AN INVESTIGATIVE STUDY OF THE FACTORS AFFECTING THE ADOPTION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN SMALL AND MEDIUM SCALE ENTERPRISES IN NIGERIA

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ABSTRACT

This study collected survey data from 20 industrial Small and Medium enterprises located in different part of Lagos state to analyze the vital influential factors affecting their adoption of Information and Communication Technology from adopter and non-adopter perspectives. A logistic regression analysis was conducted to predict the adoption inhibiting factors by the measures of Cost; Business Size; availability of ICT Infrastructure; Government support; and Management support. The results indicate that Cost is a major barrier for Small and Medium enterprises in adopting ICT. Other critical determinants also include availability of ICT infrastructure; government support; Management support and business size in that order.

Keywords: *ICT, Small scale, Enterprises, Nigeria*

1.0 INTRODUCTION

Many organizations of all types are currently utilizing Information and Communication Technology (ICT) around the globe, not only for cutting costs and improving efficiency, but also for providing better customer services. Also Governments world over are adopting ICT to provide better services to their citizens. The adoption of ICT by organizations requires a business environment that encourages open competition, trust and security, interoperability, and standardization and the availability of finance for ICT (UNCTAD, 2004). The effective use of ICT remains at central stage in facilitating the change and growth of enterprises. Many small and medium enterprises (SMEs) consider the creative use of ICT as a key enabler to their development (Dixon *et al*, 2002).

However, as the global economy became increasingly reliant on ICT to receive, process, and send out information, the small businesses within the developing countries – which form a significant portion of their developing economies – have yet to reap these benefits evenly. This is because obtaining such opportunities rests largely upon the ability of SMEs to engage in the regional and global economic business networks which, in turn demand provision of a prerequisite level of access to and use of ICT (Dixon *et al*, 2002). Unless these prerequisites are in place, these SMEs are set to lose out on opportunities to integrate into the global supply chain, bid for outsourcing businesses, and increase their internal productivity and efficiency.

The definition of small-scale enterprises (SSEs) in Nigeria has changed over the years not only in consonance with the changing fortune of the country but also in accordance with the diversity of the Small and Medium Enterprises (SMEs) supporting institutions in the country. Prior to 1992, different institutions in Nigeria adopted varying definitions of small enterprises. The institutions include the Central Bank of Nigeria (CBN), Nigerian Bank of Commerce and Industry (NBCI), Centre for Industrial Research and Development (CIRD), Nigerian Association of Small-Scale Industrialists (NASSI), Federal Ministry of Industry (FMI) and the National Economic Reconstruction and Fund (NERFUND). However, in 1992, the issues of conflicting definition was resolved with the establishment of National Council on Industry, which is now policy making organ on all

matters relating to industry in Nigeria. Among the conceptual issue that was resolved is whether Small-Scale Industry definition should include all economic activities such as trading, buying and selling or whether it should be restricted to productive industrial activities especially manufacturing. Accordingly, a clear distinction was made between small-scale enterprises consisting of trading, buying and selling activities and small-scale industries engaged in manufacturing industry.

n the guidelines for accessing equity finance under the Small and Medium Industry Equity Investment Scheme (SMIEIS) of the Bankers Committee and the Central Bank of Nigeria (2001), micro/cottage industry was classified as an industry with a total capital employed of not more than N1.5M excluding cost of land and working capital and labor employed of not more 10 workers; small-scale industry has a total capital employed of over N1.5M but not more than N50M, excluding the cost of land and working capital with labor size of 10 to 100 workers while medium-scale industry has total capital outlay of over N50M but not more than N200M excluding the cost of land and working capital and labor size of between 100 to 300 workers (SMIEIS and CBN, 2001). SMEs can benefit either as producers of ICT or as users of ICT for purposes such as increased productivity, faster communications and reaching new clients. However it must be noted at the outset that not all SMEs need to adopt ICT tools to the same degree of sophistication. The most basic ICT tool is having communication capabilities through fixed lines or mobile phones, whichever is more cost effective. SMEs may then use a personal computer (PC) with basic software for simple information processing needs such as producing text or keeping track of accounting items. Internet access enables SMEs to have advanced communication capabilities such as email, web browsing and launching a website. SMEs in manufacturing can benefit from more advanced ICT tools such as Enterprise Resource Planning (ERP) or inventory management.

While ICT can benefit SME in multiple ways, SMEs within the developing countries have been slow to adopt ICT as they face major constraints such as poor telecommunication infrastructure, limited ICT literacy, inability to integrate ICT into business processes, high costs of ICT equipment, incomplete government regulations for e-commerce, and a poor understanding of the dynamics of the knowledge economy (Lucey, 2005). Some empirical studies by Ashrafi & Murtaza (2008), Brynjolfsson and Yang (1996), Baldwin et al. (2003), Love et al (2004) and Ritches and Brindley (2005) confirm the positive effect of information and communication technologies (ICT) on firm performance in terms of productivity, profitability, market value and market share. Their study also reveals that ICT has some effect in terms of intermediate performance measures, such as process efficiency, service quality, cost savings, organization and process flexibility and customer satisfaction.

This paper aims at investigating the factors that affect ICT adoption by small and medium enterprises in manufacturing industries in south-western Nigeria. A variety of internal and external factors have been identified as preventing many SMEs from adopting ICT. The study, which is reported in this paper, provides more in-depth information about the reasons why local SMEs are reluctant to adopt ICT for their business activities. Identifying the major reasons may help the industry and government to provide appropriate information and support thus enhance ICT usage.

2.0 OVERVIEW OF SMEs SUBSECTOR IN NIGERIA

Nigeria is the second largest economy in Africa with a GDP of about $43.4 billion in 2004 (World Bank ,2005). However, 70% of its population lives below the poverty line with an average per capital income of $300 (USAID, 2003). Its economy is a dichotomy between the oil and non-oil producing sectors, with the middle income, oil producing economy of perhaps five million people having a per capital income of about $2,200 and the rest of the population part of a poor, non-producing economy (World Bank, 2005). While oil and gas production accounts for 98% of the foreign exchange earnings and 84% of budgetary revenues, the Agricultural sector is Nigeria's biggest employer (USAID, 2003). Most Nigerians derive their income from a combination of agricultural activity and operation of SME. Statistics on the number, geographical distribution and activities of the SME sector are very partial and highly unreliable (Lal, 2007). The best estimates available suggest that SMEs comprise 87% of all firms operating in Nigeria, although the total number of registered firms in Nigeria is also unknown (World Bank, 2005). the only available data appears to be the number of registered business names, the last good data for which is 47, 171 based on 2002 registration with the Cooperate Affairs Commission (CAC). However, no breakdown of this number of enterprise size was available from CAC or Nigerian Investment Promotion Council (NIPC).

It is possible to estimate, however, the approximate number of SMEs by using data on poverty and average household size. For example, 1996 Federal Office of Statistics poverty statistics indicated that 55.8 million were below the poverty line and that there are approximately five persons per household. A conservative assumption is that 75% of the total number of poor households (or 8.4 million) depend on a farm or non-farm SME for their

livelihood. This estimate is supported by an earlier Central Bank of Nigeria (CBN) report that estimated the total number of micro and small scale enterprises of seven million (Lal, 2007).

Business name registration statistics and anecdotal evidence support the finding that most SMEs, especially the larger ones, are clustered around population centers such as Lagos, Port Harcourt, and the Federal Capital Territory (FCT), however many micro and small enterprises can be found operating at the village level throughout the country. Locations of most SMEs appear to be along secondary, tertiary, and quaternary roads in and around market centers (World Bank, 2005). Characteristics of SMEs differ by business size and a review of several of their attributes is useful to inform discussion of their demand for and supply of financial and non-financial services.

3.0 SMALL AND MEDIUM ENTERPRISES AND ICT USAGE

The usage of information technology is expected to be an important factor for competitive growth of SMEs in global and regional markets. Growth of competitive pressure force SME to fight for new markets, new products and new distribution channells. These environment movements can be faced just from those businesses that have quality information systems support. The only competitive adventages companies and SME enjoy are their process of innovation and ability to derive value from information as resource. As noted earlier, information technology is the technology that is used to store, manipulate, distribute or create information. Furthermore, it is claimed that through the use of information technology, SMEs can gain from developing capabilities for managing, information intensive resources, enjoy reduced transaction costs, develop capacity for information gathering and dissemination of international scale and gain access to rapid flow of information (Minton, 2003). New business models and market configurations enabled by information technology, including business process outsourcing, provide SMEs with access to new market and new sources of competitive adventages.

SME usage of ICT ranges from basic technology such as radio and fixed lines to more advanced technology such as email, e-commerce, and information processing systems. Using advanced ICT to improve business processes falls into the category of e-business (UNDP, 2003).

However, not all SMEs need to use ICT to the same degree of complexity. The first ICT tool that most SMEs adopt is having basic communications with a fixed line or mobile phone, whichever is more economical or most convenient for the business.This allows the SMEs operators to communicate with its suppliers and customers without having to pay a personal visit. After acquiring basic communication capabilities, the next ICT upgrade is usually a PC with basic software. Even without Internet connectivity, SMEs can use PCs for basic word processing, accounting, and other business practices. With the Internet, SMEs are able to use more advanced communications capabilities such as email, file sharing, creating websites, and e-commerce. This may be sufficient for most SMEs, especially those in service industries such as tourism. SMEs in manufacturing may adopt more complex IT tools such as Enterprise Resource Planning (ERP) software or inventory management software. SMEs may adopt the tools progressively or jump immediately to advanced ICT capabilities.

Like any firm, an SME decides which type of ICT products to adopt based on the concrete benefits they can bring to its core business, the ICT capacity of its employees, and the financial resources available. Most people are familiar with basic ICT such as fixed phone lines, mobile phones, fax, computers, and basic document processing software – like Microsoft Office.

Advanced communication technology, however, is more complex. Advanced communication technology relies primarily on the Internet and the intranet, which allow people within the firm to share files with each other over the same network. Having Internet connectivity enables firms to do faster research, set up websites, conduct e-commerce, and set up video conferences. One of the most revolutionizing developments in advanced communication technology is Voice over Internet Protocol (VoIP).VoIP includes all types of voice communication transmitted through the Internet, whether it is between computer and computer or in hybrid form between computer and regular phone. It competes directly with traditional fixed line and mobile phone operators.Users only pay for their dial-up, broadband, or wireless Internet connection. Most complex of all is advanced IT. It is often very expensive, sophisticated and takes more time to implement by a firm. SMEs can sign up for one or all available services. In order to reduce costs, some firms opt to outsource this component or use an Application Service Provider (ASP) that provides functional software capabilities over the Internet.

Information and Communication Technology (ICT) can play a very important role because it can help SMEs both create business opportunities and combat pressures from competition. Appropriate ICT can help SMEs cut costs by improving their internal processes, improving their product through faster communication with their

customers, and better promoting and distributing their products through online presence. In fact, ICT has the potential to improve the core business of SMEs in every step of the business process.

4.0 LITERATURE REVIEW

There are number of studies that discuss adoption of information technology in SMEs in developed and developing countries (Lucchetti & Sterlacchini, 2004), (Love et al, 2004), (Beheshti, 2004), (Jean et al, 2006), (Ritches and Brindley, 2005) and (Marikawa, 2004). Beheshti (2004) in his study of the impact of ICT on SMEs in United States of America discovered that Information Technology can be used to create competitive opportunities for the organization. In similar vein Ritches and Brindley (2005) studied the significance of Information and Communication Technology (ICT) in the growth of SMEs in Australia. They concluded that adoption of ICT increases the efficiency of the organization. Duan et al (2002) identified lack of ICT skills and knowledge in SMEs as one of the major challenges faced by all European countries, particularly in the UK, Poland and Portugal in their study. Houghton and Winklhofer (2004) have reported a slow response of SMEs relating to adoption of ICT. Shiels *et al* (2003) found that characteristics of the firm and industry sector are contributory factors to the adoption and exploitation of ICTs by SMEs. Kapurubandara *et al* (2006) have categorized internal and external barriers that impede adoption of ICT by SMEs in a developing country. The internal barriers include owner/manager characteristics, firm characteristics, cost and return on investment, and external barriers include, infrastructure, social, cultural, political, legal and regulatory. Lal (2007) investigated the adoption of ICT in SMEs in Nigeria and found that one of the major factors inhibiting ICT diffusion and intensive utilization is poor physical infrastructure. In developing countries some of the ICT challenges include legal and regulatory issues, weak ICT strategies, lack of research and development, excessive reliance on foreign technology and ongoing weaknesses in ICT implementation (Dutta *et al* 2003).

Large amounts of researches have examined that management play a critical role in an organization innovation adoption (Cerpa and Verner, 1998; Earl, 1993). Mabert *et al*. (2006) found that senior executives were very involved throughout the Enterprise Resource Planning (ERP) implementation, from the outset to completion, and also established clear priority. Basu *et al* (2002) took a postal survey upon the impact on the achievement of strategic information system planning (SISP) objective from 105 corporate information systems planners. The result presented that senior management involvement has a positive impact on SISP objective achievement. Nickell and Seado (1986) found that in computerized business, the senior managers tend to have a more positive attitude towards adoption of information technology.

5.0 RESEARCH QUESTIONS

The following research questions were answered in the course of this research;

What is the relative contribution of each of the above variables to the prediction of adoption of ICT in SMEs in Nigeria?

What is the joint contribution of cost, business size, infrastructure, government support and management support attitude to the adoption of Information and Communication Technology (ICT) in SMEs in Nigeria

6.0 MODEL SPECIFICATION

Based on the literature discussed above, the research model illustrated in Figure 1 for this study consists of five set of variables, cost, business size, infrastructure, government support and management support. These variables are hypothesized to affect the adoption of ICT in SMEs.
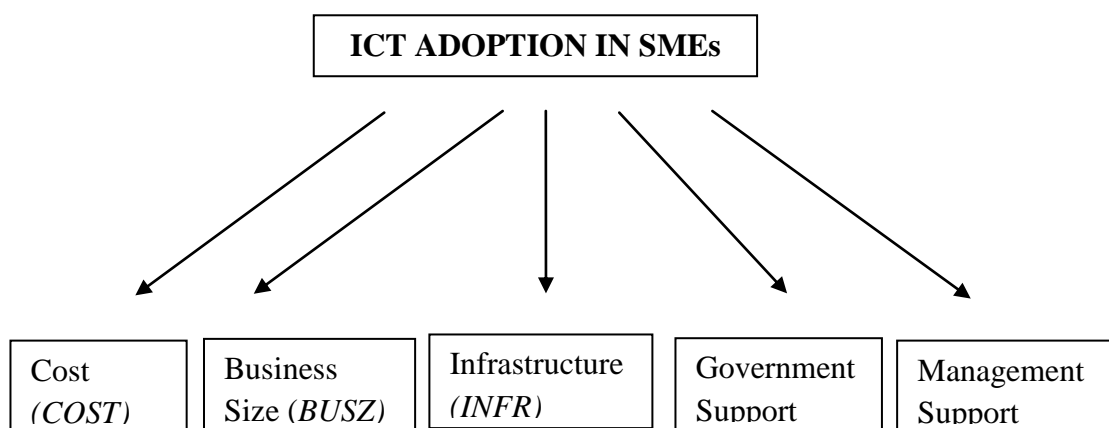

Figure1: Research Model

Logistic Regression was used to analyze the data because of its popularity as a statistical technique in which the probability of a dichotomous outcome (such as adoption or non-adoption) is related to a set of explanatory variables that are hypothesized to influence the outcome.

7.0 METHODOLOGY
Survey Procedure and Sample
A detailed questionnaire that measures the various variables was developed. The items in the questionnaire were initially derived after an extensive literature review and were subjected to thorough scrutiny. The study made use of 20 industrial Small and Medium Enterprises located in different part of Lagos state. They were randomly selected from the directory of Nigerian businesses compiled by Manufacturers Association of Nigeria (MAN) which contained information on businesses from all sectors of Nigerian economy. The companies' names were confirmed by telephone to ensure that they exist and operating. Questionnaire was administered to the owner or member of staff that can provide useful information.

The dependent variable was measured using the question "Does your company adopt ICT? Yes/No and the question was used to separate the samples into adopter (those that have adopted ICT) and non-adopter. The independent variables were measured by given the response a 5-point Likert scale where 1 is Strongly disagree and 5 is Strongly agree.

8.0 DATA ANALYSIS AND RESULTS
Twenty copies of questionnaire were sent out to the 20 industrial SMEs in Lagos, 17 responses were received for response rate of 85%. Given the lengthened and compressive nature of the survey, the response rate was concluded to be reasonable. Among the 17 effective responses, 11 had partially implemented ICT while the remaining 6 were non-adopter.

Data were entered and processed using the Statistical Package for Social Science (SPSS) software; English version 10.0. Descriptive information for the characteristics of the sample was summarized in Tables 1, 2 and 3. The food and catering services has larger percentage among the respondents and it is also the main user of ICT. The sizes of the businesses range from less than N500, 000 to above N3 million sales revenue in 2010. Of these 55.1% business had sales revenue ranging from N500, 000 to N2 Million. The number of employees ranged from less than 50 to above 300. Of these, 53.2% business had employees from 1 to 100. In all, the sample represented a wide range of business, increasing the authenticity and acceptability of the results.

Table 1: Industry Characteristics

Industry	Adopter	Non-adopter	Total	Percentage
Chemical and Pharmacy	2	1	3	17.6
Food and Catering Services	4	1	5	29.4
Textile	1	1	2	11.8
Machinery	1	1	2	11.8
Transport services	2	1	3	17.6
Metal and Hardware	1	1	2	11.8
Total	11	6	17	100

Sources: Data survey, 2009

Table 2: Sales Revenue

Sales Revenue (NAIRA)

Range	Adopter	Non-adopter	Total	Percentage
Less than 100,000	2	2	4	23.5
100~500,000	1	2	3	17.6
500~1 million	2	1	3	17.6
1 million~2 million	4	1	5	29.4
2 million~3 million	1	0	1	5.9
Above 3 million	1	0	1	5.9
Total	11	6	17	100

Sources: Data survey, 2009

Table 3: Number of Employees

Number of Employees

Range	Adopter	Non-adopter	Total	Percentage
Less than 100	6	2	8	47.1
101~200	3	3	6	35.3
201~300	1	1	2	11.8
Above 300	1	0	1	5.9
Total	11	6	17	100

Sources: Data survey, 2009

In order to test the relative importance of the independent variables with regard to the adoption of ICT, the model was analyzed using logistic regression analysis with the backward stepwise likelihood ratio method (Menard, 1995). The significance of the regression coefficients of the hypothesized independent variables was examined to determine support for the hypothesis.

Table 4: Results of logistic regression analysis

Variables	Coefficients	S.E.	Wald statistic	Significance
Constant	-3.568	1.451	5.121	0.015**
COST	0.847	0.262	4.271	0.030**
BUSSZ	-0.657	0.210	3.521	0.051*
INFR	0.721	0.429	3.711	0.093*
GOVSPT	0.557	0.377	2.821	0.041**
MGTSPT	0.531	0.271	4.285	0.029**

Notes: -2 log likelihood χ^2 =32.525 (d.f.= 6)
** Significant at 0.05 level, * Significant at 0.1 level,

The results above partially confirm the first research question. The coefficient of *Cost* is the largest among the significant variables, implying the cost of purchasing computer equipments, establish a communication network system have relative important effect on ICT adoption. Otherwise, as small businesses are characterized by server constraints on resources such as finance and in-house technical expertise, the adoption of ICT represents as disproportionately large financial risk which cannot be taken by SMEs.

In addition, availability of ICT infrastructure contributes significantly to the adoption of ICT in SME, because if there is proper policy for telecommunication equipments and services in the country there will be increase in the usage of ICT in the businesses in Nigeria. Also high cost of computer, internet facilities and other ICT equipments which form the core ICT infrastructure is also affecting the adoption of ICT by SMEs. According to the result, government support has a significant and strong positive relation to ICT adoption. According to Stoneman and David, (1986) the impact of government policies and initiatives has been shown to have direct and indirect stimulation to the supply of information which produces faster technology diffusion. For example, governmental efforts to establish a national information infrastructure in US, Singapore and Malaysia have shown that both governments provide a legitimate and positive leadership role in developing the information infrastructure in its effort to digitized its economy (Kettinger, 1994; Tan, 1998). Business size has negative relationship to the adoption of ICT while management support has positive influence on the adoption of ICT.

Table 5: Multiple Regression analysis of contribution of independent variables to the dependent variable

Multiple R	0.731
R Square	0.534
Adjusted R square	0.512
Standard Error	4.983

Table 6: Analysis of Variance Table

	DF	Sum of Square	Mean Square	F-ratio
Regression	4	426.45	106.61	42.82
Residual	12	375.85	2.49	

Table 5 indicates that a combination of independent variables; cost, business size, infrastructure, government support and management support; yielded a coefficient of multiple regression (R^2) of 0.534 accounting for 53.4% of the variance in adoption of ICT by SMEs in Lagos state. The table also shows that the analysis of variance for the multiple regression data produced F-ratio value of 42.82 which is significant at 0.05.

9.0 CONCLUSION

The primary purpose of this study is to identify the most important factors that affect the adoption of Information and Communication Technology in Small and Medium Enterprises in Nigeria. This research was empirically evaluated using data from 17 industrial Small and Medium Enterprises located in different part of Lagos state. They were randomly selected from the directory of Nigerian businesses compiled by Manufacturers Association of Nigeria (MAN) which contained information on businesses from all sectors of Nigerian economy. Several important findings can be drawn from the research.

First, Cost was discovered as the most potent factor in the adoption of ICT by SMEs in Nigeria. This is consistent with Adam (2003) findings that Cost plays a critical role at an organization adoption of ICT. Second, availability of ICT infrastructure is another important factor that inhibits the adoption of ICT by SMEs. If there is adequate ICT infrastructure in the country, it will be very easier for SMEs to adopt it rather than running away from it. The finding is in accordance with Kapurubandara *et al* (2006), which found availability of internet facilities, telecommunication services as some of the factors affecting the adoption of ICT by SMEs in developing economy. Third, government support should be considered as one of the factors militating against the adoption of ICT by SMEs in Nigeria. It is widely believed that ICT adoption and utilization is predicated on availability of physical infrastructure, legal and regulatory issues, adequate research and development, and proper policy. All these can be put in place only when there is adequate support from the government. This finding also concurs with the result of the study conducted in Nigeria by Laik (2007). Fourth, the research has

shown a negative relationship between business size and ICT adoption. Large businesses that possess adequate financial resources, maturity, knowledgeable employees and operation performance are likely to adopt ICT not Small enterprises that are still under nurturing. In order to get scale of economy, the more business size, the more intention business could adopt ICT. This also supports by Dutta et al (2003). Lastly, as management find that adoption of ICT can increases the productivity of the employees, the business will have higher intention to use them. The study discovered that management support has a positive relation to the adoption of ICT in SMEs. This is in line with the study of Mabert et al (2006) which found out that senior executives support are crucial to the adoption of ICT.

The study has shown clearly the factors affecting the adoption of ICT in Nigerian Small Scale Industries and the level at which it affect them. The findings can help marketing strategy making of ICT supplier and manufacturer, as well as in business policymakers, to identify important consideration in ICT adoption. Finally it will help small scale industries and government in identifying these factors so as to device strategy of overcoming them.

10.0 LIMITATIONS AND FUTURE DIRECTIONS

Like other empirical studies, this study is not without its limitations. Our sample consisted of SMEs in Lagos state in Nigeria may limit the generalizability of the results. Although several technology adoption studies focused on the zone basis (Van Beveren and Thomson, 2002; Cloete et al., 2002), state based respondents, such as experience using technology, differ from state to state from overall population of SMEs. The sample size itself is relatively small. The study can be strengthened by increasing the sample size and including participants in other geographical areas. With an increased sample size, a more detailed empirical analysis among the independent variables and the variables that have multiple categories can be performed. Potential correlations between some of the independent variables (e.g. gender, race, education level of the manager) need to be reported in a future study.

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