor force participation, particularly through increased wage employment. The employment and welfare effects were particularly relevant to poorer households and rural populations, demonstrating that digital connectivity can support economic inclusion beyond major urban centers. The study provides important evidence that technological advancement can improve employment opportunities by reducing communication barriers, facilitating access to information, and enabling participation in economic activities. It is particularly relevant to the present research because it demonstrates that technological infrastructure can influence employment outcomes in Nigeria. However, the study focuses on mobile broadband coverage introduced during 2010–2016 and therefore does not fully capture the more recent effects of artificial intelligence, digital platforms, and other emerging technologies. Further research is consequently needed to examine whether the employment benefits of digital connectivity remain significant under changing economic and technological conditions.

Ebiefie et al. (2026), examined technology and inclusive growth: Addressing Poverty, Inequality and Income Distribution in Nigeria, specifically, the study examined the relationship between technological advancement and inclusive economic growth in Nigeria. The study utilized annual time-series data from the Central Bank of Nigeria Statistical Bulletin and the World Development Indicators covering the period 1995–2024. The researchers constructed a composite inclusive growth index using principal component analysis and employed unit root tests, cointegration analysis, and the Vector Autoregression (VAR) technique to examine the relationships among technology, poverty, inequality, and income distribution. The findings indicated that the ICT index, government expenditure, GDP growth, inclusive growth index, and inflation generated positive responses in the study's poverty-related analysis. However, mobile phone subscriptions, internet penetration, education, and foreign direct investment showed negative and statistically insignificant relationships or shocks. The authors concluded that technological advancement alone is insufficient to guarantee poverty reduction and equitable income distribution. They therefore recommended increased investment in digital infrastructure, affordable internet access,

quality education, digital skills, and inclusive economic policies, particularly for rural communities and disadvantaged groups.

Fagbemi et al. (2025) examined the relationship between innovation and unemployment in Nigeria over the period 1990–2020. The study considered the persistent unemployment problem in Nigeria and the potential role of innovation in improving employment outcomes. The findings indicated that unemployment was an important development challenge and that increased unemployment stimulated innovation efforts, suggesting a causal relationship running from unemployment to innovation. The authors argued that innovation could play an important role in addressing unemployment if its benefits were effectively utilized. The study is relevant to the present research because it highlights the importance of examining not only whether technological advancement affects employment but also how unemployment pressures may encourage entrepreneurial activity and the search for innovative economic opportunities. For example, individuals who face difficulties obtaining formal employment may establish digital businesses, provide online services, or engage in technology-enabled and self-employment. Nevertheless, the study's finding that unemployment stimulates innovation should not be interpreted as proof that innovation automatically reduces unemployment. The employment effects of innovation depend on whether new business activities generate sustainable jobs, improve productivity, and provide opportunities for workers with different skill levels. The present study therefore extends this discussion by examining both the employment opportunities and the challenges associated with technological advancement in Nigeria.

The World Bank (2025) examined changing employer skill requirements using online job vacancy data covering the period from 2020 to June 2024. The report analyzed vacancies collected by Light-cast and classified the skills requested by employers using established occupational and skills taxonomies. Its approach provides insights into the competencies employers seek when recruiting workers, including digital and ICT-related skills, analytical abilities, and other transferable competencies. The report is important because technological advancement can change not only the number of jobs available but also the qualifications and competencies required to obtain them. As businesses adopt digital systems, workers may need skills in data analysis, software applications, digital communication, and other technology-related areas. Workers who possess these competencies may be better positioned to access emerging employment opportunities, while those without relevant training may face difficulties entering technology-intensive occupations. The report is therefore relevant to the present study because it highlights the importance of aligning education and training with labor market demand. However, online vacancy data capture only a segment of Nigeria's labor market, as many jobs, particularly informal-sector positions, are obtained through personal networks, direct applications, and other recruitment channels. Consequently, the evidence should be interpreted as an indication of skill demand in the

online recruitment market rather than a complete representation of employment requirements across Nigeria (World Bank, 2025).

Gmyrek et al. (2025) examined the potential exposure of occupations to generative artificial intelligence. The study updated earlier estimates by combining task-level information, expert assessments, and AI-generated predictions to evaluate the potential effects of generative AI on employment. The findings indicated that approximately one in four workers globally was employed in an occupation with some degree of exposure to generative AI. However, the researchers emphasized that the transformation of existing jobs was generally more likely than the complete elimination of occupations because many tasks still require human judgement, interaction, supervision, and decision-making. The study also identified increasing automation potential in certain media-related and web-related tasks as generative AI capabilities improve. These findings are relevant to Nigeria because AI may transform occupations in administration, communications, customer service, digital marketing, software development, and other information-intensive activities. While some tasks may become automated, new responsibilities may emerge that require workers to supervise AI systems, interpret information, and apply specialized knowledge. Nevertheless, the global findings cannot be directly interpreted as evidence of actual job losses in Nigeria. The effects on Nigerian workers will depend on the extent of AI adoption, access to digital infrastructure, skills availability, and the structure of the economy. The study therefore reinforces the need to examine technological advancement as both a potential source of employment opportunities and a challenge to existing occupational structures.

Ekpenyong et al.(2026) examined technology in agricultural transformation and food security: A panacea for national development, specifically, the study examined the role of agricultural technology and food security in promoting national development in Nigeria. The study adopted an ex post facto research design and employed annual time-series data obtained from the World Development Indicators, the Food and Agriculture Organization (FAO), and the National Bureau of Statistics. Using descriptive statistics, unit root tests, cointegration analysis, and the Autoregressive Distributed Lag (ARDL) technique, the researchers investigated the effects of agricultural information and communication technology (ICT) adoption, agricultural gross domestic product, fertilizer application, nutritional adequacy, and food accessibility on poverty reduction. The findings revealed that agricultural GDP, fertilizer application, nutritional adequacy, and food accessibility had positive and statistically significant effects on national development. However, agricultural ICT adoption had a negative but statistically insignificant effect on the poverty rate. The authors concluded that technological advancement can improve agricultural productivity, strengthen food security, and reduce poverty, provided that it is supported by adequate infrastructure, agricultural financing, human capital development, and effective government policies.

2.3 Research Gap

The reviewed literature identifies several gaps that justify further investigation into technology and employment dynamics in Nigeria. First, existing empirical findings are mixed. Somoye (2024) reported a positive relationship between technological innovation and unemployment, whereas Ogunwole et al. (2024) found a positive long-run relationship between ICT and employment. Bahia et al. (2024) also found that mobile broadband coverage improved labor force participation and wage employment. These differences suggest that the employment effects of technology may depend on the indicators used, the period examined, and the economic mechanisms through which technological change influences labor demand.

Second, some studies focus on aggregate employment or unemployment without adequately distinguishing between employment generation, job displacement, labor productivity, and employment quality. An increase in employment does not necessarily indicate that workers have obtained secure, adequately paid, or productive jobs. Similarly, a reduction in labor demand within one occupation does not necessarily imply an overall decline in employment if new occupations and industries emerge.

Third, the existing literature highlights the importance of digital skills but leaves room for further investigation into how human capital development influences the relationship between technological advancement and employment outcomes. The World Bank's (2025) analysis of online job vacancies provides insights into changing skill requirements, but online recruitment data do not fully represent Nigeria's informal labor market. More evidence is therefore needed on how digital competencies influence employment opportunities across different categories of workers.

Fourth, much of the empirical evidence on generative AI remains international rather than specifically Nigerian. Gmyrek et al. (2025) provide a global assessment of occupational exposure to AI, but the implications for Nigeria depend on local adoption rates, infrastructure, educational opportunities, and occupational structures. Consequently, the present study seeks to contribute to the literature by examining technology and employment dynamics in Nigeria, with particular emphasis on employment generation, unemployment, labor productivity, and the challenges associated with changing skill requirements. By considering both the opportunities and challenges of technological advancement, the study aims to provide evidence that can support policies promoting digital innovation, human capital development, and inclusive employment growth in Nigeria.

3. Method

3.1 Research Design

The design adopted in this study is an ex post facto (after the fact) design. Hence, this study used secondary sources information and therefore time series data sourced from various

publications of Central Bank of Nigeria Statistical Bulletin and world development indicators (WDI). The models for this study were estimated using data on technology, and employment dynamics indicators, which include: technology adoption measured by artificial intelligence (AI), digital technology adoption measured by ICT index (DIGTECH), economic growth measured by GDP growth rate (GDPg), domestic and foreign investment in technology (DFINV), and employment rate as a percentage of working age population that is employed (EMP) as a dependent variable for the period 1995-2025.A multiple regression analysis was used, predicated on various data diagnostics including Augmented Dickey-Fuller (ADF) and Philip-Peron (PP) unit root tests, bound testing method for co integration and the autoregressive distributed lag technique (ARDL.) was employed in this study to determine the extent to which digital skills adoption moderate the relationship between technological change and labor market absorption in Nigeria.

3.2 Model Specification

The model for this study is anchored on the Schumpeterian theory of innovation was developed by Joseph Alois Schumpeter, whose work The Theory of Economic Development was originally published in German in 1911 and translated into English in 1934. The theory emphasizes the role of innovation and entrepreneurship in promoting economic development. According to Schumpeter, economic growth is driven by the introduction of new products, production methods, markets, sources of supply, and organizational structures. These innovations transform existing economic activities and create opportunities for new businesses and industries. Hence, the model is as specified below:

3.2.1 Technological advancement, employment dynamics opportunities, and challenges for labor market equation:

LABMKT= F (TECH) Equation 3.1

Equation 3.1 states that labor market opportunities and challenges is dependent upon technology, employment dynamics variables. In demystifying the above model, the labor market opportunities and challenges and technology 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:

EMP = F (AI, DIGTECH, DFINV, GDPg) Equation 3.2

The functional form of technological advancement, employment dynamics opportunities, and challenges for labor market equation for this study is given as:
The econometric form of the model is given as:

$EMP_t = \alpha_0 + \alpha_1 AI_t + \alpha_2 DIGTECH_t + \alpha_3 DFINV_t + \alpha_4 GDPg_t + U_t$ Equation 3.3

Where:

EMP_t = Employment rate measured by the percentage of working age population that are employed in time t

AI_t = Technology Adoption measured by Artificial intelligence in time t

$DIGTECH_t$ = Digital Technology adoption proxied by ICT index in time t

$DINVTECH_t$ = Domestic and foreign Investment in Technology in time t

$GDPg_t$ = Economic Growth measured by GDP growth rate in time t (serve as a control variable in the model)

U_t– Error term

A priori Expectation shows that α_1(+), α_2 (+), α_3 (+), and α_4 (+).

4. Results and Discussion of Findings

4.1 Descriptive statistics and matrix of correlations

Table 4.1: Descriptive Statistics

	EMP	AI	DIGTECH	DFINV	GDPG
Mean	78.67	26.27	0.53	1.24	5.41
Median	78.69	15.00	0.60	0.98	5.31
Maximum	80.60	83.00	1.00	2.90	20.87
Minimum	74.78	0.10	0.01	-0.04	-1.79
Std. Dev.	1.51	27.12	0.39	0.78	4.65
Skewness	-0.63	0.79	-0.16	0.46	1.27
Kurtosis	2.73	2.22	1.42	2.26	5.61
Jarque-Bera	2.13	3.97	3.38	1.80	17.12
Probability	0.34	0.14	0.18	0.41	0.00
Sum	243.88	814.50	16.39	38.56	167.84
Sum Sq. Dev.	68.02	220.64	4.47	18.38	648.67
Observations	**31**	**31**	**31**	**31**	**31**

Source: *Researcher's computation (2026), using E-Views 9.*

Table 4.1 presents the descriptive statistics of the variables used in the study from 1995 to 2025. The results show that employment rate (EMP) recorded an average value of 78.67 about 80.60%, maximum and standard deviation of 78.69%, 1.51%, indicating high employment rate due to technology adoption despite labor market challenges such as insecurity over the study period that is not translated to improve standard of living, while artificial intelligence (AI) had a low mean value of 26.27% and maximum of 83.00%, suggesting that although there is present of AI driven labor market dynamics in Nigeria, but

the extent to which the government has committed resources to it take off and awareness does not lead to improvement in job creation in Nigeria. Digital technology adoption records an average of 0.53% and a maximum and standard deviation of 1.00% and 0.39% respectively indicating a very low level of digital technology adoption and therefore reflecting relatively low persistent decrease in employment generation within the studied period. Meanwhile, foreign and domestic investment in technology adoption exhibited considerable low variation, as reflected by the mean value of 1.24% and maximum of 2.90% as well as low standard deviation of 0.78%, indicating inconsistent and low investment committed to technology adoption within the study period. Also, economic growth rate (GDPg) exhibited a low averaged of 5.41% and maximum of 20.87%, implying substantial low economic growth rate. The skewness result shows that only GDPg is positive skewed showing a peak distribution. The result of the kurtosis shows that only GDPg is leptokurtic (kurtosis > 3), indicating peaked distributions. The Jarque-Bera probabilities indicate that EMP, AI, DIGTECH and GDPg are normally distributed, whereas DFINV deviate from normality due to variability and macroeconomic instability with the standard deviation of 1.80.

Table 4.2: correlation Matrix

	EMP	AI	DIGTECH	DFINV	GDPG
EMP	1				
AI	-0.89	1			
DIGTECH	-0.81	0.53	1		
DFINV	0.25	-0.44	0.07	1	
GDPG	0.09	-0.22	-0.06	0.64	1

Source: *Researcher's computation (2026), using E-Views 9.*

The correlation matrix of the variables is as shown in Table 4.2 above. From the table therefore, EMP has a positive correlation coefficient with DFINV and GDPg. This therefore indicates that the variables tend to move in the same direction. Meanwhile AI and DIGTECH has a weak negative correlation (-0.89 and -0.81) indicating that as EMP increases AI and DIGTECH tends to decrease. Also, from the table, there exist positive correlation coefficient between AI and DIGTECH; DIGTECH and DFINV; as well as DFINV and GDPg respectively. AI exhibit negative relationship with DFINV and GDPg, while DIGTECH exhibit negative relationship with GDPg respectively.

4.1.2 Unit Root Test

The Augmented Dickey Fuller and the Philip-Perron unit root tests were conducted to examine the stationarity condition of the variables. As indicated in Table 4.3 below, only AI was stationary at level in ADF, and PP, while EMP, DIGTECH, DFINV and GDPg were stationary after first differencing in both ADF and PP. In other words, the variables are integrated of order zero and one (i.e., I (0) and I(I)). Where some of the variables are I (0) while others are I (1) one suggests the problem of unit root-= in the equations. It becomes imperative to perform co-integration tests to determine the presence of equilibrium relationship amongst the variables in each equation. The study adopts the ARDL bound testing technique for co-integration, as the variables are integrated of diverse orders (i.e., order zero and order one).

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

Variables	ADF Level	1st Difference	Order of integration	Level	PP 1st Difference	Order of integration
EMP	-2.146143	-3.910768	I(1)	-	-	I(1)
AI	4.997617	-	I(0)	-	-	I(0)
DIGTECH	-2.615096	-3.620414	I(1)	-	-	I(1)
DFINV	-1.704608	-8.292517	I(1)	-	-	I(1)
GDPg	-1.335777	-5.636672	I(1)	-	-	I(1)

Source: *Researcher's computation (2026), using E-Views 9.*

Note: Mackinnon critical values for ADF at 1, 5 and 10% levels are -3.60, -2.93 and -2.60 respectively, and for PP are 3.605, 2.936 and 2.606, respectively. ** means significant at 5% level.

4.1.3 Lag Length Selection

Table 4.4: lag length criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-239.0305	NA	48.77017	18.07633	18.31630	18.14769
1	-56.09948	284.5594	0.000421	6.377739	7.817558	6.805873
2	-10.43352	54.12262	0.000113	4.846927	7.486595	5.631839
3	29.13218	32.23872	7.26e-05	3.767987	7.607503	4.909676
4	118.0517	39.51978*	3.59e-06*	-0.966792*	4.072574*	0.531676*

Source: *Researcher's computation (2026), using E-Views 9.*

The efficiency and validity of an error correction model depends 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 four optimal lag lengths for the model of technology and employment dynamics: opportunities and challenges for labour market in Nigeria as shown in Table 4.4 above. In order to reduce the possibilities of underestimation whilst maximizing the likelihood of recovering the true lag (Venus, 2004), the study used four as the maximum lag lengths, respectively.

4.1.4 Co-integration Test Results

From the bound testing result reported in Table 4.5 below, long run relationship exists amongst the variables in all the estimated equations, given that the values of the F-statistic are greater than the critical values at five per cent level in both the upper and the lower bounds. Therefore, the null hypothesis of absence of co-integration is rejected, while the study proceeds to estimate the long run coefficient of each of the equations.

Table 4.5: Co-Integration Test Results

5% critical value					
Equation	K	F-Stat	I (0)	I (1)	Outcome
EMP (AI, DIGTECH, DFINV, GDPg)	4	9.51	2.86	4.01	co integrated

Note: K =number of parameters

Source: *Researcher's computation (2026), using E-Views 9.*

4.2 Findings, Presentation and Analysis of Econometric Results of the Long run coefficients of the extent to which technology and employment dynamics influences opportunities and challenges for labor market in Nigeria Equation Results.

Table 4.6: Dependent variable: EMP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AI	0.028558	0.027776	2.028149	0.0320
DIGTECH	-5.830812	1.383494	-4.214556	0.0135
DFINV	0.973832	0.407923	2.387295	0.0354
GDPG	-0.075278	0.043180	-2.743340	0.0162

C	80.028505	0.193808	412.927004	0.0000

Source: *Researcher's computation (2026), using E-Views 9.*

The long-run relationship to determine extent to which technology and employment dynamics influences opportunities and challenges for labor market in Nigeria equation variables is presented in Table 4.6 above. Based on the ARDL long-run estimates, the findings reveal the following insights:

The coefficient for artificial intelligence (AI) is positive and statistically significant, indicating that a unit increase in AI results in 2.85% increases in employment rate (EMP). This finding is in line with a priori expectation, indicating that an increase in the adoption and utilization of AI is associated with an increase in the proportion of the working-age population that is employed, holding other relevant factors constant. This suggests that, rather than serving exclusively as a substitute for human labor, AI can complement workers' skills, improve productivity, stimulate business expansion, and create new employment opportunities across various sectors of the Nigerian economy. The finding indicates that the long-term effect of AI on employment may be favorable when technological advancement is accompanied by adequate investment in human capital, digital infrastructure, and the development of relevant skills.

Conversely, the coefficient of digital technology adoption (DIGTECH) is negative and statistically significant, indicating that a unit rise in DIGTECH results in a -58.30% decreases in EMP. This result is in line with a priori expectation, suggesting that technological advancement may contribute to declining employment when automation and labor substitution outweigh the creation of new jobs. The finding highlights the potential challenges of technological unemployment, skills mismatch, structural unemployment, and unequal access to emerging employment opportunities. It also demonstrates that technological progress alone may not guarantee inclusive employment growth.

More so, foreign and domestic investment in technology (DFINV) exhibits a positive and statistically significant relationship with EMP. Therefore, a one-unit increase in DFINV is associated with 97.38% increases in EMP. This result is in line with a priori expectations, showing that an increase in investment in technological development and adoption is associated with an increase in the employment rate, holding other relevant factors constant. This suggests that both foreign and domestic investments in technology can contribute to employment generation by expanding productive capacity, improving technological infrastructure, stimulating business growth, and creating new economic opportunities. The finding indicates that technology-related investment can play an important role in improving

labor-market outcomes when it supports productive activities and creates demand for workers with relevant skills.

Finally, the coefficient for economic growth rate (GDPg) is negative and statistically significant, indicating that a one-unit increase in GDPg will lead to a -7.52% decreases in EMP. This finding is not in line with a priori expectation, indicating that economic expansion may not automatically translate into improved employment outcomes. The finding is consistent with the possibility of jobless growth, in which increases in output occur alongside limited employment creation because of capital-intensive production, labor-saving technological adoption, structural unemployment, and skills mismatches.

In summary, the long-run analysis highlights the complex interplay between the extent to which technology and employment dynamics influences opportunities and challenges for labor market in Nigeria. While artificial intelligence (AI), and foreign and domestic investment (DFINV) positively influenced labor market proxied by employment rate (EMP) in Nigeria, others such as digital technology adoption (DIGTECH) and economic growth rate (GDPg) posed significant challenge. These findings underscore the need for Nigerian government not to discourage digital technology adoption or economic growth, but to improve their capacity to generate productive and sustainable employment. By aligning technological transformation with human capital development and inclusive economic policies, Nigeria can reduce the risks of technological unemployment, address the challenges of jobless growth, and create a more resilient and competitive labor market in the long run.

4.2.1 Findings, Presentation and Analysis of Econometric Results of the Short run Dynamics of the extent to which technology and employment dynamics influences opportunities and challenges for labor market in Nigeria Equation Results.

Table 4.7: Dependent variable: EMP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EMP(-1))	1.278056	0.649658	1.967273	0.1205
D(EMP(-2))	0.398781	0.371195	1.074317	0.3432
D(EMP(-3))	2.300256	0.980900	2.345047	0.0789
D(AI)	-0.172535	0.034683	-4.974588	0.0076
D(AI(-1))	-0.109386	0.122274	-0.894598	0.4216
D(AI(-2))	-0.422863	0.213634	-1.979387	0.1189
D(AI(-3))	0.477444	0.186192	2.564247	0.0624
D(DIGTECH)	-28.887888	5.803562	-4.977614	0.0076
D(DIGTECH(-1))	17.309364	4.906094	3.528135	0.0243
D(DFINV)	0.246913	0.197191	1.252150	0.2787

D(DFINV(-1))	-0.569714	0.149577	-3.808839	0.0190
D(DFINV(-2))	-0.663488	0.145087	-4.573023	0.0102
D(DFINV(-3))	-0.334570	0.124249	-2.692747	0.0545
D(GDPG)	-0.029679	0.017405	-1.705196	0.1634
D(GDPG(-1))	0.007814	0.013754	0.568139	0.6003
D(GDPG(-2))	0.047121	0.020558	2.292109	0.0537
D(GDPG(-3))	-0.063899	0.028248	-2.262091	0.0565
CointEq(-1)	-1.632362	0.711930	-2.292868	0.0536

R-squared	0.998985	Mean dependent var	78.40111
Adjusted R-squared	0.993401	S.D. dependent var	1.424949
S.E. of regression	0.115752	Akaike info criterion	-1.680575
Sum squared resid	0.053594	Schwarz criterion	-0.576714
Log likelihood	45.68776	Hannan-Quinn criter.	-1.352339
F-statistic	178.9173	Durbin-Watson stat	2.501560
Prob(F-statistic)	0.000068		

Source: *Researcher's computation (2026), using E-Views 9.*

The short-run dynamics of the relationship between extent to which technology and employment dynamics influences opportunities and challenges for labor market in Nigeria Equation Results is as presented in Table 4.7, reveal several significant findings.

The coefficient for artificial intelligence (AI) is negative and significant in current period, negative but insignificant in first and second period lags, and positive but significant in third period lag of the short run, indicating that a unit rise in AI will results in -17.25%, -10.93% and -42.28% decreases in EMP in current, first and second period and 47.74% increases in EMP in third period lag of the short run. The result of the current, first and second period lags is not in line with a priori expectation while the result of the third period lag is in line with a priori expectation, indicating that the findings are consistent with the possibility that AI initially creates labor-market disruptions but may subsequently support employment growth through productivity improvements, business expansion, and the creation of new occupations. However, the extent to which these potential benefits materialize depends on effective skills development, technological adaptation, supportive labor-market policies, and the capacity of the Nigerian economy to generate new and productive employment opportunities.

Also, the coefficient of digital technology adoption (DIGTECH) is negative and significant in current period and positive but significant at first period lag of the short run,

therefore, a unit rise in DIGTECH will results in -28.88% decreases in EMP in current period and 17.30% increases in EMP in first period lag. The result of the current period is not in line with a priori expectation, while the result of the first period lag conforms to theoretical expectation, suggesting that the short-run relationship between digital technology adoption and employment in Nigeria is characterized by an initial displacement effect followed by a potential employment-enhancing effect. The negative contemporaneous coefficient highlights the immediate challenges associated with technological adoption, particularly job displacement, skills mismatches, and the difficulties workers face in transitioning to new occupations. Conversely, the positive and statistically significant lagged coefficient suggests that the employment effects may become more favorable as the economy adapts to technological change. Nevertheless, the positive lagged relationship does not necessarily imply that all workers who lose their jobs will subsequently find employment or that the new jobs created will be sufficient to compensate for initial job losses.

More so, foreign and domestic investment in technology (DFINV) exhibits a positive and insignificant relationship with EMP in current period, negative but significant in first, second and third period lags of the short run. Therefore, a one-unit increase in DFINV is associated with 24.69% increases in EMP in current period, -56.97%, -66.34% and -33.45% decreases in EMP in the short run. The results of current period lag are in line with a priori expectations, while the results of first, second, and third period lags does not conform to theoretical expectations, showing that foreign and domestic investment in technology may have complex employment implications in Nigeria in the short run. The positive but insignificant contemporaneous relationship indicates that the immediate employment benefits of technological investment are not statistically established, while the negative and significant coefficients in the first, second, and third lagged periods suggest that subsequent periods are associated with lower employment rates. One possible economic explanation is that the labor-saving effects of technological investment may emerge more quickly than its employment-generating benefits. In other words, firms may adopt technologies and reduce their dependence on certain categories of workers before new businesses, occupations, and complementary economic activities generate sufficient employment opportunities to absorb displaced labor.

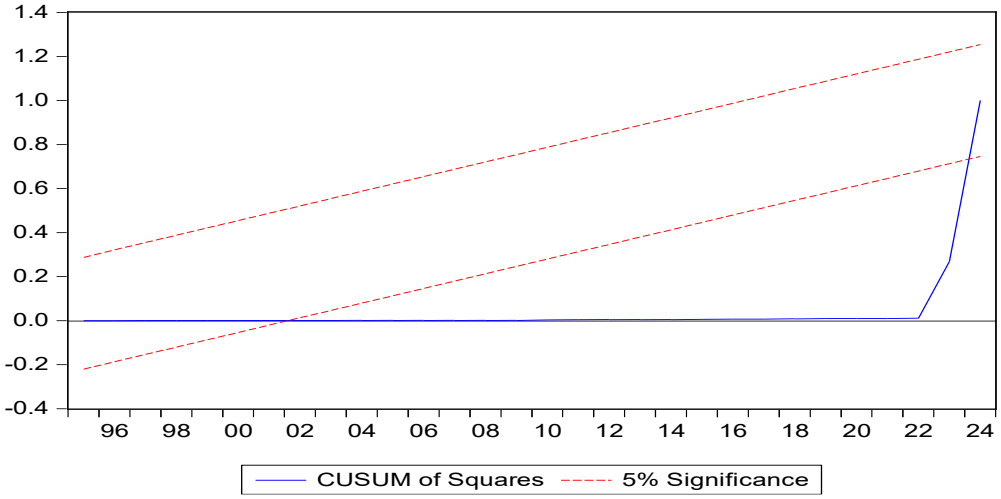
Finally, the coefficient for economic growth rate (GDPg) is negative and insignificant in current period, negative but significant in third period, positive and insignificant in first period, positive but significant in second period, indicating that a one-unit increase in GDPg will lead to -2.96% and -6.38% decreases in EMP in current and third period lags, 0.78% and 4.71% increases in EMP in first and second period lags of the short run. The result of the current and third period lags are not in line with a priori expectation, while the result of the first and second period lags conform to theoretical expectations, indicating that the short-run relationship between economic growth and the employment rate in Nigeria is dynamic

and varies across different lag periods. The negative and insignificant current-period coefficient indicates that economic growth does not necessarily generate immediate employment gains. The positive but insignificant first-lag coefficient suggests a possible delayed improvement in employment, although the evidence is inconclusive. The positive and significant second-lag coefficient indicates that the employment benefits of economic expansion may become more pronounced after some time. Conversely, the negative and significant third-lag coefficient suggests that these benefits may weaken or reverse over a longer lag period.

The ECM coefficient (-1.632362) is correctly signed and statistically significant, indicating that approximately 16.32% of short-run disequilibria adjust to the long-run equilibrium within a year. The t-statistic (-2.292868) confirms the significance of the ECM at the 5% level.

The R-squared value (0.998985) and adjusted R-squared (0.993401) demonstrate that approximately 99% of the variation in EMP is explained by the included variables (both current and lagged), with 1% attributable to factors outside the model. The F-statistic (178.91) confirms the joint significance of the model's variables, ensuring a good overall fit. Additionally, the Durbin-Watson statistic (2.50) indicates no autocorrelation, affirming the reliability of the results for forecasting and policy formulation.

The stability test using the cumulative sum (CUSUM) test in figure 4.1 below further shows that the variables included in the EMP equation were stable within the period of the study. This is evidenced by the swing of the trends within the CUSUM bound at the ± five percent significance level. The study, therefore, infers that the equation is stable and consistent to be adopted for economic policies and forecast.



Source: *Researcher's computation (2026), using E-Views 9.*

Figure 4.1: Technology Employment Dynamics: Opportunities and Challenges for Labor Market in Nigeria equation CUSUM.

4.3 Discussion of Findings

The short run and the long run ARDL dynamics shows an intriguing insight as the regression result shows that two variables of the technology and employment dynamics: artificial intelligence (AI) and foreign/domestic investment in technology (DFINV) offers a positive and significant relationship with the dependent variable employment rate (EMP). The result suggests that increases in artificial intelligence and foreign, domestic investment in technology in essence will lead to corresponding increases in employment generation in Nigeria. This finding therefore suggests that digital skills and human capital development are therefore critical determinants of the extent to which technological advancement translates into employment opportunities. By aligning education and training with labor-market needs, expanding access to digital infrastructure, supporting local innovation, and encouraging investment in skills-intensive activities, Nigeria can improve its capacity to transform technological change into sustainable and inclusive employment generation. The findings are in line with the assertion of Ekpenyong et al. (2026), Gmyrek et al (2025), World Bank (2025), Ogunwole (2024) and Bahia et al (2024) who opined that approximately one in four workers globally was employed in an occupation with some degree of exposure to generative AI, ICT, investment and mobile broadband coverage increased household consumption, reduced poverty, and improved labor force participation, particularly through increased wage employment.

However, digital technology adoption (DIGTECH) and economic growth rate (GDPg) exhibited a shocking negative relationship with employment rate in both short and long run periods. The negative impact of digital technology adoption and economic growth rate suggest that because the country faces persistent challenges associated with unemployment, underemployment, skills mismatches, inadequate infrastructure, and a large informal sector. Although digital technology can improve productivity and stimulate economic activities, its benefits may not immediately translate into increased employment or higher living standards.

The models were estimated using the error correction mechanism (ECM) and the outcome of the key urbanization and economic development equations revealed positive and significant relationship among the variables in both the short run and long run. The result of the heteroscedasticity shows absence of heteroscedasticity. Therefore, the errors are homoscedastic. Hence, the long run results succeed all tests and thus useful for analyses and forecasting.

Error Correction coefficients in all the estimated models met the three criteria for its acceptability given that it is negative, fractional and statistically significant. Consequently,

the estimated result confirms the presence of long run relationship among the variables in the models. It also shows that the speed of adjustments is moderate in all the estimated models. The value of the adjusted R-squared implies that the models have good fit as the independent variables have high explanatory powers. The Durbin-Watson Statistic connotes absence of autocorrelation in the estimated equations. The study, therefore, accepts the null hypotheses of no serial correlation in the models. This further implies that the error terms of different periods are not serially correlated. The stability test using the cumulative sum tests showed that the variables included in all the models were stable within the period of the study.

5. Conclusion and Policy Recommendation

The study investigated the impact of technology and employment dynamics: opportunities and challenges for labor market in Nigeria. Specifically, the study determines the extent to which digital skills adoption moderate the relationship between technological change and labor market absorption in Nigeria, using data from 1995-2025 and adopt the autoregressive distributive lag model (ARDL). The empirical findings reveal a positive and significant relationship between artificial intelligence (AI), foreign and domestic investment in technology (DFINV) which in turn determine the extent to which the dependent variable employment rate (EMP) in Nigeria is affected. Hence, the above empirical findings provide a nuanced understanding of the relationship between technological advancement, investment, and employment in Nigeria. While artificial intelligence may influence employment through the automation of existing tasks and the emergence of new occupations, foreign and domestic investments in technology may affect job creation through capital formation, productivity improvements, and the expansion of productive activities. These effects may differ depending on the nature of the technology adopted, the sector receiving the investment, and the capacity of the Nigerian economy to translate technological progress into sustainable employment opportunities.

In addition, the study revealed a shocking and unexpected negative impact of digital technology adoption (DIGTECH) and economic growth rate (GDPg) on employment rate in Nigeria. The finding suggests that the negative and statistically significant effects of digital technology adoption and economic growth rate on employment rate in Nigeria may have adverse implications for unemployment, poverty, income inequality, household consumption, and human capital utilization. These relationships suggest that technological advancement and economic expansion may not be sufficient to improve employment outcomes without appropriate policies and structural reforms.

5.1 Recommendations

Therefore, we recommend that:

i. Nigerian government should ensure policies that align digital transformation with workforce training, human capital development, and sustainable job creation to ensure that technological progress translates into improved employment outcomes in Nigeria.

References

Anushiem, M. I. (2025). The legal implications of technological advancements on employment Relationships in Nigeria. *COOU Journal of Commercial and Property Law*, 10(2), 112– 128.

Bahia, K., Castells, P., Cruz, G., Masaki, T., Petros, X., Pfutze, T., Rodrigues-Castelan, C., & Winker, H. (2024). The welfare effects of mobile broadband internet: Evidence from Nigeria. *Journal of Development Economics,* 170, Article 103314.

Berman, E., Bound, J., & Griliches, Z. (1994). Changes in the demand for skilled Labour Within US. Manufacturing Industries: Evidence from the Annual Survey of Manufactures. *The Quarterly Journal of Economics*, 109(2), 367 - 397

Ebiefie, V. E., Ekpenyong, B. E. & Ekpenyong, U. B. (2026). Technology and Inclusive Growth: Addressing Poverty, Inequality and Income Distribution in Nigeria. *Global Journal of Modern Research and Emerging Trends,* 2(5), 156 – 188.

Ekpenyong, B. E., Ebiefie, V. E. & Udo, A. U. (2026). Technology in Agricultural Transformation and Food Security: A Panacea for National Development. *International Journal of Public Relations and Social Sciences.* 2(3), 69 - 101.

Fagbemi, F., Ajibike, J. O., & Adesanya, T. A. (2025). Unemployment in Nigeria: The significance of optimizing benefits of innovation. *African Journal of Science, Technology, Innovation and Development,* 17(3), 336 – 346.

Gmyrek, P., Berg, J., Kaminski, K., Konopczynski, F., Ladna, A., Nafradi, B., Rostaniec, K., & Tronszynski, M. (2025). Generative AI and Jobs: A refined global index of occupational exposure (ILO working Paper No 140) International Labour Organization.

Goldin, C., & Katz, L. F. (1998). The Origins of Technology- skill Complementarity. The Quarterly Journal of Economics, 113(3), 693 - 732

Igwe, C. E. (2025). Digitization and labor market dynamics: Evaluating job creation, skill Requirements, and worker displacement in emerging economies. *International Journal of Social Sciences and Development,* 10(3), 40–55.

Kindberg-Hanlon, G. (2021). Technological change and labor market dynamics in developing Countries: A Structural VAR analysis. World Bank Policy Research Working Paper, No. 9540.

National Bureau of Statistics. (2021). Labor force statistics: Unemployment and Underemployment report (Q4 2020). NBS Publication.

Oyegoke, E. O. (2021). Does technological innovations affect unemployment in Nigeria? *Central Bank of Nigeria Bullion,* 45(1), 14–28.

Ogunwole, E. B., Asaleye, J. A., Tabash, M. I., Ahmed, A., Elsantil, Y., & Lawal, A. I (2024). Debt service and information communication technology on employment and Productivity: Short and Long -run Implications. *Scientific African,* 24, article e02227.

Somoye, O.A. (2024). The impact of Technological Innovation on Unemployment in Nigeria: An Autoregressive Distributed Lag and Frequency Domain causality Approach. *SN Business & Economics,* 4, (56), 185 -20.

Venus, K.L. (2004). Which Lag Length Selection Criteria Should We Employ? Economic Bulletin, Vol. 3 No. 33 pp 1 – 9.

World Bank. (2025). Nigeria-skill demand trends: Insights from online job Vacancy Data. World Bank. Official Publication Page.

World Economic Forum. (2025). The future of jobs report 2025: Strategic insights for emerging Economies. World Economic Forum.

Yakubu, B. N., & Krisztián, R. (2022). The effects of modern technology on job security in Nigeria. Hungarian Review of Agriculture and Rural Development, 11(1), 23–31.