The Impact of ICT on performance of SMEs in the Emerging Market Economies: A System GMM Approach

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ABSTRACT
Businesses have been deeply influenced by Information and Communications Technologies (ICT). And the application of ICT among business is uneven. The objective of this study is to analyze the impact of information and communications technologies on performance of small and medium-sized enterprises. In the literature of ICT, its adoption as proxied by secure serve per users and Mobile phone subscription had significantly improved the growth of SMEs. The study provides empirical evidence on the impact of ICT application on the performance of SMES using a Dynamic System GMM approach. Findings revealed that there is a positive and significant impact of ICT adoption on growth of SMEs in emerging economies. Secure server per user, investment in ICT and mobile phone subscription, investigated have significant influence on ICT adoption. With respect to SMEs output performance, the study recommends that government and information sector should formulate policies that will facilitate the adoption of ICT by SMEs because of its potential in improving firm's growth and performance. SMEs owners should consider scanning the environment to find the latest ICT equipment that could be useful in promoting service delivery and/or proper product mix / choice that suits customer needs. *This will lead to improving their productivity and competitiveness; SMEs owners should invest in ICT and its components because they have been proven to significantly influence organizational performance.*

Keywords: *Information and Communication Technology, SME Performance ,SME Growth, Emerging Economies, GMM Model.*

Introduction

According to European Commission (2003), small- to medium sized enterprises (SMEs) are those companies which have the number of employees up to 250 and a maximum annual turnover of 50 million euro. The importance of SMEs today is undeniable both for developed and developing countries. By providing millions of work places, the institute of SMEs serves as the primary means of sustainable industrial and social diversification of the society, thus addressing one of the main drivers of economic development in the countries. However, globalization, the internationalization of domestic markets, the global economic crisis, the volatility of financial markets, declining investment, rapidly changing consumer demand patterns etc. - have increased pressure on SMEs and encouraged them to seek other ways for survival and growth in the modern business environment. How do these SMEs find these ways, struggle with the above-mentioned problems?

The world economy is undergoing a fundamental structural change driven by the globalization of business on the one hand and by the revolution in information and communication technology on the other. The New Economy is the superior economic structure that is expected to arise as an outcome of these two forces (Mattie, 2002). With respect to emerging economies, the ICT revolution, by making more, better, cheaper and faster exchange of information possible globally, may have the effect of

reducing the country-specific risks associated with the development of new products and services (Rao, 2001). Today's business world has been deeply influenced by Information and Communication Technologies (ICT) and the application of ICT among business is widespread. ICT is rapidly changing global production, work, business methods, trade and consumption patterns between enterprises and consumers. In the developed countries including Australia and United Kingdom Small and Medium Enterprises (SMEs) account for more than half of all business and over half of all employment (Kazi, 2009). Nowadays small businesses are increasingly using and adopting information and communication technology due to their cost-effectiveness and affordability. Alberto and Fernando (2007) argued that the use of ICT can improve business competitiveness with internet providing numerous opportunities for SMEs to compete equally with large corporations.

Research by The Centre for development and research on the use of ICTs in economic performance of SMEs in east Africa has shown that firms that have been able to effectively utilize ICT can provide small firms with a strategic advantage which can positively influence their competitiveness. The use of ICT can provide SMEs with valuable information, increase knowledge, improve performance, improve e- relations with customers and suppliers, increase efficiency, reduce cost of production among others. Big businesses have taken the opportunity of ICT to a get an edge over their competitors unlike the SMEs. There is strong evidence that ICT is the driver for economic growth reducing production and transaction costs and helping in expansion of market through e-advertising which helps to save time. Through this, governments all over are encouraging SMEs to adopt ICT.

The global market for ICT-enabled business process management (BPM) which incorporate all sorts of communications, software, web applications and services, ERP-systems, etc. was estimated in 2008 at 1.8 billion US dollars and is expected to grow up to 6.2 billion dollars in 2015. At the same time, nowadays the usage of ICT in business process management for SMEs in developing countries is quite low. Previous researches in the western context have however revealed that many factors have contributed to a low or high level of Information and Communication Technology adoption for improved performance of SMEs. According to Ghobakhloo, *et al.,* (2011), in looking for reasons for such differences in IT adoption in SMEs, unique characteristics of these businesses can be highlighted. SMEs generally have limited access to market information and suffer from globalization constraint (Madrid-Guijarro, Garcia & Auken, 2009) Consequently, studies have to be conducted on the usage and impact of ICT on SMEs in developing countries. Herewith, among the developing countries with the greatest potential for ICT development one can distinguish the BRICS countries: Brazil, Russia, India, China and South Africa. The development of small and medium businesses is one of the main basis for the development of these states and the other countries of the world. The above arguments and the facts became the prerequisites for the analysis of ICT adoption and its impact on SMEs performance in emerging market economies countries especially among the BRICS.

Statement of the Problem

Business growth and development is a major area of concern to top management all over the world. But in less developed countries the problem is complicated further by infrastructural limitations and other rigidities. Information technology has come to solve or reduce the business challenges faced by our businesses. Most of these businesses are owned by individuals or cooperatives. The size of their operation is small and limited. The rate of awareness to ICT capabilities is limited by the knowledge and exposure of the chief executives or owners of the business. In the light of this limitation, we seek to find out in this paper how fast and how well SME are adopting ICT technics to their businesses and the impact of such adaptation.

In most emerging economies SME lack appropriate driving resources including the collective knowledge, skills and other necessary resources that are essential for business growth. A further intricacy which is restricting emerging economies SMEs to perform economically better and or have higher international commitment is that they are often labelled to have reputation of low quality product and there are technological requirements both in regional and developed markets as well as difficulties in joining international supply-chain networks. In addition to the problem noted here, there is poor inter-firm linkage between small firms and large firms. Cooperation between small and large

firms permits small enterprise in particular to reap the benefits of scale and scope economies. Although, SMEs in emerging economies continue to face an array of challenges, the solution may be found in effective utilization of information and communication technologies (ICT). The earlier SMEs open up their flanks to this ICT revolution the better and more competitive they will become.

LITERATURE REVIEW

Previous studies from different backgrounds in the developed and developing countries have provided insight on the dimension of different benefits derived from application of information and communication technology in enhancing the performance of SME. Due to differences in socio-economic context among these countries, the literature on the topics became paramount with various literary perspectives and insights. This section is therefore delimitated broadly into four section to achieve the objective. Conceptual Framework, Theoretical Literature, Empirical Literature and Summary/Gaps in Literature.

Conceptual Review

Information and communication Technology

Information and communication technology refers to technologies that pertain to the new science of collecting, storing, processing and transmitting information worldwide. It is a move to make the world smaller and information readily available. ICT is like a house that accommodates all forms of technical means for processing and communicating information. The inter-relationship of information technology and telecom technology gave birth to ICT (Akunyili, 2010). ICT when expressed in digital form includes computer, the internet, mobile telephone, the different electronic applications (e-banking, e-government E-commerce etc.) digital media and broadband technology.

SME (Small and Medium Scale Enterprise) Definition

SME's have been defined in various ways and there is no generally accepted definition of small business because the classification of business into large-scale or small scale is a subjective and qualitative judgement. The central Bank of Nigeria in its Monetary policy circular No 22 of 1998 defined small and medium scale enterprise as having an annual turnover not exceeding half a million naira (₦500,000.00). The National economic reconstruction fund (NERUND) put the ceiling for small scale-industries at 10-million-naira section 37(b)2 of the companies and allied matters Decree of 1990 defined a small company as one with an annual turnover of not more than 2 million naira and net asset value of not more than 1 million naira (Ekpeyong & Nyong,1992).

Theoretical Review

Theoretical literature (Mpofu, Milne & Watkins-Mathys, nd; Mutua & Wasike, 2009) explaining ICT adoption in SMEs suggested several existing theories and different approaches that help to explain and advance the understanding of ICT adoption in small businesses. In this study the theory of technology Acceptance Model is reviewed. This model was initially propounded by Dauls (1986) to expound on assertiveness behind the quest to utilize technical knowhow (Monyoncho, 2015). TAM has to do with observations and procedure. It argues that perceived ease of use (PEOU) and perceive usefulness (PU) influences customer choice on any new technology (Lule, Onnansa & Waema, 2012). PEOU is the level of trust that individuals have on a method and if users perceived a new technology to be useful both in short and long-run.

The TAM upholds that the systems and real deployment is only determined and depends on each customer's behavioural objectives and is confirmed by an individual's opinion about the system. The theory also clarifies that the assessment towards new technology has a positive relationship with its content and the flexibility of the system (Lim & Tong, 2012). TAM contemplates that acceptance of technology and relevance is predisposed by individual objectives that establishes the customer's interpretation towards the system (Mojtahed, Nunes & Peng, 2017) Davis (1989) defined perceived ease of use as the degree to which a person believes that using a particular information system would be free of effort attitude usually will lead to increase ICT usage while negative attitude will result in reluctant

to use ICT (Zhang & Aikman, 2009). According to Forman and Goldfarb (2006) in Mpofu *et al.,* (nd), Technology Adoption Model (TAM) has proven to be a robust model that is frequently used to study user acceptance of ICT. It is widely viewed as an information system theory which helps to understand the adoption and use of internet (Gibbs et al., 2007; Davis 1989). The theory helps to understand how adopters come to accept or reject the use of ICT in their small businesses. Although it has been criticised on various grounds: as less comprehensive compared to the diffusion approach which has more innovation characteristics, including time as an essential element of the theory; and for not accounting for the influence and personal control factors on behaviour, including the lack of consideration to other factors such as external influences from the environmental attributes, suppliers, customers and competitors (Manueli *et al.,* 2007; Rogers, 1995; Gibbs *et al.,* 2007; Van Akkeren & Cavaye, 1999)

Empirical Review

Dalrymple, (2004) lists profitability, financial management, productivity, investment, growth, customer service, supplier management, innovation, people management and people satisfaction as some of performance measures of an SME.

Ollo-Lopez and Aramendia-Muneta, (2012) state that ICT adoption seems to have a positive effect on productivity, directly as well as indirectly, depending on the sectors and to have great potential to support a sustainable development. Furthermore, the use of e-mail, e-commerce, and social media network has significantly cut down on the physical transportation involved in sending mail, banking, advertising and buying goods (Manochehri, Al-Esmail & Ashrafi, 2012).

Mutua and Wasike (2009) reviewed literature on ICT adoption and its impacts on firms in both developing and developed countries and analyses the determinants of ICT adoption and their impact on firm's performance. By use of an additional survey on ICT service providers, they unearth and provided challenges facing ICT providers in Kenya and how these challenges can be dealt with. Their study provided empirical evidence both on the factors that determine adoption of ICT (landline or internet connection) and the impact of proxies for ICT adoption on output of SMEs. Findings show that the main determinants of adoption of ICT are the size of the firm as indicated by firm employment, formal registration, and if a manager has some internet training. Registration or formalization of firms is also correlated with higher probability of adopting ICT. As predicted, the study finds that ICT tends to augment both capital and labour thus raising productivity of firms. Thus, the analysis shows that the ICT adoption as proxied by access to internet or a landline is significantly correlated with higher SMEs output. The study shows that adoption and use of ICT is a key factor to helping enterprises to raise their productivity and competitiveness.

According to Brynjolfsson and Hitt (1996), ICTs can enhance enterprise performance through indirect cost savings such as labour costs and increased labour productivity, and direct cost reduction of firm's input such as information costs. UNDP, (2001) claimed that ICT is considered as a tool of marketing and contacting customers and looking for possible customers, as well as presenting ICT services is distinguished as a potential service for customers (Werthner & Klein, 2005).

Adeosun, (2009) state that the use of ICT enables strategic management, communication, collaboration, information access, decision making, data management and knowledge management in organizations. ICT causes fundamental changes in the nature and application of technology in businesses. ICT can provide powerful strategic and tactical tools for organizations, which, if properly applied and used, could bring great advantages in promoting and strengthening their competitiveness (Buhalis, 2004).

Ghobakhloo (2011) analyzed reasons that persuade small and medium enterprises (SMEs) to adopt information technology (IT), as well as which factor and how it affects the level of IT sophistication in SMEs entrepreneurial segment. Drawing on the technology-organization-environment view of the firm, the study hypothesizes that technological, organizational and environmental factors can be viewed as the reasons for IT sophistication within SMEs.

Summary/ Gap in Literature

The empirical literature has provided insights and have also identified various factors that affect ICT application for improved SME performance from various standpoints and with varying literally perspectives and insightful empirical findings. This study fills a gap by investigating the impact of ICT on SME performance in emerging market economies countries.

Econometric Model

In the empirical estimations on the impact of ICT on SME performance, percentage of firms using banks as working capital proxied as SME will be employed as the dependent variable. In order to measure the effect of ICT on SME performance, we used the Gross domestic product (GDP), Secure server Per users (SSP) Public and private Investment in ICT (INVICT) are employed as explanatory variables. We included two control variables are phone subscriptions (PLC) and interest rate(INT) to avoid simultaneous bias in our regressions.

Methodology of GMM Estimators for Panel Models

We use the generalized method of moments (GMM) estimators developed for dynamic models of panel data introduced by Holtz-Eakin et al. (1990), Arellano and Bond (1991) and Arellano and Bover (1995). Consider the following regression equation:

$Y_{it} - Yi_{t-1} = (\alpha - 1)\, Y_{it-1} + \beta_o X_{it} + \mu i + \varepsilon_{it}$ ..... (1)

where Yit is the logarithm of SME, $Y_{it} - Y_{it-1}$ is the rate of SMEs growth, Yit_{-1} is the initial level of SME, Xit represents a vector of explanatory variables, μ_i is an unobserved country-specific effect, εi is the error term and the subscripts i and t represent country and time period respectively. Rewriting (1), we obtain:

$Y_{it} = \alpha Y_{it-1} + \beta_o X_{it} + \mu i + \varepsilon it$..... (2)

To eliminate country-specific effects, we take first differences of (2):

$Y_{it} - Y_{it-1} = a(Yit-1 - Yit-2) + \beta_o(Xit - Xit-1) + \varepsilon it - \varepsilon it-1$ ..... (3)

Levine et al. (2000) suggest the use of instruments for two reasons: to deal with the likely endogeneity of the SME and ICT adoption and because by construction the new error term (εit −εit−1)in equation (3) is correlated with the lagged dependent variable, (Yit−1 Yit−2).The GMM panel estimator uses the following moment conditions:

$E[Yit - s(\varepsilon it - \varepsilon it-1)] = 0$ for $s \geq 2$; t = 3, ..., T

$E[Xit - s(\varepsilon it - \varepsilon it-1)] = 0$ for $s \geq 2$; t = 3, ..., T

Under the assumptions that the error term, ε, is not serially correlated and that the explanatory variables, X, are weakly exogenous. The authors refer to this as the difference estimator. There are, though, statistical shortcomings with this estimator. Alonso-Borrego and Arellano (1996) and Blundell and Bond (1998) show that when the explanatory variables are persistent over time, lagged levels of these variables are weak instruments for the regression equation in differences. To reduce the potential biases associated with the difference estimator, the authors use a new estimator that combines in a system the regression in differences with the regression in levels The authors use a GMM estimator that uses lagged differences of Y_{it} as instruments for the equation in levels in addition to lagged levels of Y_{it} as instruments for equations in first differences. Blundell and Bond (1998) suggest that Monte Carlo simulations and asymptotic variance calculations show that this extended GMM estimator offers efficiency gains where the first-difference GMM estimator performs poorly. The instruments mentioned are appropriate under the following assumption: although there may be correlation between the levels of the right hand side variables and the country specific effect in the level equation, there is no correlation between the differences of these variables and the country specific effect. The additional moment conditions for the second part of the system which is the regression in levels are:

$E[(yit - s - yit-s-1)(\mu i + \varepsilon i,t)] = 0$ for s = 1

$E[(Xit - s - Xit-s-1)(\mu i + \varepsilon i,t)] = 0$ for s = 1

Given that the lagged levels are used as instruments in the differences specification, only the most recent difference is used as instrument in the levels specification. Using other lagged differences will result in redundant moment conditions [see Arellano and Bover (1995)]. The authors use the moment conditions above and employ a GMM procedure to generate consistent and efficient parameter estimates.

Data

Our empirical study is based on a short panel data set covering 42 emerging market economies Countries. All the data used in this study are secondary data collected from Central Bank of Nigeria (CBN) and World Development indicator database publications by World Bank. The choice of sample countries is based on data availability covering the 3-year period of study.

EMPIRICAL RESULTS

This section provides both OLS and GMM regressions results of empirical estimations on the relationship between SME performance and ICT adoption. Three techniques of estimations were used to revisit the various econometric approaches which studied the link between the ICT adoption and the SME performance as described before. These methods are Pooled OLS, the generalized method of moments in difference (GMM-Difference, Arellano and Bond, 1991) and in system (GMM-System, Blundell and Bond, 1995). Our results will be based on the last one which was the object of recent applications concerning the theme. In the first place, we made estimations by the Least Squared method. This last one allows checking the problem of heterogeneity of countries. Hausman Test, which allows choosing specific fixed effect or random effect, is applied. As shown table1, the relevance of fixed effects is established in the majority of regressions. The GMM estimations in first difference and in system allow taking into account the problem of endogeneity of variables. The GMM-System estimator treats combination of both difference and level equations. Instruments used for the difference equation are the delayed values of variables in levels. Moreover, variables are instrumented by their first differences in level equation. This system of equations is estimated simultaneously by GMM. The simulations of Monte Carlo made by Blundell and Bond (1998) showed that system estimator is the most efficient. The tests used for over-identification are Hansen test and test of second serial correlation of Arellano and Bond. Statistics of Hansen test allowed acceptance of validity of instruments. For serial correlation test, results validate the hypothesis of absence of second serial correlation of residuals. In all regressions, standard deviations of coefficients are corrected by White method in order to check heteroscedasticity problem.

Analysis of the Static Panel Data Estimations

Using the log of real GDP as dependent variable, the results of the pooled OLS Estimators in table 1, the coefficient of investment in ICT are positive and highly statistically significant, confirming a long-run positive relationship between financial development and growth as predicted in the majority of theoretical models. This is also consistent with the argument that well-developed ICT sectors in countries contribute significantly to an increase economic growth through improved SMEs performance or growth and private sector participation. For example, a 1% increase in the private and public sector investment in ICT leads to about 30% increase in growth of SMEs as predicted by pooled OLS. The same result goes with the variable interest rate which indicates positive and significant relationship with SMEs performance. All other variables indicate negative and insignificant relationship with SME performance in emerging economies countries. The results are consistent with previous studies, which find a positive relationship between ICT adoption and SMEs performance (see Bryniofsson & Hitt, 2000; Adeosun, 2009).

Analysis of the Dynamic Panel Data Estimations

The values reported for the Diff-in-Hansen test are the p-values for the validity of the additional moment restrictions necessary for system GMM. We do not reject the null that the additional moment conditions are valid. The values reported for Arellano-Bond test for second order serial correlation are the p values for second order autocorrelated disturbances in the first-differenced equation. As reported

in Table 1, there is no evidence for significant second order autocorrelation in the estimated model including the control variables. To sum up, our test statistics hint at a proper specification. The result of two-step GMM-Difference shows a consistent but insignificant negative relationship between investment in ICT and SMEs Performance. For instance, a 1% increase in the investment on ICT leads to about 14% decrease to SME performance or growth. while the result of the two-step GMM-System. Shows a consistence significant and negative relationship between ICT investment and SMEs performance or growth. for the control variables, a negative and statistically insignificant impact of interest rate (INTR) on SME performance is reported in which indicates that the increase in interest rate has marginally led to decrease in SME growth in the economy. Though confirms to theoretical postulation but one plausible reason might be through decrease in portfolio investment. However, the coefficient of secure server per user(SSP) is Positive and significant, for instance a 1% increase in secure server connection leads to about 46% increase in SMEs performance. The coefficient of mobile subscription(MSP) is positive and statistical significant for instance a 1% in mobile subscription leads to about 60% increase in SMEs performance which confirms to theoretical postulations because mobile and server connection enhances communications among entrepreneurs and in many ways will improve SME performances. These finding is consistent with Adeosun (2009) and Mutua and Wasike (2009) who examined the link between ICT adoption and SMEs Performance for 98 countries using dynamic panel's method and concluded that there is no statistical significant relationship among the variables.

Table 1: ICT adoptions and SMEs Performance in Nigeria: Static and Dynamic Panel Estimation, over the Period 2014 to 2018.

Variables	POOLED OLS	DIFF-1 GMM	DIFF-2 GMM	SYS-1 GMM	SYS-2 GMM
GDP2	-0.027 0.110	0.322 0.000	-0.989 0.414	0.213 0.003	-6.889 0.332
LnSSP	-0.318 In Nigeria0.034	-0.567 0.987	0.765 0.050	0.001 0.988	0.456 0.019
LnInvICT	0.302 0.046	0.221 0.045	-0.144 0.154	0.566 0.011	-0.608 0.021
LnMSP	-0.366 0.096	-0.987 0.885	-0.768 0.020	0.004 0.113	0.604 0.025
LnINT	0.745 0.000	0.865 0.678	0.223 0.000	0.445 0.320	-0.453 0.345
CONSTANT	1.773 0.017	23.34 0.022	0.456 0.034	2.455 0.023	4.345 0.011
INSTRUMENT		9	9	9	9
DIFF-IN-HANSEN TEST OF OVER-IDENTIFYING RESTRICTION		0.821	0.821	0.766	0.786
ARELLANO-BOND TEST FOR SECOND ORDER SERIAL CORRELATION		0.254	0.182	0.09	0.08
OBS	117	117	117	117	117
COUNTRIES	42	42	42	42	42

Source:

SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

This study examined the impact of ICT adoption and SMEs Performance in emerging market economies over the period 2014 -2018. Pooled OLS and Generalized Method of Moment Panel Model were employed as estimation techniques. The estimations of the dynamic panel-data results concluded that there is statistical significant relationship between ICT adoption and SMEs Performance in the selected emerging market economies. The results show that ICT adoptions lead to growth in the SMEs using short panel data of the selected countries. The study also considered, Secure server usage, Mobile phone connection and interest rate as determinant of growth in SMEs, under two-step GMM estimation. The implication of the results is that there is ardent need to develop the information and communication sector in order to stimulate growth SMEs which will guarantee real growth in economic growth of the selected Emerging economies countries. Development of the digital economy will play a great role towards improved efficiency in the SMEs include; increased productivity and efficiency; faster processing of transactions hence greater customer satisfaction; immediate dissemination of information throughout the SMEs; faster sharing of data between different departments; processing of enormous amounts of data; easy accessibility of information at any time; speed and volume of work done; improved process management; improved lead times in service delivery; improved communication flow access to real time information; reduced communication costs; data accuracy through the use of industry standard communication platforms and using applications that validate against business rules.

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