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Empirical Study of Factors Affecting Cloud Computing Services Adoption Among Small and Medium-Sized Enterprises (SMES) In Oyo State, Nigeria

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ABSTRACT

This study examined factors affecting cloud computing services adoption among SMEs in Oyo State of Nigeria. A validated conceptual model was developed in order to examine the influence of fifteen contextual factors affecting cloud computing services adoption among SMEs in Oyo State of Nigeria.A descriptive survey design was employed and structured questionnaire previously used by some researchers was used as an instrument to collect data from the respondents. An incidental random sampling technique was used to select one hundred and twenty respondents from the fifteen firms reside in Oyo State. The reliability of the instrument used was tested using cronbach's alpha analysis. Three hypotheses were formulated for the study and data collected were analysed using frequency count, percentage and multiple regression analysis at 0.05 level of significant. Results of this study showed that the model explains approximately 57% of the variance in intention to use cloud computing technology (adjusted R^2=.568). In addition, Technological factors (β=.627, p=.000, p<0.05), Organizational factors (β=.197, p=.003, p<0.05)and Environmental factors (β=.232, p=.000, p<0.05) have positive significant influence on the intention of small and medium-sized enterprises (SMEs) in Oyo State of Nigeria to adopt cloud computing services and technological factors made the highest significant effect on the intention of SMEs to adopt cloud computing services, it accounted for 63% of the total variance of the SMEs intention to adopt cloud computing services. Moreover, the results of the study indicates that Technological Factors (cost savings, relative advantages, compatibility, and complexity), Organizational Factors (top management support, and prior similar technology experience), and Environmental Factors (market scope, competitive pressure and external computing support) were found to be determinants of the adoption of cloud computing services. Based on these results, the study recommended that government should incorporated cloud computing into national ICT policy framework so as to strategize policy makers a way forward to increase the adoption and use of cloud computing services amongst SMEs in Nigeria and also efforts must be geared towards increasing broadband coverage and access to fast internet speeds at affordable prices for SMEs in Nigeria. Also government should provide an enablement environment that will encourage SMEs in Nigeria to invest and integrate cloud computing services in their business operations and activities.

Keywords: Cloud Computing, DOI, ICT, SMEs, TAM, TOE, UTAUT

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1. INTRODUCTION

Cloud computing refers to an information technology (IT) service model where computing services (both hardware and software) are delivered on-demand to customers over a network in a self-service fashion, independent of device and location (Gangwar, Date and Ramaswamy, 2015; Marston, Li, Bandyopadhyay, Zhang and Ghalsasi, 2011). Cloud computing has dramatically changed the mode of traditional IT operation because cloud computing vendors can take care of the development, deployment, upgrading, and maintenance of IT. As a result, client firms can access IT resources on-demand without investing a large amount of money in IT infrastructure and focus on the business use of IT without engaging in the complexity of IT infrastructure (Liu, Yang and Ran, 2016). This is highly valuable to firms, especially firms lacking enough financial resource and technical skills for IT implementation.

The use of cloud computing has become increasingly popular in both private and public sectors. For example, numerous government agencies and enterprises are expected to rely on the cloud for more than half of their IT services by 2020 (Garrison, Wakefield and Kim, 2015). A recent survey by IDC suggests that public cloud computing will become a $127 billion dollar industry by 2018 (Sabi, Uzoka, Langmia and Njeh, 2016).

Numerous benefits of cloud computing for firms, especially for small-medium enterprise (SMEs) have been noticed in the literature. For instance, cloud computing transfer the fixed costs of IT investment into available costs, which reduces the barrier of IT infrastructure investment for SMEs and increase their ability in dealing with market changes (Chen and Wu, 2012). In general, it is suggested that cloud computing dramatically lowers the cost of entry for SMEs trying to benefit from compute-intensive business analytics that were hitherto available only to the largest of corporations and it can provide an almost immediate access to hardware resources, with no upfront capital investments for users, leading to a faster time to market in many businesses (Marston et al., 2011).

Despite the advantages offered by this technology, the pace towards its adoption is not matching the speed of technology advancement. Various reasons for this are suggested such as: (1) the technology is still in its early advancement stages, with some firms not yet convinced of its benefits and waiting to see actual success to take serious actions; (2) some firms have limited budget allocations for technology; (3) there is limited technical knowledge within the firms; (4) and there is hesitation about migrating to new technologies (Al-Isma'ili, Li, Shen and He, 2016). On the other hand, some scholars (Carcary, Doherty and Conway, 2013, Ross and Blumenstein, 2015, Dillon and Vossen, 2015, Sultan, 2010) have indicated that Small and Medium-sized Enterprises (SMEs) can take advantage of the benefits offered by cloud computing by using its services to be more productive and competitive. However, the decision-making process in adopting these services is not always straightforward, and there are several factors the firms usually take into consideration before they make their decision. Previous studies have discussed some of these determinants (Gajbhiye and Shrivastva, 2014, Goscinski and Brock, 2010, Ercan, 2010). According to Saedi and Iahad (2013) and El-Gazzar (2014) investigation of cloud computing must consider context because different contexts might have specific determinants.

There is no universal definition of cloud computing with each scholar coming up with his own definition. Tehrani (2013) defines cloud computing as a computing paradigm in which the computing resources are delivered to customers over a network (e.g. Internet). The National Institute of Standards and Technology (NIST) define it as "…a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources, that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Mell and Grance, 2011). Following Bharadwaj (2000)'s concept of IT capability, Liu et al. (2016) define cloud capability as firm's ability to acquire, deploy, combine, and reconfigure IT resources in support and enhancement of business strategies and work processes through cloud computing services. This capability is mainly about how firms use cloud computing services to support their business. With the increasing popularity of cloud computing, cloud capability will eventually make great influence on firms' competitive advantage and performance.

The term Small and Medium Enterprise (SME) has a wide range of definitions. The definition varies from country to country and different criteria are used to judge what an SME is. Whilst others have used the number of employees or total net assets, sales and investment level have also been used in some parts of the world. However, in all the varying definitions, the most common basis has been the number of employees, but even with that, there is a variation in defining the upper and lower size limit of the number of employees for an SME. Majority of sources define an SME as having a maximum of 250 employees (Ayyagari, Beck and Demirguc-Kunt, 2007).
SMEs are confronted with a lot of issues in their adoption of new technologies and its sustainability (Wang and He, 2014). This is because SMEs generally have limited resources making their adoption different from big businesses with more resources (Alshamaila, Papagiannidis and Li, 2013). However, given the constraints that SMEs face, cloud computing provides them with many opportunities such as flexibility, scalability, business agility and a pay-per-use option to deal with cost (Iyer and Henderson, 2010; Sultan, 2011; Venters and Whitley, 2012).

To examine the factors affecting cloud computing services adoption among SMEs in Oyo State of Nigeria, this study developed a research model based on the integration of Diffusion of Innovation Theory (DOI) and the Technology-Organisation-Environment framework (TOE). Data were collected from 15 firms in Oyo State, Nigeria and the data collected were used to evaluate the research model. This study, therefore, contributes to the scientific knowledge with its holistic presentation of the cloud computing adoption determinants based on the Diffusion of Innovation Theory (DOI) and the Technology-Organisation-Environment framework (TOE) perspectives. The study will contribute to the wider knowledge of cloud computing adoption, particularly within the Nigerian context.

2. LITERATURE REVIEW

The term "cloud" is derived from the idea where users are able to access applications from anywhere in the world on demand (Sultan, 2010). Cloud computing uses ubiquitous resources that can be shared by business users over the Internet, allowing them to communicate with many servers at the same time (Low, Chen and Wu, 2011). There are three types of cloud computing services, namely, Infrastructure-as-a-System (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS). IaaS is the most basic service level that offers customers the infrastructure services over the Internet, including storage, network, and software. The customer mainly manages the operation of the infrastructure while the provider generally maintains the operations of the data centre (Bhardwaji, Jain and Jain, 2010). PaaS offers services, such as application design, development, testing, deployment, and programming language hosting tools, in which the access to these services are provided online to customers who desire to build an application for their organisation (Gangwar et al., 2015). Hence, customers who use these PaaS services do not have to buy and manage the underlying infrastructure to develop the application as they are available online. In the SaaS model, users can utilise a hosted set of software that they do not own, but pay for the elements of the utilisation (Bhardwaji et al., 2010). Customers can install the software according to the types of exclusive and non-exclusive method, including public, private, hybrid, and community clouds (Mell and Grance, 2009) and the applications can be used at anytime and anywhere over the Internet (Gangwar et al., 2015).

In spite of the increasing attention of researchers to cloud computing, the empirical studies on the factors that influence cloud computing adoption in organisations are however, limited. It is likely that cloud computing is a relatively recent area of research in the Information Science (IS) discipline (Oliveira, Thomas and Espadanal, 2014). Most of the studies were carried out in the Asia-Pacific region see, for example, (Gangwar et al.,2015; Yigitbasioglu, 2015), Europe (Gutierrez et al., 2015; Oliveira et al., 2014), and North America (Cegielski, Jones-Farmer, Wu and Hazen, 2012). Many of them focused on both small and large companies in more than one industry. Only one study emphasised on the SMEs (Gupta, Seetharaman and Raj, 2013) and on a single industry (Low, Chen and Wu, 2011).

Many different theories and models have been proposed to study the process of adopting new technologies. Review of literature on Information Technology (IT) adoption shows that there are several studies at the individual level. There are many theories and models used for IT adoption at the individual level such as Technology Acceptance Model (TAM) (Davis, 1989), Theory of Planned Behaviour (TPB) (Ajzen, 1985; Ajzen, 1991), TAM 2 (Venkatesh& Davis, 2000), Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis and Davis, 2003). However, there are fewer studies at the organization level. This article mainly focused on well-known and most relevant theories for this study, Diffusion of Innovation (DOI), Technology-Organization-Environment (TOE).

Diffusion of Innovation Theory (DOI) is a theory developed by Everett Rogers in 1962. DOI is a theory of how, why, and at what rate new ideas and technology spread through cultures (Rogers, 2003). DOI is mostly based on the innovation's characteristics and the perceptions of the users about the technology. Rogers (1983) defined diffusion of innovation as "the process in which an innovation is communicated through certain channels over time within a particular social system".

Rogers (2003) identified five important attributes of innovation that influence the decision whether to adopt or reject a particular innovation. These five attributes are valid for both individual and organizational adoption of technology. Rogers suggested the characteristics which influence the adoption of innovation as relative advantage, compatibility, complexity, observability, and trialability. Relative advantage is the degree to which an innovation can bring benefits to an organization.
Compatibility refers to the degree to which an innovation is consistent with existing business processes, practices and value systems. Complexity considers the degree to which an innovation is difficult to use. Observability is the degree to which the results of an innovation are visible to others and trialability is the degree to which an innovation may be experimented with on a limited basis (Rogers, 2003).

TOE framework was developed by Tornatzky and Fleischer in 1990 to analyze the adoption of technological innovation by firms and organizations. According to TOE framework there are three context groups: technological, organizational and environmental which influence the adoption an innovation at firm level (DePietro, Wiarda and Fleischer, 1990; Melville and Ramirez, 2008; Low et al., 2011).

Technology-organisation-environment (TOE) framework has been widely used in prior studies to examine factors influencing cloud computing adoption in organisations, for example, Hsu, Ray and Li-Hsieh (2014) carried out a study on exploration of the determinants for decision to migrate existing resources to cloud computing using an integrated TOE-DOI model. TOE framework suggests that the process by which an organisation adopts and implements technological innovations is influenced by factors from three contexts: technology (T)-technologies that are relevant to organisations; organisation (O)-the organisation's size, scope, and the amount of slack resources available in the organisations; and environment (E)-external environment in which an organisation conducts its business (Tornatzky and Fleischer, 1990).

Recognising the importance of the TOE framework in prior studies, this framework is used to present the various technological, organisational, and environmental factors found to influence the cloud computing adoption in organisations. Most studies have explored the importance of these factors on cloud computing adoption in their studies; however, their influences on the adoption vary across different industry contexts. It was also found that not all studies covered factors from all the three contexts (Yigitbasioglu, 2015; Gupta et al., 2013).

From the technological context, three common factors tested in prior studies were relative advantage, compatibility, and complexity. These three factors are derived from Roger's DOI theory (Rogers, 2003). Relative advantage was covered by most of the studies and was found significant. The significant importance of relative advantage indicates that the organisations recognise the relative advantages of cloud computing, such as in reducing IT costs, creating the competitive advantage, and enabling easier access to information. Nonetheless, organisations in high-tech industry have perceived relative advantage as significant but negatively influencing cloud computing adoption. These organisations may have realised the relative advantage of using cloud computing, however, they may have a lower level of cloud computing knowledge (Low et al., 2011).

Compatibility was seen as not an important factor to consider cloud computing in all the three studies (Gutierrez et al., 2015; Low et al., 2011; Oliveira et al., 2014). Conversely, the significant finding of complexity to cloud computing adoption (Gutierrez et al., 2015; Gangwar et al., 2015; Oliveira et al., 2014; Gupta et al., 2013) implies that the organisations have a level of fear and concern regarding the adoption of cloud computing services (Gutierrez et al., 2015).

From the organisational context, a number of studies on cloud computing adoption have witnessed significant role of top management support on cloud computing adoption in Taiwan (Low et al., 2011), Australia (Yigitbasioglu, 2015) and Portugal (Oliveira et al., 2014). The result suggests that top management plays the decision process by demonstrating support in the form of committing financial and organisational resources and engaging in the process (Oliveira et al., 2014). Although the adoption of cloud computing is not limited to large organisations, organisation size was found to be a facilitator of cloud computing adoption (Low et al., 2011; Oliveira et al., 2014). Larger organisations with more resources were argued to have more tendencies to adopt cloud computing than smaller organisations. Evidence from the study conducted by Oliveira et al. (2014) indicates that firms, with an established technology infrastructure and competent workforce, are better suited for cloud integration.

From the environmental context, external pressure was mostly tested and found significant (Gutierrez et al., 2015; Low et al., 2011; Gangwar at al., 2015). Complex architecture of cloud computing requires tighter integration of customers, business partners, and suppliers and is influenced by the adoption status of its trading partner (Gangwar at al., 2015). The finding implies that when competitors implement cloud computing as a competitive instrument, other organisations face strong competition, hence, feel pressure to adopt cloud to maintain a competitive edge (Gangwar et al., 2015). Both regulatory support and perceived legal uncertainty were found to be not significant to cloud-computing adoption. This does not necessarily mean that the organisations disregard prevailing standards and regulations, but rather that existing legislation protecting the use of cloud computing has not been earnestly embraced by the organisational decision makers (Oliveira et al., 2014).

2.1 Research Objectives

In this study, an integrated theoretical framework for cloud computing adoption based on DOI and TOE that are widely used in IT adoption studies was proposed. Therefore, the main objective of this study is to examinefactors affecting cloud computing services adoption among SMEs in Oyo State of Nigeria using the TOE framework. The variable of primary interest is the "Intention to adopt cloud computing", which is the dependent variable, and Technological, Organizational, and Environmental factors are the independent variables used to explain the variance in the dependent variable. Research Model is represented in Figure 1.

2.2 Research Hypotheses

Based on the objective of this study as well as the study's research model, the following hypotheses are developed and will be tested:

H1: Technology factors do not significantly affect cloud computing services adoption among SMEs in Oyo State of Nigeria.
H2: Organizational factors do not significantly affect cloud computing services adoption among SMEs in Oyo State of Nigeria.
H3: Environmental factors do not significantly affect cloud computing services adoption among SMEs in Oyo State of Nigeria.

3. RESEARCH METHODOLOGY

3.1 Research Design, Population and Sampling

The descriptive research design of the survey type was employed in the study. The population of the study consists of all small and medium-sized enterprises (SMES) resides in Oyo State, Nigeria. A random sampling technique was used to select fifteen (15) firms among the SMEs resided in Oyo State and an incidental random sampling technique was also used to select one hundred and twenty (120) respondents from the population.

3.2 Measurements

Table 1 presents the research constructs, their operational definitions and measurements. The measures of Security concerns, Cost savings, Relative advantage, Privacy risk due to geo-restrictions, Uncertainty, Compatibility, Complexity, Trialability, Firm size, Top management support, Innovatiness of the firm, Prior similar technology experience, Market scope, Competitive pressure and External computing support used a 5-point Likert scale (ranging from 1=strongly disagree to 5=strongly agree). The selected items in the instrument were carefully selected through the review of the relevant literature without modification. But the items on security concerns, cost saving, firm size, market scope and competitive pressure were constructed by the researchers. The instrument includes two parts. The first part is designed to collect demographic data (e.g. name of the firm, address, year of establishment, number of employees, total cost including working capital but excluding land). The last part consists of the items that are used to measure the variables in the research model.

3.3 Validity and Reliability of the Instrument

This study used scales and items that were previously developed and used by other researchers with similar interests. In addition, a draft of the questionnaire was reviewed by the academic lecturers–who have sufficient knowledge and experience in this scope to make sure that each item is measuring what is expected to measure, and to avoid any ambiguity or complexity in the phrasing of the questions. The reliability of the instrument was measured by the Cronbach's alpha coefficient. According to Hair, Anderson, Tatham and Black (1998), the values of all indicators or dimensional scales should be above the recommended value of 0.60. Table 3represents the results of Cronbach's alpha for the independent and dependent variables. Cronbach's alpha coefficients of all the tested variables are above 0.60 which indicates that the composite measure is reliable.

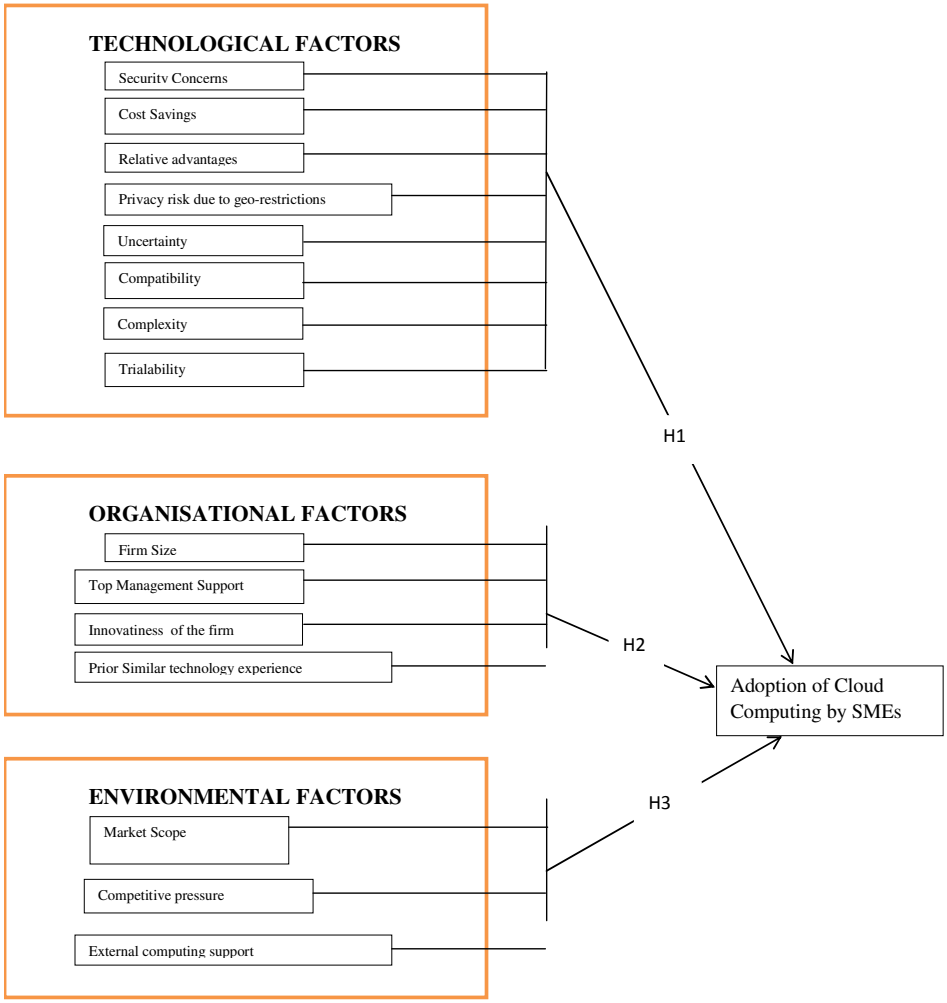

Figure 1: Research Framework Model
(Adapted from Al-Isma'ili et al., 2016; Low et al., 2011; Alshamaila et al., 2013)

Table 1: The Research Constructs and Measurement

Construct	Operational Definition	Measurement
Security Concern	The degree to which an innovation ensures security of data, privacy risks, and protects information loss. (Zissis and Lekkas, 2012; Wang, 2010)	SC1 It is secured to keep business data in the cloud providers data center. SC2 It is secured to use cloud services over the Internet to conduct business' operation. SC3 Cloud Computing concept satisfy our firms security and privacy policies. (Survey, 2017)
Cost of Saving	The degree to which innovation is perceived as reduction in IT investment, and reduction in total cost of computing resources (Cervone, 2010).	CS1 Using cloud computing services will reduces energy consumption, decreases infrastructures cost and lowered maintenance costs. CS2 Using cloud computing services enables us to reduce IT investment and total cost of computing resources. (Survey, 2017)
Relative advantage	The degree to which an innovation is perceived as being better than the idea it supersedes (Rogers, 2003)	RA1 Using cloud computing services enables us to accomplish tasks more quickly. RA2 Using cloud computing services gives us greater control over our work. RA3 Using cloud computing services increases our productivity. (Adapted from Alshamaileh, 2013)
Uncertainty	The extent to which the results of using an innovation are insecure (Ostlund, 1974; Fuchs, 2005)	U1 Cloud computing services might not perform well and create problems with our IT operations. U2 Cloud computing services servers may not perform well and may not support our IT operations effectively. (Adapted from Alshamaileh, 2013)
Privacy risk due to geo-restriction	The degree to which innovation ensure authentication of data (Ziyad and Rehman, 2014; Wang, 2011) .	PR1 Our signing up for and using cloud services that run from a different country would lead to a loss of privacy for us, because of different privacy legislation applying to those in our country. PR2 Due to differences in legislation, we might lose control of our data if we used cloud computing services provided from a supplier hosting data outside my country. (Adapted from Alshamaileh, 2013)
Compatibility	The degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters (Rogers, 2003)	CP1 Using cloud computing services is compatible with all aspects of our work. CP2 Using cloud computing services fits well with the way we like to work. CP3 Using cloud computing services fits into our work style. (Adapted from Alshamaileh, 2013)
Complexity	The degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers, 2003)	CM1 We believe that it is easy to get cloud computing services to do what we want them to do. CM2 Overall, we believe that cloud computing services are easy to use. CM3 Learning to operate cloud computing services is easy for me. (Adapted from Alshamaileh, 2013)

Trialability	The degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003)	TR1 TR2	Before deciding whether to use any cloud computing service applications, we were able to properly try them out. We were permitted to use cloud computing services on a trial basis long enough to see what it could do. (Adapted from Alshamaileh, 2013)
Firm Size	The size of the firm.	FS1 FS2	Cloud services is relatively easier to adopt by smaller firms than larger firms. Cloud services are cheaper and affordable to maintain by smaller firms than larger firms. Survey, 2017
Top management support	Devoting time to the ICT program in proportion to its cost and potential, reviewing plans, following up on results and facilitating the management problems involved with integrating ICT with the management process of the business (Young and Jordan, 2008).	TP1 TP2	It is not essential for the top management team to be involved in reviewing a consultant's cloud computing recommendations. The top management team has nothing to do with the cloud computing adoption project monitoring. (Adapted from Alshamaileh, 2013)
Innovativeness	The extent to which a client adopts innovations earlier than other members of the same social context (Rogers and Shoemaker, 1971).	I1 I2	If we heard about a new information technology, we would look for ways to experiment with it. Among our peers, we are usually the first to try out new information technologies. (Adapted from Alshamaileh, 2013)
Prior similar technology experience	The extent of a user's experience with previous similar technologies (Heide and Weiss, 1995; Lippert and Forman, 2005).	PT1 PT2	Overall, our firm has extensive technical knowledge about technologies similar to cloud computing. Cloud computing services were a familiar type of technology to use. (Adapted from Alshamaileh, 2013)
Market scope	The horizontal extent of a company's operations (Zhu, Kraemer and XU, 2003).	MS1 MS2 MS3 MS4	Our market scope for sales distribution is limited to local region and this affect cloud computing adoption. Our market scope for sales distribution is limited to regional region and this affect cloud computing adoption. Our market scope for sales distribution is limited to national region and this affect cloud computing adoption. Our market scope for sales distribution is limited to international region and this affect cloud computing adoption. Survey, 2017.
External support	The external activities that can significantly influence the probability that an innovation will be adopted (Frambach, Barkema, Nooteboom and Wedel, 1998).	EX1 EX2 EX3	It is necessary to have adequate technical support before cloud computing adoption. It is necessary to have adequate technical support after cloud computing services adoption. We believe that a good relationship with other parties will be crucial. (Adapted from Alshamaileh, 2013)

Competitive pressure	The degree of pressure felt by the firm from competitors within the industry (Oliveira and Martins, 2010)	CMP1	The closet partners already having their own cloud solutions put pressure on our firm to adopt cloud computing. Survey, 2017
Intention to use Cloud Computing	The extent to which firm would like to use cloud computing services	IU1	Our firm would use cloud computing services for different business transactions.
		IU2	Using cloud computing services for handling business related transactions is something our firm would do.
		IU3	I would our firm using cloud computing services in handling business related transactions. Survey, 2017

Source: Field Survey, 2017

4. RESULTS

Table 2 showed the demographic information of the firms. The table indicates that 18.3% were the firms established between 1- 5 years, 34.2% were established between 6-10 years, 15.0% were established between 16-20 years while the remaining 15.0% were established between 20 years and above. In terms of number of employees, the firms having 101 and above number of employees have the highest percentage of 46.7% follow by 36-100 number of employees (25.8%) while the least is 1-10 number of employees (13.3%). Finally, 5.8% of the firms having total cost of running company less than ₦1, 000, 000.000, 34.2% of the firms having total cost of running between ₦1, 000, 000.000 and ₦39, 000, 000.000, 47.5% of the firms having total cost of running between ₦40, 000, 000.000 and ₦199, 000, 000.000 while 12.5% of the firms having total cost of running between ₦200, 000, 000.000 and above.

Table 2: Demographic data of the Firms

Demographic	Frequency	Percentage
Year of Establishment		
1- 5years	22	18.3
6-10 years	41	34.2
11-15 years	18	15.0
16-20 years	21	17.5
Above 20 years	18	15.0
Number of Employees		
1-10	16	13.3
11-35	17	14.2
36-100	31	25.8
101 and above	56	46.7
Total Cost (Including Working Capital but Excluding Land)		
Less than ₦1, 000, 000.00	7	5.8
₦ 1, 000, 000.00- ₦ 39, 000, 000.00	41	34.2
₦ 40, 000, 000.00- ₦ 199, 000, 000.00	57	47.5
₦ 200, 000,000.00 and above	15	12.5

Source: Field Survey, 2017

Table 3 showed the results of Cronbach's alpha for the independent and dependent variables. The results indicated that the values of all indicators or Cronbach's alpha coefficients of all the tested variables are above 0.60 which indicates that the composite measure is reliable.

Table 3: The Study Variables' Cronbach's alpha

Variable	Number of Items	Cronbach's Alpha
Technological Factor	20	0.748
Organisational Factor	8	0.711
Environmental Factor	8	0.705
Intention to Adopt Cloud Computing	3	0.752

Source: Field Survey, 2017

In Table 4, normality of the independent variables and the absence of multi co-linearity problem (a case of multiple regression in which the independent variables are themselves highly correlated) were checked. As suggested by Pallant (2005), most of the values should be inside the adequate ranges for normality (i.e. a VIF value of 5 or 10 and above and a tolerance of less than 0.20 indicate that variables are multi-collinear). The results indicated that VIF ranges between 1.005 and 1.147 which are well-below five. In addition, the tolerance values range between 0.872 and 0.995 which are above 0.2. These factors indicate that there is no evidence of multi-collinearity problem in the regression model.

Table 4: Tolerance and VIF for the independent variables

Variable	Tolerance	VIF
Technological Factor	0.873	1.146
Organisational Factor	0.872	1. 147
Environmental Factor	0.995	1.005

Source: Field Survey, 2017

The first stepwise regression model (Table 5) is used to test all the three hypotheses (H1, H2 and H3). The model explains approximately 57% of the variance in intention to use cloud computing technology (adjusted R^2=.568).

The results also indicated that Technological Factor (β=.627, p<0.05), Organisational Factor (β=.197 p<0.05) and Environmental Factor (β=.232, p<0.05) influence the intention to adopt cloud computing services. The F Value is equal to (53.251) and hence is significant at (p<0.05) and this assures that all the factors (i.e. Technological factor, organisational factor and environmental factor) influence the intention to adopt cloud computing services. These results provide a partial support for the acceptance of H1, H2 and H3. Therefore, Technology factor do influence the intention to Adopt Cloud Computing, also Organizational factor do influence the intention to Adopt Cloud Computing while Environmental factor do influence the intention to Adopt Cloud Computing.

Table 5: Regression Model for Technological factors, Organisational factors and Environmental factors against Intention to Adopt Cloud Computing

Model	B	Std. Error	Beta	t	Sig. value
1 (Constant)	8.727	2.711		11.219	.002
Technological Factors	.686	.071	.627	9.125	.000
Organisational Factors	.297	.097	.197	3.056	.003
Environmental Factors	.283	.07	.232	3.845	.000

R	R^2	Adjusted R Square	Std. Error of the Estimate
.761	.579	.568	4.416

Source: Field Survey, 2017

The second stepwise regression model (Table 6) is used to test all the fifteen contextual factors influencing the intention of SMEs in adopting cloud computing services. The results indicated that cost saving (β=.205, p<0.05), relative advantages (β=.339, p<0.05), compatibility (β=.271, p<0.05), complexity (β=.207, p<0.05), top management support (β=.467, p<0.05), prior similar technology experience (β=.304, p<0.05), market scope (β=.608, p<0.05), competitive pressure (β=.335, p<0.05) and external computing support (β=.259, p<0.05) were the only contextual factors that influence the intention to adopt cloud computing services by SMEs in Oyo State of Nigeria.

Table 6: Regression Analysis of Fifteen Contextual Factors Influencing the Intention of SMEs in Adopting Cloud Computing Services

Variables	B	Std. Error	Beta	t	Sig. value
Security concern	4.953	2.777	.192	2.384	.120
Cost savings	1.194	1.340	.205	3.892	.002*
Relative advantages	1.588	1.208	.339	1.315	.000*
Privacy risk due to geo-restriction	-15.215	3.933	-.009	-3.868	.435
Uncertainty	-1.229	1.481	-.187	-2.830	.409
Compatibility	1.562	1.291	.271	4.210	.012*
Complexity	1.343	.511	.207	2.627	.010*
Trialability	3.055	.562	.107	5.433	.070
Firm size	9.931	2.222	.186	4.469	.068
Top management support	2.560	1.348	.467	7.899	.006*
Innovatiness of the firm	-1.510	1.820	-.144	-.829	.409
Prior similar technology experience	9.084	2.047	.304	4.438	.000*
Market scope	-3.198	1.280	.608	2.491	.014*
Competitive pressure	1.895	1.576	.335	.202	.023*
External computing support	4.787	1.548	.259	3.093	.003*

R	R^2	Adjusted R Square	Std. Error of the Estimate
.761	.579	.568	4.416

Source: Field Survey, 2017

5. DISCUSSION OF THE FINDINGS

The main purpose of conducting this research was to determine whether the factors suggested by the TOE framework affecting cloud computing services adoption among small and medium-sized enterprises (SMEs) in Oyo Stateof Nigeria. The results of the study indicated that the three factors proposed by the framework (Technology, Organization, and Environment) played a role in the decision to adopt cloud computing in Nigerian SMEs.

The result in Table 5 showed that Technological factors had positive significant impact on the intention to adopt cloud computing services. Also, the finding of this study revealed that this factor had the most impact on the intention to adopt cloud computing services. This result corroborates the findings of other researchers such as (Oliveira et al., 2014; Gangwar et al., 2015; Sultan, 2011; Alshamaila et al., 2013). The finding of this study revealed that the cost saving has significant influence on the intention to adopt cloud computing services (See Table 6). This result corroborates the findings of (Cervone, 2010; Marston et al., 2011; Benlian and Hess, 2011) which found that cloud computing enables cost savings benefits through lowering energy consumption, decreasing infrastructure costs, and lowering maintenance costs. As a result of this, cloud computing vendors offer affordable IT solutions that can help SMEs with new opportunities in offering their products and services more innovatively. Also, the finding of this study showed that relative advantage has significant influence on the intention to adopt cloud computing services (See Table 6). This finding supported previous studies such as (Gibbs and Kraemer, 2004; Lee, 2004; Ramdani and Kawaiek, 2007).

Moreover, complexity and compatibility was found to be significantly influence the adoption of cloud computing (See Table 6). This result supported similar studies such as (Ching and Ellis, 2004; Tiwana and Bush, 2007; Chaudhury and Bharati, 2008). Also, the results in Table 5 indicated that organizational factor have significant influence on the intention to adopt cloud computing. This result supported the results of the previous studies such as (Lin and Lin, 2008; Kim and Lee, 2008; Yoon, 2009; Ramdani and Kawaiek, 2007; Belso-Martinez, 2010). But it was not as strong as the other two factors (Technology and Environment). In this study, organizational context included firm size, top management support, innovativeness of the firm and prior similar technology experience. According to Rogers (2003), size is one of the most critical determinants of the innovator profile, however, in this study, firm size was not found to be the significant predicting factor for cloud computing adoption (See Table 6). Given the relative homogeneity of the sample and the types of applications adopted, this may suggest that they have relatively similar IT requirements and consequently it is not a matter of size as such.

The finding of this study showed that top management support has influence on the adoption of cloud computing services (See Table 6). This result supported the previous studies (Ramdani and Kawalek, 2007; Ramdani and Kawalek, 2008). This may be due to the growing awareness between business and IT managers regarding the potential benefits of cloud computing that outweigh the risks of its adoption (Alshamaila et al., 2013). Furthermore, the findings of this study showed that prior similar technology experience significantly impact on cloud computing adoption (See Table 6). The finding of this study supported similar studies such as (Dholakia and Kshetri, 2004; Lippert and Forman, 2005) which found that prior similar technology experience have direct influence on cloud computing adoption. In addition, the finding of this study showed that innovativeness of the firm does not significantly influence the intention to adopt the cloud computing. This result supported the findings of Sarrina Li (2003) but inconsistent with the findings of (Marcati, Guido and Peluso, 2008) that found that innovativeness promotes the likelihood for further positive adoption decisions for new technological innovations within firms.

Lastly, the results in Table 5 revealed that environmental factor was found to have a positive impact on the decision to adopt cloud computing. This finding supported previous studies such as (Oliveira and Martins, 2010; Yoon, 2009). This study found that competitive pressure has significant influence on the intention to adopt cloud (See Table 6) computing which supported the findings of (Oliveira and Martins, 2010; Yoon, 2009). This result is in line with the views of Zhu, Dong, Xu and Kraemer (2006) which stated that organizations that face strong competition tend to implement changes more aggressively and respond more quickly in a competitive environment. When competitors implement cloud computing as a competitive tool, other organizations face strong competition and thus feel pressure of adopting cloud computing so as to maintain a competitive edge. Tough competition forces organizations to shift to cloud computing (Zhu, Dong, Xu and Kraemer, 2006). Furthermore, this study shows that market scope was significant factor in the adoption of cloud computing by SMEs in Nigeria (See Table 6). This result is in consonant with some published studies (e.g. Zhu, Kraemer and Xu, 2003; Anand and Kulshreshtha, 2007). However, it is inconsistent with those of (Ramdani and Kawalek , 2008; Alshamaileh, 2013). A possible explanation for the significance of this factor might be that most participants in this study belonged to industries that not heavily use ICT innovations and, therefore, the differences between adopters and non-adopters was easily determined. The results of this study show that external computing support significantly influences the adoption of cloud computing (See Table 6). This result supported the previous findings of (Kwon and Zmud, 1987; Gatignon and Robertson, 1989; Scupola, 2003) which demonstrated that the availability of supplier efforts and external support are positively related to adoption. But, this result contradicted the findings of Alshamaileh (2013).

6. IMPLICATION OF THE STUDY

The results of this study will enables consultants and software vendors to be more focused in identifying appropriate role models, learn about the specific problems facing SMEs organisations and understand organisational characteristics in order to take a more proactive role in promoting successful diffusion of cloud computing services in SMEs in Nigeria. Prior understanding of the factors influencing SMEs adoption of cloud computing technologies will enable technology consultants to design strategies for a widespread of cloud computing services adoption for different organisations.

The proposed model of this study may help managers of SMEs to evaluate possible adoption and increase their awareness about the factors influence cloud computing services by SMEs in Nigeria. It was shown by the findings of this study that relative advantage, cost saving, compatibility and complexity are important technological factors in SMEs' adoption of cloud computing services. This implies that managers should evaluate the potential benefits of cloud computing to increase their awareness, evaluate and plan their technology adoption and implementation to accomplish their tasks more quickly which can give them greater control over their work and increase the productivity of their firms. The findings of this study also provides a set of valid and reliable measurements for managers to identify the strengths and weaknesses of the potential cloud computing services providers which can helps them to choose appropriate cloud computing service provider for their firms.

The results of this study will also encourage Nigeria government to reviews its policies and incentives in promoting the adoption of technology among SMEs. In fact, the research model of this study can help maximise the potential benefits of the Nigeria government's ICT implementation effort by providing an understanding of the factors that influence the adoption and implementation of ICT technologies such as cloud computing.

Taking all the above into account, this study presents some useful information for organisations, technology consultants, vendors and policy makers. Therefore, this research is viewed as being relevant to the current era of rapid developments of cloud computing technologies.

7 .CONCLUSION

This study explores and develops an SME cloud computing adoption model that is theoretically grounded in the TOE framework. A validated conceptual model was developed in order to examine the influence of fifteen contextual factors affecting cloud computing services adoption among SMEs in Oyo State of Nigeria. The suggested adoption model was presented in Figure 1. Results of this research showed that the three factors of this framework (Technology, Organization and Environment) are significantly influence the intention of organizations, particularly small and medium-sized enterprises (SMEs) in Oyo State of Nigeria to adopt cloud computing services. It was found that the most factor that influenced the intention to adopt cloud computing was Technological factor followed by the Environmental factor, and finally the Organizational factor.

Additionally, data analysis indicates that Technological Factors (cost savings, relative advantages, compatibility, and complexity), Organizational Factors (top management support, and prior similar technology experience), and Environmental Factors (market scope, competitive pressure and external computing support) were found to be determinants of the adoption of cloud computing services. Benefits of the findings are twofold. First, they provide knowledge about cloud computing determinants in the Nigerian marketplace. Second, they provide policy planners and SMEs' decision makers with insights and directions for successful adoption of cloud computing technology.

8. RECOMMENDATION

Based on the findings of this study, the following suggestions are recommended:

(i) Government should incorporated cloud computing into national ICT policy framework so as to strategize policy makers a way forward to increase the adoption and use of cloud computing services amongst SMEs in Nigeria.
(ii) Efforts must be geared towards increasing broadband coverage and access to fast internet speeds at affordable prices for SMEs in Nigeria.
(iii) Government should provide an enablement environment that will encourage SMEs in Nigeria to invest and integrate cloud computing services in their business operations and activities.
(iv) SMEs should organize adequate training programme in ICT for their employees to boost their knowledge.
(v) Cloud computing vendors or service providers must offered free training package as part of adoption process for those SMEs that patronize them and this arrangement will allow SMEs to understand and appreciate the services and application offered to them.

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