



EXAMINATION OF THE CAUSAL RELATIONSHIP BETWEEN ICT INVESTMENT AND SMES' PERFORMANCE IN SOUTHWESTERN NIGERIA

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Abstract: The nexus between investment in Information and Communication Technology (ICT) and Small and Medium Enterprise (SMEs) performance is crucial to SMEs development in Nigeria. SMEs' development emanated from a performance such as Sales' growth, profitability and productivity. Thus, this study critically and statistically examines the causal relationship between ICT investment and SMEs performance in Nigeria. This study was carried out in Southwestern Nigeria. Multistage sampling procedure and purposive sampling techniques were used to select 3520 registered and unregistered SMEs in the study area for the study. The causal relationships between ICT investment and SMEs performance were tested using Granger Causality. The Grangers causality test revealed that there was a significant ($P \leq 0.01$) relationship between ICT investment and SMEs profitability, sales growth and productivity. This study concluded that investment in ICT had a positive and significant effect on SMEs' performance. Therefore, SMEs should invest more on ICT to increase their sales growth, productivity and profitability.

Keywords: ICT Investment, SMEs, Performance, Productivity, Profitability, Sales Growth

Introduction

Information and Communications Technology (ICT) has become a fundamental part of human life since the 21st century (Azam, 2015). It describes how information, communication, and electronics have come together. It is often regarded as the most essential means of transitioning developing communities to more developed societies through the application of new methodologies and techniques for the digital economy based on information technologies. It encompasses all communication technologies, including wireless networks, the Internet, computers, mobile phones, social

media, video conferencing, and other services that allow users to access, store, retrieve, process, and transmit digital information (Aims 2019). The rapid usage of ICT and its applications in various economic sectors have paved many opportunities for individuals, businesses, and society. Most especially, the introduction of numerous ICT devices has increased business opportunities and has assisted business owners to manage intra- and inter-organizational affairs. The business environment today has been undergoing unprecedented changes and many companies are seeking new ways to stand out from the competition by sustaining their competitive advantage.

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Globally, the use of Information and Communication Technology (ICT) has changed the way businesses are conducted thereby resulting in the emergence of the digital Small and Medium Enterprise (SMEs). It is now commonly accepted that ICT provides many benefits to companies as well as SMEs. This makes them more resourceful, effective and it is a strategic tool needed for the operational and efficient development of SMEs in both developing and developed countries.

Information and Communication Technology has a significant impact on businesses both in developed and developing countries, by creating new opportunities that enable the delivery of digital goods that effectively stimulate SMEs to increase margin and revenue by accessing foreign markets directly. It is one of the strategic tools to enhance a company's competitiveness (Papaioannou and Dimelis, 2007). The potential use of ICT as a competitive weapon is fast growing and has positioned itself as one of the main mechanisms for growth among major business organizations and SMEs since it facilitates a more cost-effective way of doing business (Turban, McLean, and Wetherbe, 2011). In many developing countries, SMEs constitute a large majority share of production and employment, hence their perception as poverty alleviation. Relatively, ICT provides the means for business transformation and the opportunity to conduct business anywhere in the world. It makes services more easily tradable and increases productivity in manufacturing enterprises. The use of ICT can provide a platform for SME development, continuity, and quality service delivery.

A business organization could assess its performance through the application of financial and non-financial measures. The financial measure parameter includes profitability measurement while the non-financial measure focuses on issues relating to customers' satisfaction and referral rates, delivery time, waiting time, and employees' turnover. Recognizing the limitations of

relying solely on either of the two measures, researchers have adopted a hybrid approach of using both measures to assess the effects of ICT investment on SME's performance. Performance measurements for SMEs could be an economic measurement (productivity) and market share measurement (sales growth) and these have been used by Hu and Plant (2001) and Lee and Kim (2006). It could also be an accounting measurement namely profitability analysis done by determining Return On Asset (ROA), Return On Capital Employed (ROCE), Return On Equity (ROE) and Net Profit Margin (NPM) (Sircar, Turnbow, and Bordoloi, 2000; Lee and Kim 2006).

Investment in ICT has become an important strategy for the SMEs industry to survive the millennium challenges. However, factors influencing ICT and the extent to which SMEs have invested in ICTs to enhance their performances vary from developed to developing countries and also from one SME to another. In this regard, Agboola (2006) states that "reasonable investment in ICT has provided self-service facilities (Automated customer service machine) from where prospective customers can complete their transaction and shopping direct online on a real-time basis".

There are reported cases of heavy investment by SMEs in ICT in developed countries and little or no investment in developing countries. Improved performance observable in developed countries may be as a result of the appreciation of ICT with attendant causality effect. In developing countries, the inability to invest in ICT may likely harm their performance. It has also been affirmed that it is not only investment in ICT that enhances SMEs performance and that investment in ICT is needed to be combined or strategically aligned with complementary factors such as; type of information system/information technology, management practices/contextual factors, organizational structure, and the competitive and macro environment to achieve



organizational performance (Cooper, Mallory, Egeland, Jarnik and Strich, 2000; Dewan and Kraemer, 2000; Brynjolfsson, Hitt and Yang, 2002). Sheppard and Hooton (2006), opine that researches in the areas of ICT adoption to SMEs performance are abundant in developed countries unlike in developing countries like Nigeria. There have been many types of research on ICT adoption and SME performance in Nigeria but most of them used descriptive statistics to measure performance (Akande and Yinus, 2013). However, little that has been done on ICT investment and SMEs performance are focused on the direct effect of ICT on SMEs performance (Adewoye and Akanbi, 2011 and Adewoye and Akanbi, 2012), hence the need for empirical study in the Nigerian context on the impact of ICT investment on SMEs performance focusing more on the causal effect of ICT investment on SMEs performance and vice versa.

Hypothesis of the Study

A null hypothesis stated as follows was tested in the study H_{01} : There is no causal relationship between ICT investment and SMEs' performance.

Conceptual Review

Information and Communication Technology (ICT) can be described as a complex varied set of goods, applications, and services used for producing, distributing, processing, transforming information (including) telecoms, Television and radio broadcasting, hardware and software, computer services and electronic media. ICTs are technologies that can be used to interconnect information technology devices such as; computers and laptops with communication technologies such as telephones and their telecommunication networks. Laudon and Laudon (2010) defined ICT as all hardware and software technologies a SMEs needs to achieve its business objectives while Akunyili (2010) defined ICT as an umbrella term that covers all technical means for processing and communicating information and that the convergence of information technology (IT) and telecom

technology gave birth to ICT. Practically speaking, ICT finds expression in digital technology and all its uses and variants, including the computer, the internet, mobile telephony, the different electronic applications (e-banking, e-governance, e-commerce, etc), digital media, and broadband technology. For this research work, the researcher will adopt the definition of Warren (2002) and Akunyili (2010) for ICT.

ICT investment is an investment that covers the acquisition of equipment and computer software that is used in production for more than one year. ICT has three components: information technology equipment (computers and related hardware), communications equipment, and software. The software includes the acquisition of pre-packaged software, customized software, and software developed in-house. Investment in physical capital is important for growth. It is a way to expand and renew the capital stock and enable new technologies to enter the production process. Information and communication technology (ICT) has been the most dynamic component of investment in recent years (OECD, 2007).

ICT Capital refers to as money spent on the acquisition of information technology equipment (software and related hardware), communication equipment such as telephone, television, video, telex, voice information system, machines, fax, internet, mobile telephony, electronic applications (e-commerce, e-business, e-marketing) digital media and software such as text editor and spreadsheet enterprise software, data storage and security, network security, etc. that are used for production for more than a year. ICT- Labour, Non ICT- Labour.

Non ICT Capital refers to money spent on maintenance of acquisition information technology equipment (software and related hardware), communication equipment such as telephone, television, video, telex, voice information system, machines, fax,



intent, mobile telephony, electronic applications (e-commerce, e-business, e-marketing) digital media and software such as text editor and spreadsheet enterprise software, data storage and security, network security, etc. for fifteen years.

ICT- Labour is defined as the salaries paid for the staffers that are operating ICT devices such as computer hardware and software and communication equipment for five years.

Non ICT- Labour these are money spent on staffers that are not operating ICT devices (factory worker, clerk, and drivers, etc) for fifteen years.

For performance measurement, there are three basic measurements of performance; productivity, financial and non-financial measurement. Financial measurement assesses SMEs (profit, sales), productivity measured output as a function of input while Non-financial appraised customer satisfaction, quality service etc. Performance measures for this study were productivity, sales growth, Profitability (net profit margin (NPM), return on assets (ROA), return on equity (ROE)

and return on investment (ROI)). The study considered four measures of SME profitability performance: profitability (ROA, ROE ROI, and NPM), sales growth was also measured. For each performance measure, an annual figure was calculated for each of the ten-year-periods from 2010 – 2021.

Theoretical Framework

Having looked at the various theories in determining the effect of ICT investment on performance, this study adopted the theory used by Dehning and Richardson (2002) as indicated in figure 2. This theory is employed to determine the relationship between ICT investment and SMEs financial performance. Various research models have been suggested in the measurement of ICT business. Kim et al. (2009) adapt the theory used by Dehning and Richardson (2002) to determine the effect of ICT investment on SMEs performance. Therefore, this study also adapted this theory in determining the relationship between ICT investment and SMEs' performance as depicted in Figure 1.

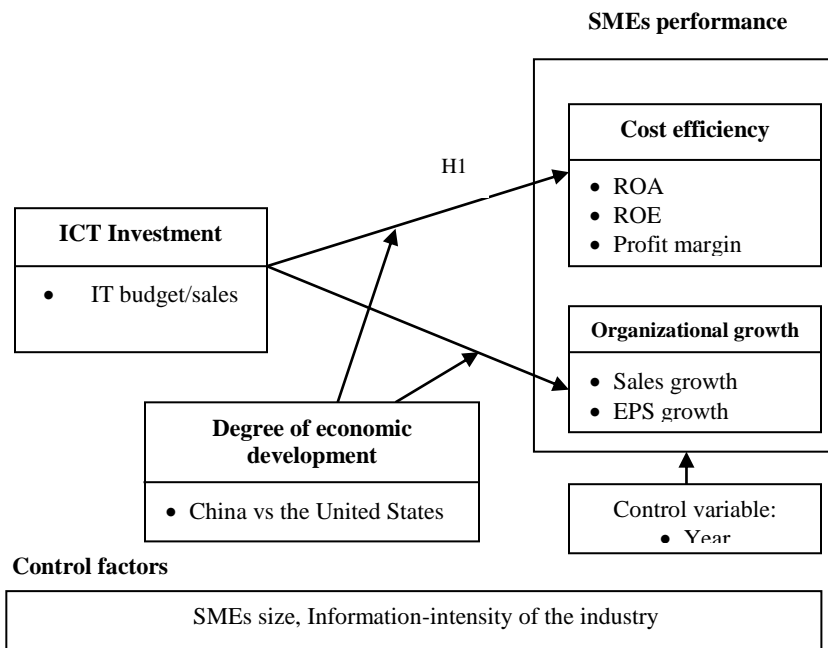


Fig. 1: Theory used to determine the impact of investment on SMEs performance

Source: Kim et al. (2009).



Fig. 2: Theoretical Framework

Source: Adapted from the work of Dehning and Richardson, (2002)

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Empirical Review

The findings of Ab Wahab et al., (2020) established that ICT adoption has a substantial impact on the overall performance of SMEs. According to the findings, SMEs that implement ICT in their commercial enterprise environment have a significant impact on and increase commercial enterprise performance. It was also discovered that using ICT has advantages such as lowering business transaction costs, expanding business opportunities, improving provider operations, better understanding customer needs, reducing communication barriers, and obtaining information about specific customer needs and outside competition will improve the firm's overall business performance.

Olorunshola (2003) stipulated that SMEs have consistently created greater employment opportunities per unit capital investment than any other sector of the economy. SMEs provide about seventy percent of the employment rate and forty-six (46) percent of gross domestic product therefore they are central to boosting the Nigerian economy (Mukaila and Sidikat, 2011).

Kretschmer (2012) review the productivity effect of ICT and stated that productivity is not only significant and positive but also increasing over time. The relationship between IT investments and SMEs performance had been investigated by different authors with different findings. The findings of Cemal, Busra, Bulent and Ali (2010) revealed that if IT investments are managed successfully, it can help to increase the SMEs performance (Rotzocki and Weistroffer, 2009). Adewoye and Akanbi (2012) also found a positive relationship between ICT investment and SMEs (Sachet Water Company) performances in Nigeria.

Indahwati and Afiah (2014) reported that, ICT may help reduce inefficiency in the use of capital and labour, e.g. by reducing inventories, and that the more

customers or SMEs are connected to the network, the greater the benefits (spillover effects). Information and Communication Technology (ICT) can play a very important role because it can help SMEs both create business opportunities and combat pressures from the competition as appropriate and can also help SMEs to cut costs by improving their internal processes (Irefin et al, 2012). SMEs are slowly realizing the positive impact of ICTs, which include; increased sales due to web presence, better communication via e-mail, and effective processes due to ICT utilization in their organizations (Agboh, 2015).

Sajuyigbe and Alabi (2012) concluded that ICT play an important role in SMEs by cutting costs through improving internal process and product, fast communication with their customers, and better promoting their products through online presence. SMEs adopted ICT tools to enjoy; improved communication (with suppliers, customers or employees and so on), meet information processing needs and having internet presence (Chacko and Harris, 2005). According to Mingaine (2013), external pressure from other trading partners is one of the significant predictors that has a strong influence on SMEs in the adoption and use of technology arguing that without this external pressure, many SMEs owners may perceive adoption and use of technology as a waste of resources.

The findings of Mokaya (2012) on the adoption of ICT by small enterprises in Thika Municipality, Kenya, revealed that most business owners believe that the cost of ICT tools and equipment is high, thus, discouraging investment leading to poor adoption levels.

Agboh (2015) identified the challenges of ICT adoption in his study, Drivers and challenges of ICT adoption by SMEs in Accra Metropolis conducted in Ghana to be lack of internal capabilities, high cost of ICT



acquisition, and lack of information about suitable ICT solutions and implementation are some of the factors Irefinet al (2012) also pointed out that the major factors that affect the adoption of ICT are infrastructure, cost of purchasing computer equipment, government support and management support respectively.

Spieza et al. (2016) worked on the effects of ICT investments on total labor demand, labor demand by skill level, and labor demand by industry in selected Organisation for Economic Co-operation and Development (OECD) countries over the period 1990 to 2012. It was reported that “ICT investments are estimated to have raised total labor demand in most examined countries over the period 1990-2007 but to have reduced it after 2007 and this attributed to polarization in favor of high and low skills and against medium skills. However, the effects on both total labor demand and polarization are estimated to varnish in the long run”

Jackson and Josphat (2016) studied assessment of ICT Adoption for Performance of SMEs so as to achieve an insight into the various factors that affect the adoption of Information and Communication Technology for the performance of SMEs in Nairobi county Kenya. The study used descriptive design. The targeted population was 4560 SMEs registered by the Ministry of Trade and Industrialization within Nairobi County. The sample size of 367 SMEs was used. The stratified random sampling was used in selecting the sample. The data were collected using structured questionnaire. The administering was on a "drop and pick-later" basis. The questionnaires return represented an approximately 70% of the sample population. The data analysis was conducted using both descriptive and inferential statistics with the help of SPSS. Moreover, the result was presented using pie charts, bar charts and tables. From the findings ICT infrastructure, ICT user skills, ICT services, and government policies as licenses showed statistical significance in relation to ICT adoption on performance

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METHODOLOGY

The study was carried out in Southwestern Nigeria and conducted on SMEs (manufacturing industry, production, and traders) that registered with the Ministry of Industries, Manufacturing Association of Nigeria (MAN), and Corporate Affairs Commission (CAC) and unregistered SMEs. Only SMEs that had been in existence for 15 years, with permanent sites, keeping records and that fall within the definition of SMEs in Nigeria were used. Both registered and unregistered SMEs in Lagos and Oyo States were stratified and judgmentally selected from a cross-section of Lagos and Oyo States, and covering virtually all forms of manufacturing food and beverages industry (wine, bakery, biscuits, cake, beans product, soya milk, candy, canned food, canned fruit, chocolate ingredient, cooking oil, dried food, fast food, flavor enhancers and carbonated drinks and service rendering organization). Among the sampled SMEs, only 3,520 SMEs that fulfilled the condition of judgmental sampling techniques were selected and their business activities covered fifteen years.

Data for this study were obtained from both primary and secondary sources. While primary data was from the administered questionnaire to SMEs staff, the secondary data was obtained from the books of account of the selected SMEs and annual reports.

Two sets of questionnaires were designed and administered to SMEs Owners and Computer engineers/computer operators (data management officers) in charge of ICT devices and the first test for the study was the panel unit root test. It is used to examine the unit root properties of the data series before other analyses were carried out.

Granger Causality Test

The exploration of causal relationships in scientific research dates back to several years ago. Though the identification of causal relationships in non-experimental" settings is a rather new and extremely challenging problem. Granger Causality is one of the earliest methods developed to quantify the causal effect from time-series observations. It is based on the commonly accepted observation that the cause occurs before its effect. Formally, X Granger causes Y if its past value can help to predict the future value of Y beyond what could have been done with the past value of Y only.

Granger causality (GC) is a method for inferring certain types of causal dependency between stochastic variables based on reduction of the prediction error of a putative effect when past observations of a putative cause are used to predict the effect, in addition to past observations of the putative effect. The concept is first introduced by Norbert Wiener in 1956 and later reformulated and formalized by Granger in the context of bivariate linear stochastic autoregressive models (Weiner, 1956). The concept relies on two assumptions and these two assumptions are:

1. Causes must precede their effects in time
2. Information in a cause's past must improve the prediction of the effect above and beyond the information contained in the collective past of all other measured variables (including the effect).

The Granger causality test is a statistical hypothesis test for determining whether one-time series is useful in forecasting another (Grangers, 1969). Ordinarily, regressions reflect "mere" correlations, but Clive Granger, who won a Nobel Prize in Economics, argued that a certain set of tests reveal something about causality and it is mathematically written below as:

Let y and x be stationary time series. To test the null hypothesis that x does not Granger-cause y , one first



finds the proper lagged values of y to include in a univariate auto regression of y :

$$y_t = a_0 + a_1 y_{t-1} + a_2 y_{t-2} + \dots + a_m y_{t-m} + \text{residual}_t \quad (1)$$

Next, the autoregression is augmented by including lagged values of x :

$$y_t = a_0 + a_1 y_{t-1} + a_2 y_{t-2} + \dots + a_m y_{t-m} + b_1 x_{t-1} + \dots + b_q x_{t-q} + \text{residual}_t \quad (2)$$

One retains in this regression all lagged values of x that are individually significant according to their t -statistics, provided that collectively they add explanatory power to the regression according to an F -test (whose null hypothesis is no explanatory power jointly added by the x 's). In the notation of the above-augmented regression, p is the shortest, and q is the longest, lag length for which the lagged value of x is significant.

The null hypothesis that x does not Granger-cause y is accepted if and only if no lagged values of x are retained in the regression.

Granger causal theory will be used to test the causal effect of ICT investment on all the performance indicators for this study (Profitability, Productivity and Sales growth). So Granger causal effect technique will be used to test the effect of ICT investment on profitability, the effect of ICT investment on SMEs productivity and also the effect of ICT investment on sales growth.

RESULTS AND DISCUSSIONS

As depicted in table 1, the causal relationships of ICT investment on productivity, profitability and sales growth and vice versa were investigated using the Granger causality effect of ICT investment. The Causal effect between ICT investment and SMEs profitability does not granger-cause profitability. The granger F -statistics for the test is 2.529 and it is significant at 10%.

This implies that, ICT investment significantly granger-cause SME's profitability. It is, however, important to note that the alternative hypothesis that states that, the profitability of the SME's does not granger-cause their ICT investment was also rejected at 1%. This showed that the causality between SME's profitability and their level of ICT investment is bidirectional.

Furthermore, ICT investment does not granger-cause sales growth. The granger F -statistics for the test is 16.216 and it is significant at 10%. As observed for the first two tests, the same result was obtained for the granger causality test of the alternative hypothesis that the sales growth of the SMEs does not granger-cause their ICT investment. The hypothesis was also rejected at 10%. This showed that the causality between SME sales growth and ICT investment is bi-directional. Also, ICT investment does not granger-cause their productivity. The granger F -statistics for the test is 11.348 and significant at 1%. It is also important to note that the alternative hypothesis that the productivity of the SMEs does not granger-cause their ICT investment was also rejected at 10%. This shows that the causality between SMEs' productivity and their level of ICT investment is bi-directional. This result corroborated the studies of Kim et al. (2009) and Dehning and Richardson, (2002).

The result of the effect of ICT investment on the extent of usage revealed the coefficient of 0.284** and that there exists a positive and significant relationship between ICT investment and ICT usage at 5%. Thus, the null hypothesis that states that: 'Ho: ICTEXTENT and ICTINVEST are independent' was rejected.



Table 1: Causality between ICT investment and Productivity, Profitability and Sales Growth

Null hypothesis	Observations	F- ratio	Probability
ICTINV does not Granger Cause TPROFT	3498	2.529	0.0793
TPROFT does not Granger Cause ICTINV			0.010
ICTINV does not Granger Cause SALES-GROWTH	3498	16.216	9.8E-08
SALES-GROWTH does not Granger Cause ICTINV			0.062
SMEPRD does not Granger Cause ICTINV	3498	11.348	0.085
ICTINV does not Granger Cause SMEPRD			0.033

Source: Data analysis from Author data (2021)

CONCLUSION AND RECOMMENDATION

The study concluded that there is a significant relationship between ICT investment and SMEs productivity, sales growth and profitability. Of all the hypothesized variables used to determine the relationship between ICT investment and SMEs performance, statistically significant among these variables were ICT capital, Non-ICT capital and Non-ICT labor expenses while ICT Labour expenses were not statistically significant. For profitability measurement, investment in ICT was statistically significant only for ROA, ROE, and NPM while it was not significant for ROCE. The study also revealed that there exists a positive and significant relationship between ICT investment and the extent of ICT usage at 5%. Similarly, for sales growth measurement, the sales growth which was modeled as a function of ICT investment and ICT perception has a positive coefficient (6.529) but an insignificant relationship with sales growth; ICT investment has a positive and significant effect on sales growth. The coefficient is 6.529 and it is significant at 1%. The result

shows that there is a positive and significant relationship between sales growth and ICT investment. The estimation of a causal effect of ICT investment on SMP shows a bi-directional effect. ICT investment is statistically significant and influences the performance (profitability, productivity, and sales growth) and vice versa of small and medium scale enterprises.

Given the findings of the study, the following recommendations are made to both SMEs' owners and the Government to enhance SMEs performance in Nigeria:

- i. Invest more in ICT and be ICT compliant, since it has been confirmed that positive relationships exist between ICT investment and SMEs performance.
- ii. Creation of more awareness on the benefit of ICT investment and ICT adoption because of their contribution to the economy.
- iii. Creation of more flexible policy that will support easy adoption of ICT



- iv. Providing more funds for SMEs to invest in ICT to enhance their performance

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