

The Problem of Infrastructure on E-Commerce, Small and Medium Enterprises in Nigeria

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Abstract

This study focuses on the problem of infrastructure as it affects electronic commerce, small and medium enterprises in Nigeria from the period 1990-2014. With a dichotomous dependent variable, the use of probit model estimated with maximum likelihood method was deployed. Nine regressors (financial cost, business size, infrastructure, government support, managerial support, security concern, I.T capability, market readiness and employment generation) model, their marginal effects and first difference effects were derived. The study reveals that ecommerce is impactful on SME performance in Nigeria and very capable in attracting investments into the ICT sector of the Nigerian economy. The study suggests that small and medium scale enterprises need to own, maintain and publish products and services on the internet through creation of domain websites to access global markets and maximize the benefits of ecommerce. In addition, the need for government to create enabling laws for handling online commercial disputes and enhance infrastructure necessary for SMEs to leverage ecommerce benefits through steady power supply and transportation systems amongst others were suggested.

Keywords: Infrastructure, E-commerce, Small & Medium Enterprises, Probit Model

1.0 Introduction

Electronic commerce is described as the process of buying, selling, transferring or exchanging products, services and information through computer networks, principally the internet (Turban E., King D, Lee J. K. & Viehland, D. (2004). Electronic commerce is a commercial activity dealing with the trading of goods and services and with other related business activities, in which the electronic communication medium plays a central role (Heng, 2012). These activities include the communication of information, the management of payment, the negotiating and trading of financial instruments, and the management of transport.

Aremu (2004) posited that small and medium enterprises play an important role in the economy of any country in accordance with their relative levels of development. He further emphasized that poverty is a worldwide phenomenon and its incidence in Nigeria had soared high since 1980. Small and medium enterprises contribute substantially to the gross domestic product, export earning, and to the development opportunities of all developed and emerging economies. Akintoye and Oladejo, 2008 opined that the role of SMEs in developed and developing countries cannot be overemphasized. It has played important role the economies of the countries of the world by generating employment, income and also serve as a means of reducing poverty

The effective use of information and communication technology (ICT) remains at the central stage in facilitating the growth of small and medium enterprise. ICT increases productivity of SMEs, improves faster communications and helps reach out to new clients. Many small and medium enterprises consider the creative use of ICT as a key enabler to their development, (Dixon, Thompson and McAllister, 2002).

The massive demand for this technology has generated employment and income opportunities for the economy. Other efficiencies include reduced inventory and round the clock access at no additional cost. E-commerce enables higher customization, allows organizations to improve customer service, (Choi and Whinston 2000). A vital benefit of e-commerce is that; it grants access to global markets which enables businesses to expand their reach.

On a larger scale, e-commerce enables individuals and organizations to exchange money via the internet or via virtual private networks (VPNs). An individual or organization can purchase goods from another by sending a purchase order over the internet. Using encryption technology, the bank involved would certify the identities of its account holders and serve as the intermediary through which its account holders can verify the identities of the account holders of the other transacting bank. The purchasing organization after verification pays for the purchase via the internet using EFT to transfer funds to the supplier's organization account. In this way, both sides of the party would have some assurance that they are not dealing with an impostor. Such intermediary role increases the security of online business (Trepper, 2000).

Mbarika, Okoli, Byrd and Datta (2005) stated that much of the discussion on digital divide was focused on that which occurs among different social groups; they noted the existence of international digital divide between countries. According to them, this digital divide is abundantly clear when comparing sub-Saharan Africa with countries of the west like the United States of America or the United Kingdom. One area where international digital divide is evident is in electronic commerce. One only needs to examine the major e-commerce sites to detect the inequality.

Ian (2003) observed that telecommunication is a vital engine of growth of an economy. It is an essential infrastructure that promotes the development of other sectors such as agriculture and education. He also observed that it has considerably reduced the risk and rigor of travels and has helped to arrest rural-urban migration in Nigeria. This technology is increasingly being used as a safe means of sending money to Nigeria's rural areas without bank hurdles.

Telecommunication is now widely considered as a strategic investment option in Africa and is very instrumental to Nigeria's quest in achieving the Millennium Development Goals in 2015. In Nigeria, it is glaring that Global System for Mobile Communication (GSM) and indeed satellite communication services are the bedrock upon which information technology and its derivatives such as e-banking, e-government, and of course e-commerce are built. Obi (2005), argues that GSM facilitates easy and fast entry, improves customer service, reduce cost and increases productivity in business organizations. It is an integral part of most economic activities. It has also been applied to the travel industry, media, transportation, medicine, manufacturing, retailing and wholesaling. Apart from labour and capital, information is now fast becoming an integral part of the factors of production.

In Nigeria, poor electricity supply, high cost of computers, poor access to the internet, poor infrastructure; poor hinterland networking and lack of relevant local content are the key challenges facing online transactions in the country coupled with prevalent internet fraud, inadequate legal framework and the country's cash based economy (Adeniyi-Aderoju, 2011). Some retail e-commerce sites are fast springing up in Nigeria and prominent amongst them are: www.jumia.com, www.konga.com, www.olx.com and www.dealdehy.com to mention but a few. Electronic commerce brings with it flexibility, convenience, empowerment and also customization of products. It has also changed the way banks operate by reducing transaction and operational cost. But to analyze the problems of infrastructure on electronic commerce and small medium enterprises in Nigeria is entirely an empirical issue.

This paper seeks to answer the following questions:

- i. are there adequate infrastructures to attract investments in SMEs in Nigeria?
- ii. to what extent is the diffusion of e-commerce technology by SMEs?

From above introduction, section II of the paper will focus on literature review, while section III will explain the methodology. Section IV deals with discussion of results and section V will be the conclusion and policy recommendations.

2.0 Literature Review

The impact of e-commerce on small and medium scale enterprises performance has not been greatly explored in Nigeria. Quite a number of studies have discussed the adoption of information technologies in SMEs in developed and developing countries, Lucchetti and Sterlacchini (2004).

Celestino, Navarrete and Juan (2008) measured the competitiveness of manufacturing small and medium enterprises using electronic commerce strategies in Mexico. Their study used both qualitative and quantitative data from 2000-2008. A probit model was used and the result reveals that the use of e-commerce by SMEs increased their performance by 67% relative to non-ecommerce SMEs. The study suggests therefore that organizational size and planning are important factors when adopting e-commerce by SMEs.

Akande and Yinus (2013) in an attempt to explore the extent to which an improvement in Small and medium enterprises (SMEs) operation can be certified by the application of electronic commerce. Using a multi stage sampling technique on data obtained via questionnaires and analyzed using a non-parametric statistical test, the result showed that electronic commerce has a significant impact on the performance of small and medium enterprises in Nigeria. They concluded that involvement by small and medium scale enterprises in electronic commerce will significantly improve their performance in terms of productivity, time saving, business turnover, reduction in operation expenses and contribute to economic growth.

Bairagi and Asghar (2011) in their study on the effect of electronic commerce applications on the business processes in the SMEs. Using data collected from questionnaires and analyzed with ANOVA, the result indicate that electronic commerce applications has a significant and positive impact on small and medium enterprises. Their study therefore suggests SMEs to own websites and publish goods in order to reach global world.

Kalingajolaga (2010) in a study conducted to investigate the use of electronic commerce by SMEs using data obtained via questionnaires from a survey of 70 SME owners in Canada. Using 2010 data collected by interviews with owners of 79 SMEs. A logit model was used and the result revealed that e-commerce played an important role in SME performance by 79% as compared to non-ecommerce SMEs. The study therefore suggests government support and assistance toward existing and potential e-commerce SME operators.

Tijani (2012) in an investigative study of the factors affecting the adoption of electronic commerce in small and medium enterprises in Nigeria using qualitative data collected by survey from 20 SMEs located in different parts of Lagos. A logistic regression was used and the result reveals that cost was a major barrier for small and medium enterprises in adopting electronic commerce. Other critical determinants include availability of

infrastructure, management support, government and business size. These determinants will be incorporated into our study to be used in analyzing the impact of e-commerce on SME performance in Nigeria.

3.0 Methodology

3.1 Theoretical Framework

This research model builds on the work of Celestino et al. (2008) where a maximum likelihood probit model was adopted to ascertain the competitiveness of manufacturing SME's Electronic commerce strategy. This is required because of the dichotomous nature of the response variable hence model estimates are non-linear and error term heterogeneous which makes ordinary least square estimation impossible. Estimating the probit model with the Maximum likelihood method has been shown by Gujarati and Sangheeta (2007) to produce consistent estimates just like the ordinary least square method. This procedure, however poses some interpretation challenges with some degree of computational difficulty. Essentially, interpreting the coefficient of the latent variable has little empirical use. Nonetheless, its interpretation will show the degree to which the estimated coefficients gravitate towards the probability of occurrence of the response variable.

3.2 Model Specification

To explain the behaviour of a dichotomous dependent variable, we will use a cumulative distribution function (CDF). The estimating model that emerges from the CDF chosen is a Probit model and this model is based on the utility theory of the behavior of firms with or without ecommerce. To motivate the probit model, assume that an SME's decision says I, to adopt ecommerce or not depends on an unobservable utility index I_i (also known as a latent variable), that is determined by one or more explanatory variables, say income X_i , in such a way that the larger the value of the index I_i , the greater the probability of a firm adopting ecommerce. We express the probit model as:

$$P_i = P(Y=1/X) = P(I_i^* \leq I_i) = P(Z_i \leq \beta_1 + \beta_2 X_i) = F(\beta_1 + \beta_2 X_i)$$

Where $P(Y=1/X)$ means the probability that an even occurs given the value(s) of the X, or explanatory variables and where Z is the standard normal variable and this is the model that will be used for the study.

The equation in this research work is specified thus:

$$EC = F(FC, BS, INF, GOV, MG, SC, I.T, MA, EG) \dots\dots\dots (3.1)$$

Where EC represents Electronic commerce adoption and is a dichotomous variable where the value of 1 depicts SMEs with e-commerce and 0 represents SMEs without e-commerce. FC is the financial cost, BS stands for business size, INF represents Infrastructure, GOV is the government support, MG represents management, SC stands security concern, IT is the I.T. capability while MA and EG are market awareness and employment generation respectively.

Hence, equation (3.1) can be specified in its econometrics form as thus;

$$EC = \beta_0 + \beta_1 FC + \beta_2 BS + \beta_3 INF + \beta_4 GOV + \beta_5 MS + \beta_6 SC + \beta_7 IT + \beta_8 MA + \beta_9 EG + \mu \quad (3.2)$$

β_0 is the intercept, $\beta_1 - \beta_5$ represent the coefficients of the explanatory variables, while μ is the error term.

The apriori expected posed that, all the independent variables produce a positive relationship with the dependent variable except FC. Therefore, $\beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8$ & $\beta_9 > 0$ while $\beta_1 < 0$.

Equation (3.2) is difficult to estimate in this form as the dependent variable can only assume values ranging from 0 to 1, say values that determine the probabilities. As EC approaches 1, a firm has adopted electronic commerce and as it approaches 0 it has less probabilities of adopting ecommerce. Thus fa binary response model of the form shown is needed:

$$P(EC = 1/X = X_i) = G(\beta_0 + \beta_i) \quad (3.3)$$

Where:

EC = Electronic Commerce adoption and

G = A function assuming values ranging from 0 to 1: $0 < G(z) < 1$ for every real number z.

$$G \text{ is the normal standard distribution: } G(z) = \Phi(z) \equiv \int_{-\infty}^z \phi(v)dv \quad (3.4)$$

$\phi(z)$ is the probability of the normal distribution and

$$I = \beta_0 + \beta_i X_i \quad (3.5)$$

I_i is an unobservable utility index determined by X_i (explanatory variables).

From equation (3.5) above, the probability for ecommerce adoption by an SME can be established as follows:

$$P_i = P(Y=1/X) = P(I \leq I_i) = P(Z_i \leq \beta_0 + \beta_i X_i) = F(\beta_0 + \beta_i X_i) \quad (3.6)$$

Where:

Y = Probability that the firm has adopted ecommerce

X = Value of the explanatory variable

I_i = Utility index

F = Standard normal curve that is, $Z \sim N(0, \sigma^2)$

increases the probability of e-commerce adoption by 20%. Government support increases the chance of e-commerce adoption by 16.2%, on the average. Managerial support increases the chance of an SME's adopting of e-commerce by 57.8%, while IT capability by an SME's owner increases the chance of e-commerce adoption to the tune of 28.9%. Market readiness is another factor that contributes to the adoption of e-commerce by an SME, with a magnificent rate 59.4%.

Meanwhile, insecurity inform of apprehension for internet scam reduces the probability of e-commerce adoption by an SME to the tune of about 27.5%; and an increase in the supply of labour reduces the probability of e-commerce adoption to the tune of about 6.1%. Managerial support ($z = 2.578$, $p = 0.010$) and Market readiness ($z = 2.084$, $p = 0.37$) appeared to be the significant drivers of e-commerce adoption among the sampled SMEs. ($p =$ readiness and reduces the probability of enhanced capacity efficiency). Since this value is starred, it shows that acquisition of computer technical skill is a significant determinant of enhanced capacity efficiency in the sector.

From our results, SME owners whose customers have knowledge of internet purchases (market awareness) have 18% more chance of adopting e-commerce compared to SMEs whose customers are not knowledgeable on internet purchases. Similarly, an SME that enjoys managerial support has 18% chance of adopting e-commerce compared to its identical counterpart who does not enjoy managerial support. With infrastructural availability, an SME has 7.9% chance of adopting e-commerce compared to the absence of infrastructural facilities.

An SME that enjoys government support has 6.8% chance of adopting e-commerce compared to an SME that does not enjoy any form of government intervention. Similarly, the presence of managerial support confers 18% chance for e-commerce adoption compared to its absence; also IT capability confers 18% for e-commerce adoption compared to the lack of it. Although small chance is offered, the presence of labour supply and security concerns raise the chances of e-commerce adoption by 2.6% and 13% respectively, compared to the lack of them.

4.0 Discussion of Results

This paper examined the problem of infrastructure on electronic commerce, small and medium enterprises in Nigeria with a view to ascertaining its prospects and challenges. The study was disaggregated into SMEs that have adopted e-commerce and those that have not. The study used both qualitative and quantitative methods of analysis to describe and infer on the relationship that exist between e-commerce and SMEs business performance. The results of the coefficients of financial cost, business size, employment generation and security concern held negative relationships with the adopter and non-adopter categories of e-commerce SMEs while managerial and government support, infrastructure, IT capability and market awareness all had a positive and significant relationship between the adopter and non-adopter SME firms.

Using normal equation and multiplying each coefficient of the independent variables by the inverse of the likelihood function to obtain first difference equation conditional upon each independent variable; the results of the estimates showed a positive and significant relationship between infrastructure, IT capability, market readiness, managerial and government support. Financial cost, business size, employment generation and security concerns (a major challenge against cybercrime) all exhibited a negative but significant relationship. The results from the estimates indicate that e-commerce is impactful on SMEs in Nigeria and highly prospective in attracting investments into the ICT sector of the Nigerian economy.

5.0 Conclusion and Recommendation

Small and medium enterprises constitute significant resources of employment opportunities and wealth creation. It also benefits the government in generating revenue in the form of taxes. However, it is noteworthy that not all SMEs are in the formal sector. SMEs constitute important sources of local supply and service provision to larger firms due to extensive knowledge of resources in their field. They also serve as the main customers to larger corporations; provide varieties of products ranging from food, clothing, recreation, entertainment, healthcare and education. They also help in economic development through industrial disposal and production of primary and intermediate products.

The conclusion from the empirical result reveals that e-commerce is positively impactful on SME performance, business profits and also contributory for economic growth in Nigeria. However, security concern remains a critical issue. The negative relationship signifies that due to a lack of cybercrime law, consumers are weary of transacting financially online but prefer to pay cash on delivery. This implies that a business to consumer type of e-commerce is preferable in Nigeria. The negative contribution of business size suggests that increase in size of business without corresponding returns to scale results to an increased overhead. Alternatively, smaller sized SMEs with lower overheads in an effort to reach global markets and supported by government interventions (Sure-P, etc.) are better positioned for commercial activities online. Employment generation under I.C.T specifically with e-commerce is none the less associated with the problems of business dis-intermediation. Dis-intermediation of economic agents in the distribution chain occurs when goods and services are channeled directly from manufacturers to consumers cutting of other agents of distribution. This vacuum caused by

adoption of electronic commerce technology negatively impacts on labour whose services have been eliminated.

In view of the findings of this study, the following recommendations are made.

The need for an influx of cheap reliable computers together with other I.C.T devices in the market to reduce cost of adoption and increase affordability of computers by every small scale and medium scale enterprise in Nigeria. The need for small and medium enterprises to own, maintain and publish products and services on the internet through creation of domain websites to maximize the benefits of e-commerce. The need for small and medium enterprises in Nigeria to leverage social media like Twitter, Facebook, Instagram, Youtube amongst others to engage local and international markets. There is an opportunity for SMEs to penetrate global markets internationally. The need for government to enhance infrastructure necessary for e-commerce in particular and business in general to thrive such as steady power supply, transportation systems amongst others. The need for government at both federal and state levels to foster stricter contract enforcement climate through a robust, enforced rule-of-law system. This would greatly accelerate the inflow of foreign direct investment in the ecommerce space specifically and the economy as a whole. The need to realize government ministries to grant ecommerce companies "Pioneer Status" that is currently enjoyed by some other sectors of the economy. This would give small and medium enterprises that have adopted e-commerce the necessary leeway to take root and grow rapidly.

The need for governments especially at state level to develop special ecommerce hubs as exists in Lagos (CC Hub for example) that would provide shared resources that budding ecommerce companies need to run easily on low budget. The need for the federal government through the NCC to work with stakeholders to improve the quality and geographical reach of broadband internet access while driving down the costs. Nigeria has one of the most expensive internet access fees in the world. Ecommerce is driven by internet access. If it is cheaper, faster and widespread the entire ecommerce industry would grow. China is enjoying this for example. The need for e-commerce SMEs adopters to engage in more offline marketing via TV, radio, outdoors and experiential marketing. They need to have/show visibility in physical communities and not just online so that Nigerians in cities, towns and villages across the country would be aware of them. The banks and telecommunication companies have done this over the past 15years and the results have been tremendous for the individual companies and their respective industries.

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**APPENDIX A
 DESCRIPTIVE STATISTICS**

	CF	ED	TRG	SER01	PRM	RD	MO
Mean	0.961395	0.925280	0.983811	0.875467	0.858032	0.854296	0.925280
Median	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Maximum	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Minimum	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Std. Dev.	0.192772	0.263103	0.126282	0.330394	0.349234	0.353029	0.263103
Skewness	-4.789925	-3.234824	-7.667182	-2.274258	-2.051662	-2.008433	-3.234824
Kurtosis	23.94338	11.46409	59.78569	6.172248	5.209317	5.033802	11.46409
Jarque-Bera	17746.26	3797.424	115757.7	1028.915	726.6597	678.2525	3797.424
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	772.0000	743.0000	790.0000	703.0000	689.0000	686.0000	743.0000
Sum Sq. Dev.	29.80324	55.51681	12.78954	87.54670	97.81569	99.95268	55.51681
Observs.	803	803	803	803	803	803	803

APPENDIX B

Parameter Estimates

Parameter	Estimate	Std. Error	Z	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Financial_Cost	-.056	.328	.171	.864	-.586	.698
Business_Size	-.224	.277	-.808	.419	-.768	.319
Infrastructure	.271	.337	.804	.421	-.390	.933
Government_support	.218	.487	.447	.655	-.737	1.172
Managerial_Support	.779	.302	-2.578	.010	-1.372	-.187
Security_Concern	-.370	.295	1.253	.210	-.209	.949
IT_capability	.039	.340	-.115	.909	-.705	.627
Market_Readiness	.801	.384	-2.084	.037	-1.553	-.048
Employment_Generation	-.082	.323	-.254	.799	-.714	.550
Intercept	1.101	.307	3.590	.000	.795	1.408

a. PROBIT model: PROBIT(p) = Intercept + BX

. probit Electronic Financial Business Infrastructure Government Managerial Security IT Market Employment
 . dprobit electronic financial business infrastructure government managerial security it market employment, asis
 Iteration 0: log likelihood = -61.138753
 Iteration 1: log likelihood = -51.994555
 Iteration 2: log likelihood = -51.865685
 Iteration 3: log likelihood = -51.865496

