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ICT Usage and Unemployment Rate Nexus in Nigeria: An Empirical Analysis

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Abstract

This paper empirically estimates the impact of ICT usage on unemployment rate in Nigeria from 1985-2015. Adopting a classical linear regression model with data from the National Bureau of Statistics (NBS), the results reveal that within the period under review, ICT had a significant positive impact on unemployment rate in Nigeria. The study therefore concludes that ICT innovations can help the Nigerian unemployment situation through different channels but the government and other policy makers must be pro-active in adopting useful policies and strategies that will enhance ICT penetration and usage in critical sectors of the economy. Apart from Telecom services, other

elements of ICT infrastructure should be adopted and utilized in the economy in order to enhance productivity and reduce unemployment.

Keywords: ICT, Infrastructure; Unemployment; Nexus; Economy; Analysis

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INTRODUCTION AND MOTIVATION

The challenges confronting the Nigerian economy in the 21st Century are diverse and enormous and they have kept the economy in the most unacceptable state owing to the fact that it is a country abundantly blessed and enormously endowed with both human and natural resources but whose potentials remained largely untapped and even mismanaged. Ironically, an attempt to evaluate the country's economic achievements underscores the scope of its misfortunes when compared with classical examples such as Indonesia and Malaysia. Hence, the quest for economic development in Nigeria has been the key priority to the government and other policy makers.

As it were, Nigeria has gone through different structural changes since the attainment of independence in 1960. These domestic structural shifts have however not resulted in any generally-acceptable significant and sustainable growth and development in the economy. According to NBS [1], the oil boom of the 1970s contributed significantly to the growth of the Nigerian economy in the 1970s but the growth was not sustained because of the wasteful expenditures in the public sector and other attendant problems. This among many other crises resulted in the introduction of the Structural Adjustment Programme (SAP) in 1986 and other current economic reforms. The main reason for the introduction of the economic structural reform was to revitalize the Nigerian economy and support its growing population. However, these economic reforms put in place may not have yielded the desired results as a result of several socio-economic challenges faced by the country.

Conceptually, no single definition incorporates all of the different strands of economic development. Thus, development may be seen as growth through a series of progressive and structural changes or as a gradual advancement towards improved standard of living. Typically, economic development can be described in terms of objectives. These include creation of jobs, redistribution of wealth, and the general improvement in standard of living or quality of life. Summarily, the main goal of economic development is improving the economic well-being of a community through efforts that entail job creation, job retention, tax base enhancements and quality of life. From the foregoing, it is clear the creation of jobs which contributes to employment (and reduces unemployment rate) is a major factor in defining economic development [2].

Unemployment has been a major problem for most countries across the world. The USA Unemployment rate for example, increased from 5% in 2007 to 9% so far in 2011.

Within the same period, Spain increased from 8.6% to 21.52%; UK from 5.3 to 8.1%. Ireland currently stands at 14.3% from 4.8%, Latvia from 5.4% to 16.5%, Greece from 8.07% to 18.4% and Italy from 6.7% to 8.3%. The average for the Euro area is 10.7%. Even within the African continent, unemployment has risen with South Africa, having a higher rate than Nigeria at 25%, Angola at 25%, Botswana at 17.5%, Egypt at 11.8%, Kenya at 11.7% and Namibia at 51%. Essentially, unemployment is one of the development problems that face every developing economy. It is also an established fact that unemployment rate is a very significant factor to be considered in the quest for economic development in Nigeria. It is therefore very imperative to take a deep look into the significance of the various measures that have been adopted to enhance job creation, particularly, information and communication technology.

Historically, Nigeria embarked on series of periodic national development plans between 1960 and 1990 and Telecommunications development was featured in each of these plans, which were usually of five-year duration. During this period, the priority of the government was to meet the needs of the fledging commercial and industrial sector of the economy through the reconstruction and rehabilitation of the telephone equipment and other infrastructure damaged during the civil war, installation of more telephone lines, expansion of trunk dialling facilities and general expansion of the telecommunication network.

According to Akpang-Upkong information and communication technology (ICT) has permitted people to participate in a world in which school, work, and other activities have been increasingly enhanced by access to various technologies. And these have helped people explore, find, analyze, exchange, and present information in a more scientifically-advanced way since the 1980s. Although ICT development in Nigeria has been confronted with several opportunities and challenges, it has also turned into the sector which shows the best synchronization of different technologies, and has a high growth potential in the global economy. Thus, since its inception in Nigeria, a little over a century ago, ICT has progressed through various stages of development from the primitive communications equipment in the colonial days to the enormous variety of technologies available today.

On a global scale, for example, the impact of the ICT on an economy is expected to be impressive and could be responsible for creating new investment and employment opportunities. In India for instance, the export of computer software as of 1999 was already in excess of U.S. \$2 billion and was set to become India's largest export industry before the end of the first decade of the 21st Century. Also, with the rise of knowledge economy and the wide application of ICT, electronic and website technology are widely used in the big (small office and home office mushroomed in big cities) and medium-sized cities in China. In other words, working at home is not strange any more [3].

As earlier noted, one of the impediments to the socio-economic development of the Nigerian nation is the ever-increasing rate of unemployment and the optimistic

predictions about the ability of the modern industrial sector of the country to absorb the increasing number of urban unemployed and rural underemployed labour force is yet to be realized. One of the cardinal objectives of the various national reform policies such as Structural Adjustment Programmes (SAP), National Economic Empowerment and Development Strategies (NEEDS), etc was to develop as rapidly as possible, opportunities in education, health, and other sectors for creation of more jobs. But unfortunately, the incidence of unemployment and poverty across all strata and geographical entities in the country has grown deeper and become widespread.

Against this background, the main objective of this research work is to investigate the impact of ICT usage on the unemployment rate in Nigeria.

The rest of the paper is structured as follows: Section two undertakes a review of related literature while the Methodology is presented in section three. Section four deals with the presentation of results and analysis while section five concludes the study.

LITERATURE REVIEW

Several empirical studies have been conducted by foreign and domestic researchers with respect to this subject; but there is still no conclusive agreement on the matter yet. For example, UNCTAD [4] study showed that Information and communication technology has role in the creation of employment and self-employment opportunities. The study argued that the impact can be indirect through multiplier effects or direct, through growth of ICT-using industries or the ICT sector. The paper concludes that even though ICT can lead to loss of employment as systems and tasks are automated, when a country supports ICT initiatives, individuals can also benefit by enhancing their opportunities for employment through acquiring ICT skills.

Similarly, UNCTAD [5] argues that information and telecommunication services might offer the greatest opportunities for employment creation in low-income countries if adequately managed. However, only a small number of developing countries have a well-developed ICT sector. For those that do, ICT manufacturing can be significant in employing people. In China, for example, the ICT sector provides employment to about 26 million internal migrant workers, with evidence that a large portion of their earnings is remitted to poor rural and remote areas. Mobile telephony penetration is increasing dramatically in developing countries [6].

Sepehrdoust [7] focused on the effects of information and communication technology (ICT) on the employment level of selected Organization of Islamic Conference (OIC) countries. The study used econometric panel data model to analyze the relationship between ICT and employment rate of OIC countries for the period 2000 to 2009. Adopting the Constant Elasticity Substitution (CES) category of production function, the findings showed that the introduction of technology has led to major structural changes in the economy of OIC member countries and there is also a positive and significant effect of the ICTs on employment rate, but the effects are diversified among oil-based

as well as non-oil economies.

Katz [8] in his study, shows that broadband penetration can increase employment in at least three ways. The first is the direct effect of jobs created in order to develop broadband infrastructure. The second is the indirect effects of employment creation in businesses that sell goods or services to businesses involved in creating broadband infrastructure and the third is induced effects in other areas of the economy. The second two ways can be expressed, through an input-output model, as multiplier effects. Kalz [8] also argues that, although the estimate of employment growth relies on a number of assumptions, yet there is a causal relationship between broadband diffusion and employment through these mechanisms.

ESCWA [9] examined the impact of telecentres on the economic development of poor communities. The results show that many poor people were positively affected in their employment status through the adoption of ICT. For example, a survey data indicated positive impacts accruing to IT Club members in Egypt. This occurred through improving ICT capabilities and having better job opportunities. In Jordan, a 2007 survey-based evaluation of the impact of the Knowledge Stations Initiative on community development showed positive impacts on male and female employment status and indirect employment opportunities through better access to microloans. Again, in the Syrian Arab Republic, cultural community centres have trained a large number of people and appear to have enhanced indirect employment opportunities.

The potential impact of IT services on poverty reduction may include its multiplier effect on employment. This is because workers in IT services and IT industries tend to be relatively well educated, thus, indirect employment may be the major employment benefit for the poor [5]. According to the World Bank [10], women in India and the Philippines benefit disproportionately from employment opportunities in IT services, with women accounting for about 65 per cent of professional and technical workers in the Philippines, and 30 per cent in India. Both are higher participation rates than in other service industries.

Another study by Navarro [11] argues that Internet use by individuals in six Latin American countries is associated with increased earnings and better living. The study found significant differences between salaried and self-employed workers after controlling for factors such as wealth before internet adoption and education. For the former, there was a significant positive large return to Internet use on earnings for all countries except Paraguay, where the difference was large but not statistically significant. The earnings advantage ranged between 18 per cent in Mexico to 30 per cent in Brazil and Honduras. Results showed a positive and statistically significant effect of use only at work and this was always greater than the return to use only at other places, including home. However, use at work as well as other places displayed higher returns than use only at work. For self-employed workers, results were similar, with Internet users having higher earnings. Difficulties controlling for pre-existing characteristics indicate that the results show an upper bound on the impact of Internet

use on earnings.

Some studies that have investigated the relationship between ICT and different sectors in Nigeria include Kehinde [12], Oladunjoye [13], Muhammad [14], Okogun [15] and Oye [16]. For example, Kehinde [12] analysed the relevance of agriculture in the Nigeria society and the need for employment and application of information and communication technology into agricultural sector as a solution to unemployment problems in Nigeria. Data for the study was gathered through qualitative method with focus group and individual in-depth interviews. Participants were selected randomly from a group of farmers, students and traders in Ogun and Lagos States of Nigeria. The empirical results showed that although government support was essential in improving the agricultural sector in Nigeria, it was also imperative for institutions of learning and the private sector players to join hands in creating the much needed awareness amongst the youths on the significance of the agricultures and application of ICT as a veritable but untapped employment opportunity. Oladunjoye [13] investigates the relationship between vocational opportunities of youths and ICT in Nigeria. Using data from both primary and secondary data, the study argues that ICT development will enhance vocational opportunities to the youths if the application of ICT is encouraged among the youths. Another study by Muhammad [14] investigated the Impact of ICT on the Nigerian banking industry using eleven selected Commercial Banks in Nigeria. Using bank annual data over the period 2001 to 2011 and a Fixed and Random Effects Models, the results showed that there is increase in the banking sector's return on equity because of the use of ICT. Other studies in the area include Okogun [15] on ICT and poverty reduction, Oye [16] on ICT and economic growth in Nigeria. Having reviewed some studies on ICT, it is clear that the issue of ICT is a very important subject in the literature. It is therefore the aim of this study to measure the extent to which ICT has impacted the Nigerian unemployment rate, which most studies have failed to carry out; thereby, contribute to the existing literature in Nigeria.

RESEARCH METHODOLOGY

Various analytical techniques have been used to measure the economic impact of ICT at the macroeconomic, sectoral and microeconomic (firm) level. The main techniques are econometric modelling using regression, growth accounting and input-output analysis. In this paper, we adopt a simple multiple regression analysis to investigate the impact of ICT usage on unemployment in Nigeria.

SPECIFICATION OF MODEL

To address the objective of this paper we specify the econometric model as:

$$UR_t = \beta_1 + \beta_2 POPLF_t + \beta_3 ICT_t + \beta_4 INF_t + \beta_5 GE_t + \beta_6 PINV_t + \mu_t \quad (1)$$

Where:

UR=Unemployment rate; POPLF=Population of labour force; ICT=ICT Usage (Proxied by ICT's contribution to GDP); INF=Inflation Rate; GE=Government Expenditure; PINV=Private Investment

β_1 =the intercept

$\beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ and β_7 are the slopes or parameters of their respective variables

μ_t =Random or stochastic term

The choice of the variables for the model has been informed by several previous studies and the availability of data. Several factors have been linked with the unemployment or underemployment dilemma facing the country.

SOURCES OF DATA

Time series data from 1985-2015 were collected from the Central Bank of Nigeria (CBN) Statistical Bulletin and the National Bureau of Statistics (NBS).

PRESENTATION AND ANALYSIS OF RESULT

The results of the research carried out are presented and analyzed in this section.

Unit Root/Stationarity Tests

The test is conducted to ascertain the level of stationarity existing between the variables under consideration; this is because we are dealing with time series variables which are generated through a stochastic process (i.e. a collection of random variables ordered in time). For this purpose, the Augmented Dickey-Fuller test is applied following the decision rule stated as: if the absolute value of the Augmented Dickey-Fuller (ADF) test is greater than the critical value at 5% level of significance at level, 1st difference and 2nd difference we conclude that the variables under consideration are stationary; if otherwise, they are not (Table 1).

Table 1: The stationarity result is presented.

Variables	Adf Test Statistics	Critical Value At 5%	Order of Integration
POPLF	-32.36084	-2.9178	I(1)
ICT	4.243519	-2.9167	I(0)
INF	-7.071810	-2.9178	I(1)
GE	-8.037277	-2.9178	I(1)
PINV	3.997374	-2.9167	I(0)

From the table shown above, variables ICT and PINV are stationary at order zero (0) while variables POPLF, INF, and GE are stationary at order one (1). As a result of their different order of integration, we need to ascertain whether the variables have a sustainable long run relationship or are stable over time (Table 2).

Presentation of OLS Regression Result

Table 2: The result of the regression is presented.

Variables	Coefficients	Standard Errors	T-Statistics	Probability
CONSTANT	-27.3924	15.9612	-1.7161	0.0917
GE	-0.0260	0.1093	-0.2382	0.8125
ICT	0.0953	0.0393	2.4225	0.0187
INF	-0.007174	0.002714	-2.6429	0.0106
PINV	-0.0985	0.03628	-2.7173	0.0087
POPLF	1.7626	1.036167	1.7010	0.0945

R2=0.8215

Adjusted R2=0.8056

F-STAT=23.45634

Discussion of Results

From the regression result, Unemployment Rate (UR) is the dependent variable while Total Population of Labour Force (POPLF), Information and Communication Technologies’ Output (ICT), Inflation Rate (INF), Government Expenditure (GE), and Private Investment (PINV) are the independent variables. All the variables (except Unemployment Rate and Inflation Rate) were logged to scale down the data and achieve better numerical accuracy.

From the regression result, the coefficient of the intercept (C) shows that if all other things remain the same (ceteris paribus), Nigeria’s unemployment rate will continue to fall by 27.39%. The result also shows a positive relationship between Unemployment rate (UR) and the population of the labour force; indicating that if the population of the

labour force increases by 1%, unemployment rate will increase by 1.76%. As for inflation rate, it has a negative relationship with unemployment rate; implying that 1% increase in inflation rate will reduce unemployment rate by 0.007%. Also as expected, both Government expenditure and Private investment have negative relationships with unemployment rate. While 1% increase in government expenditure will decrease unemployment rate by 0.02%, 1% increase in private investment will reduce unemployment rate by 0.09%.

The regression result also shows a positive but negligible relationship between ICT and Unemployment rate in Nigeria. It reveals that during the period under review, ICT usage contributed to unemployment rate in Nigeria. This could be explained by the number of people who have lost their jobs in different sectors of the economy because their role have been replaced by computers and other technological devices. The coefficient of ICT implies that as ICT usage increases by 1%, unemployment rate also increases by 0.09%. It is also important to note most of the results were statistically significant expect for Government Expenditure and Population of Labour force.

Co-integration Test

The co-integration test procedure is conducted to establish a long run relationship between the variables under consideration. According to Gujarati [17], two variables are said to be co-integrated if they have a long run or an equilibrium relationship between them. To test for co-integration among the variables, we will use the ADF test on the regression residuals as proposed by Gujarati [17]. The ADF unit root test on the residuals work with the same decision rule as unit root test i.e. if the absolute value of the Augmented Dickey-Fuller (ADF) test is greater than the critical value at 5% level of significance at level $I(0)$, we conclude that the variables under consideration are co-integrated; if otherwise, they are not. Below is the result of the co-integration test (Table 3).

Table 3: Results of the co-integration test.

Variable	ADF statistics	Critical value (5%)
Residual term	-5.654579	-2.9167

The ADF test statistics reported a result of -5.621353 which is greater than the critical value at 5% (-2.9167) in absolute terms. This means that the series are stationary at level. Thus, although all the series are individually non-stationary, their linear combination is stationary. Conclusively then, there is a co-integrating relationship among variables i.e. there is long-run equilibrium/relationship between the regressors and the regressand. This means that the original regression is not spurious. This further leads to the specification of the short-run equation (model).

Short-run dynamics: The Error – Correction Model

In this test, the error-correction mechanism is employed to look at the short-run behavior of the dependent variable D(UR) in relation to its explanatory variables D(POPLF), D(ICT), D(INF), D(GE), D(PINV) and ECM(-1). This equation incorporates the short-run adjustment mechanism into the model. In the previous test, it was evident that there is at least one co-integrating relationship between the variables. Nevertheless, in the short-run, there may be disequilibrium. Therefore, the error term equation is employed to eliminate deviation from the long-run equilibrium. Below is the result of the parsimonious Error-Correction Model (Table 4):

Table 4: Results of the parsimonious error-correction model.

Variables	Coefficients	Standard Errors	T-Statistics	Probability
CONSTANT	0.0042	0.0275	01557	0.8788
D(GE)	-.08117	0.1447	-0.5607	0.5773
D(ICT)	0.01319	0.0675	0.1953	0.8459
D(INF)	-0.00404	0.0035	-1.1265	0.2649
D(PINV)	-0.03875	0.0384	-1.0082	0.3178
D(POPLF)	1.8246	1.7539	1.0402	0.3028
ECM(-1)	-0.5703	0.1240	-4.5970	0.0000

From the above result, the coefficient of ECM in absolute terms indicates that the Error-Correction model corrects 57.03% of the deviation from the long-run equilibrium bi-annually. The table also shows that the t-statistic of the ECM was significant. The estimate of (1- α) indicates the speed of adjustment in eliminating deviation from the long-run equilibrium.

SUMMARY, POLICY RECOMMENDATIONS AND CONCLUSION

From the result of this work, one can see that ICT innovations that have benefitted many economies have not been so friendly to others. In Nigeria, while we appreciate the critical role of ICT to national development, our study clearly shows that many people may have lost their jobs in banks and other sectors because their jobs were

replaced by computers and other technological innovations. Hence, the result of this research work is justified. This finding however, contradicts some empirical findings on this same subject. For instance, Akwani [18] found that the fastest growing employer of labour in Nigeria today is the telecom industry. Specifically, the wireless telephone sector that provides services to individual customers using the GSM. Okogun [15] revealed that an anti-poverty measure introduced through the use of ICT has been able to generate substantial amount of employment through the use of mobile phone by many Nigerian to sustain a living. There are many call centers in villages and towns mostly operated by people between age distributions of between 20-29 years (38%), mostly women with secondary/post-secondary education in Nigeria. Some of these people run shops for the sale of Global System of Mobile (GSM) accessories as a major form of occupation as means of self-employment as well as a means of sustaining livelihood. Ndukwe [19] said that Past studies have shown that over 2,000 persons are directly employed by GSM operators while he found that an estimate of 40,000 Nigerians are benefiting from indirect employment generated by GSM operators in Nigeria. From their findings, we can deduce that the major, if not the only, way ICT have created employment is through GSM operation (i.e. call centers) and the sales of GSM accessories. Although these researchers are right in stating that these have massively engaged many unemployed Nigerians, it is quite clear however, that what they mean by employment is pretty different from what employment really is. The National Bureau of Statistics (NBS) regards a person as employed if he/she is engaged in the production of goods and services, thereby contributing to the gross domestic product, in a legitimate manner, which is a component of the national accounts. Since most of the road-side GSM operators may not be contributing to the Gross Domestic Product in a tangible manner and are not at the current wage level and/or working conditions, they cannot and should not be referred to as employed; they rather fall under the category of those who are either frictionally unemployed or structurally unemployed or technologically unemployed (which are all forms of unemployment). From the foregoing, we therefore recommend that:

1. ICT policies in Nigeria should be revisited, reviewed and implemented to be employment friendly.
2. Public-private capital investment on ICT is necessary to enhance adequate ICT infrastructure in the economy
3. The Federal and State Governments should implement a long-term ICT-Human Capital Development Policy. Education curriculum at all levels must be revised to become more ICT-centric, and an ICT Work-Force assistance program should emerge to retrain unemployed and underemployed graduates.
4. Non-specialized foreign ICT expatriate should be replaced with indigenous Nigerians or Nigerians in Diaspora.
5. ICT facilities should be utilized effectively to provide job opportunities for young people in different critical sectors of the economy.

CONCLUSION

From the analysis of data, we find that ICT has a statistically significant positive impact on unemployment rate in Nigeria. The reason for this, as we argued, is that Nigeria is yet to adopt the usage of ICT in a holistic sense. As it were, Nigeria seems to have been able to adopt telecommunication fully (which is only a component of ICT) to the detriment of others components of ICT. In conclusion, therefore, for ICT to help the Nigerian unemployment situation, as it is doing to some other economic indicators, it must be fully adopted through appropriate policy implementation, increased public-private capital investment and ICT- human capital development.

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