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An Exploratory Performance on the Determinants of Cloud-based E-Learning Adoption by ICT Professionals: A Nigerian Perspective

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Abstract

Cloud-based e-learning is an emerging method of delivering leaning contents via a virtualized environment as well as sharing and collaboration of computing resources, thus, offering an enhanced performance and availability of e-learning resources 24/7. With the level and increment of students seeking entrance into the Nigerian Higher Education Institutions and the limited IT resources, the use of Cloud-Based E-learning would contribute to providing education for all. Therefore, this paper aims to assess the determinants of Infrastructure as-a service-Based e-learning intention to adoption model by the ICT directorates. The study utilized and amalgamated the Technology, Organization, and Environment with the Diffusion of Innovation theory. The data were collected from 454 ICT directorates top managers. The data were analyzed using SPSS and SmartPLS software. The findings showed that relative advantage and service provider support should be considered by decision-makers in the universities, service providers and government to promote the adoption of cloud computing services for e-learning.

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Introduction

Cloud computing (CC) is a model that allows computing resources to be provided to cloud users via the internet as-a-service. The "as-a-service" simply means renting the services and resources of cloud to cloud user son a pay-as-you-go method. The cloud is comprised of numerous deployment models which are; the Infrastructure as a Service (IaaS), Platform as a Service (PaaS) as well as Software-as-a-Service (SaaS) correspondingly. Also, the private, public, hybrid, and community cloud are the service model. The CC offers many benefits to Higher Education Institutions (HEIs), such as easy and quick access to resources, improving student performance, cost savings (operational costs) and availability of learning contents anywhere and anytime with geographical restrictions. Nonetheless, its adoption in emerging nations and precisely Nigeria is limited.

Furthermore, e-learningalludes to the environment in which student's relations with learning resources (readings, the assignment, exercise, etc.) peers, and or instructors are facilitated via innovative information

technology(Alavi & Leidner, 2001, p. 2).CC for e-learning is comprised of a collection of resources(such as hardware, software, etc.) to augment the out-datede-learning infrastructure. Similarly, most of the existing research on CC for e-learning focuses on the SaaS model of the cloud, thus overlooking the PaaS as well as IaaS architectures. Hence, this study focuses on the IaaS service delivery model, by proposing an Infrastructure as-a Service-Based E-learning (IaaSBEL) model. Some of the reasons for proposing the IaaSBEL model is that many HEIs in emerging nations cannot afford the upfront cost needed for the acquisition of the infrastructure, installation of software as well as maintain dedicated data centres needed to support research collaboration between institutions (research projects) and research collaboration. The adoption of IaaSBEL is indeed driven by users (shareholders) needs, sagacity, circumstances, as well as the inclination to grasp change. Hence, the socio-cultural and infrastructural conditions where new technology such as IaaSBEL is adopted, have a great influence on the perception and acceptance of the technology (Sabi, Uzoka, Langmia, Njeh, & Tsuma, 2017). Therefore, the economic, technological, as well as cultural determinants can mediate stakeholders (users) acuity of the diffusion as well as the eventual adoption of IaaSBEL in the Nigerian HEIs.

Similarly, most universities in emerging nations and particularly Nigeria operate on un-reliable, limited IT infrastructure (un-reliable e-learning in some institutions) to augment teaching, learning, and research and collaboration among the Nigerian HEIs. The CCaids HEIs in reducing the exorbitant spending on IT infrastructures such as hardware, software installations, and maintenance (Chrysikos, McDowell, & Ward, 2016). The CC services provide HEIs with innovate methods of saving cost on new hardware and software updates as well as improved Quality of Service (QoS). Some universities in the developed countries have used a cloud computer for e-learning such as; Westminster University evaded an expenditure of £1 million by moving to the CC infrastructure, hence, the drastic cost reduction on hardware as well as software updates (Universities UK, 2011). The CCfor e-learning is a suitable source to leverage the economic viability and success of institutions amid contemporary, competitive, and most advanced societies. Consequently, the Nigerian budget on education from 2009 to 2019 ranges between 0.6% -7% of the total budget on education, thus, this is less than the recommended 15- 20% suggested by the UNESCO(Punchng, 2019).

Similarly, most Cloud-based e-learning studies focused exclusively on SaaS, students, or academic staff, while neglecting IaaS and the role of ICT-directorates top managers, since they are crucial key players in innovation adoption decisions, in particular, Nigerian HEIs. This study will look at the private (On-premise) IaaSBEL model. Consequently, to fill this gap, this study was conducted in the Federal and State Universities in the Northern region of Nigeria, which consists of 31 universities in total. Furthermore, TOE, DOI theory as well as other external constructs are used in this study.

Theoretical Background

Numerous theoretical models have been adopted in Information System (IS) research for innovation adoption decisions such as the TAM, DOI, TOE, UTAUT, etc. Therefore, this study will merge the TOE and DOI theory since, research has shown consistency between the two theories (Tornatzky & Fleischer, 1990). Additionally, this study will incorporate trust as an external variable in the study. The reason for incorporating trust is due to the nature of the CC in general. Thus, handing over of institutions critical data to the cloud service providers will bring the issue of trust, such as the data integrity, data availability, as well as the ownership of the data. This is one of the major reasons people are skeptical about adopting CC services. The study will further amalgamate the TOE and DOI theory.

Diffusion of Innovation Theory

The Diffusion of Innovation (DOI) is among the most utilized theories in innovation adoption decisions. Thus, DOI theory sees advancement as being imparted using certain correspondence channels and inside a specific system after some time. The adoption of an innovation is a process that moves via divergent stages over time. Rogers's theory explains the DO into four elements; innovation, communication channels, time and social systems. Rogers (2003) characterizes development as an interrelated heap of new thoughts and those developments diffuse crosswise over social gatherings unsurprisingly and reliably. Thus, it has received substantial empirical support in numerous literature(Klug & Bai, 2014; Oliveira & Martins, 2010). Relative advantage, compatibility, and trial ability were found by numerous authors to influence the adoption of innovation(Alzougool & Kurnia, 2010; Jeyaraj, Rottman, & Lacity, 2006; Kendall, Tung, Chua, Ng, & Tan, 2001; Rogers, 2003). For these reasons, this study will utilize the relative advantage and compatibility factors of the DOI theory.

Technology, Organization, and Environment

The Technology, Organization, and Environment (TOE) are the three dimensions that influence HEIs ability to adopt or reject the innovation. The technological aspect comprises relevant technology to the organization; both the technology that is used in the institution and the once which are readily presented in the market, but not procured in the institution(Baker, 2012).The organizational perspective refers to the HEIs in Nigerian. The top management support was utilized since they assert power and a significant role in how innovation (IaaSBEL) is diffused in the HEIs. The environmental perspective includes other competing institutions,

government regulations, ministries, local authorities, etc. All these entities play a significant part in the affairs of the HEIs. Furthermore, the TOE will be the base theory in which variables and other external variables will be attached. This is because the TOE is seen as a generic model with which other factors can be incorporated. Thus, it has more emphasis on individual divergent factors to support the distinctive nature of the decision-makers, while identifying the role and influence of technology, organization, and environmental conditions involved in innovation adoption decisions.

Hypotheses

There are five hypotheses in this study. Hence, the hypotheses are broken down into the technological, organization and environment factors:

Technological perspective

The Technological factors symbolize the internal workings and the outer technology related to organizations such as the existing systems in use as well as the technology that is available in the market (Almazroi, Shen, Teoh, & Babar, 2016). Relative advantage and compatibility are the technological factors adopted. Relative advantage refers to "the degree to which an innovation is perceived as being better than its predecessors" (Rogers, 1995). The relative advantage could be monetary or non-monetary. Nonetheless, there is no complete rule as to who or what is involved in relative advantage, hence, depending on the individual perceptions and the needs of the user group (Robinson, 2009). Despite the enormous advantages and ability of IaaSBEL to revolutionize e-learning, yet it is not adopted. This study sought to comprehend and ask the question "what are the factors that will influence the adoption of Infrastructure as-a Service-Based E-learning (IaaSBEL) in the Nigerian HEIs?"

The Technological context focuses on the traits of technology innovation. Thus, it is an important factor in the TOE framework for the adoption of CC(Oliveira & Martins, 2010). Nonetheless, according toTornatzky and Fleischer (1990), among all the five DOI characteristics, relative advantage, compatibility, and trial ability are the key features that consistently influence innovation adoption(Rogers, 2003).Relative advantage and compatibility were utilized in this study to explain the technological aspect of the innovation adoption by the ICT directorates, top managers.

Relative advantage isthe "degree to which an innovation is perceived as being better than its predecessors"(Moore & Benbasat, 1991, p. 195; Rogers, 2003, p. 14). Thus, the bigger the relative advantage, the quicker the diffusion of innovation by organizations (Rogers, 1995, 2003). IaaSBEL will provide the Nigerian HEIs with numerous benefits such as; cost savings, improve efficiency and effectiveness of delivering teaching, learning, and overhaul of the overall e-learning systems. Hence, the relative advantage was found from preceding studies to significantly influence the adoption of CC(Low, Chen, & Wu, 2011; Oliveira, Thomas, & Espadanal, 2014; Sallehudin, Razak, & Ismail, 2015; A. Tashkandi & Al-Jabri, 2015). Nonetheless, the contrary was found by numerous authors as well (Alhammadi, Stanier, & Eardley, 2015; Gangwar & Date, 2016). Be that as it may, based on the anticipated benefits of IaaSBEL to Nigeria and developing countries in general, this study posits:

H1: Relative advantage will significantly influence the intention to adopt IaaSBEL.

Compatibility is the "degree to which an innovation is perceived as being consistent with the existing values, needs as well as past experiences of potential adopters"(Moore & Benbasat, 1991, p. 195). Thus, it is one of the key factors of innovation adoption (Tornatzky & Fleischer, 1990). When innovation such as IaaSBEL is compatible with HEIs existing systems, they will be more likely to adopt it. Therefore, compatibility was found to significantly influence the adoption of CC(Tarhini, Masa'deh, Al-Badi, Almajali, & Alrabayaah, 2017; A. Tashkandi & Al-Jabri, 2015). Hence, this study theorizes:

H2: Compatibility will significantly influence the intention to adopt IaaSBEL.

Organizational perspective

Organizational context is the main feature of the organization (institutions) adopting IaaSBEL. It refers to the resources as well as the features of the firm which facilitate the adoption of innovation in organizations. This study will use top management support; thus, it means the attitude of the top managers as well as resources provisioned towards their intention to adopt IaaSBEL. Top management support simply means the responsibilities devoted to supporting the adoption of IaaSBEL in the HEIs by decision-makers(Molla & Licker, 2005). Nonetheless, IaaSBEL adoption requires the integration of resources (e.g. Systems), due to its complexity which may require structural change in the HEIs(Low et al., 2011). Consequently, preceding research has demonstrated a connection between top management support as well as the adoption of CC(Alhammadi et al., 2015; Lai, Lin, & Tseng, 2014; Oliveira et al., 2014). In light of this, this study postulates:

H3: Top management support will significantly influence the intention to adopt IaaSBEL.

Environmental perspective

The Environmental viewpoint is the external characteristics of the institution that encourages innovation adoption (Alshamaila, Papagiannidis, & Li, 2013; Tweel, 2012). Service provider support will be utilized as the environmental variable. It refers to the "availability of support for implementing and using information systems" (Premkumar & Roberts, 1999, p. 47).The service provider support elaborates on the

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external support provided by the service providers such as training, maintenance, discounts, etc. Thus, it was found to influence CC adoption in Australia (Al Isma'ili, Li, Shen, & He, 2016). Therefore, we theorize:

H4: Service Provider Support will significantly influence the intention to adopt IaaSBEL.

External Variable

In this study, trust was utilized as an external variable due to the very nature of CC. Trust refers to "the willingness of an individual to behave in a risky and uncertain situation when expected benefits surpass perceived risks" (Wu, 2011). In e-commerce, trust is considered a potential factor (Wu, 2011). Flavián and Guinalíu(Flavián & Guinalíu, 2006)findings indicated that individual loyalty to a web site is linked to the level of trust. This can also be applied to the context of IaaSBEL, for the Cloud users will have to hand over their crucial data to the care of the cloud service provider. Trust plays a significant part in the intention to adopt CC(Tarhini et al., 2017). However, Almazroi et al. (2016) found the contrary. Therefore, we posit:

H5: Trust will significantly influence the intention to adopt IaaSBEL.

Research Model

The research model utilized in this study is the combination of the TOE and DOI variables, as well as adding trust as an external variable as a new construct. The factors are divided into three; the technological perspective, organizational, and environmental perspective. Figure 1 presents the research model comprises of five (5) construct derived from the TOE, DOI, and trust as an external variable ranging from H_1-H_5. This study adapted questionnaires from literature as follows: relative advantage is measured by 6 items (Ifinedo, 2011; Moore & Benbasat, 1991; Oliveira et al., 2014); compatibility is measured by 6 items (Ifinedo, 2011; Lai et al., 2014; Mohammed, Alzahrani, Alfarraj, & Ibrahim, 2018; Moore & Benbasat, 1991); trust is measured by 3 items (Almazroi et al., 2016; Jarvenpaa, Tractinsky, & Vitale, 2000; Pavlou, 2003); security is measured by 4 items, however, one item was deleted during the pilot study (Low et al., 2011; Mohammed et al., 2018; Oliveira et al., 2014); top Management commitment is assessed by 6 items (Ifinedo, 2011; Lai et al., 2014; Oliveira et al., 2014; Premkumar & Roberts, 1999); service provider support is measured by 7 items (Ghobakhloo, Arias&Aranda, & Benitez&Amado, 2011; Klug & Bai, 2014; Lai et al., 2014; Thong, Yap, & Raman, 1996). Therefore, all the proposed factors and items measurements by experts in the research area, thus, suitable adjustments were made based on their feedback.

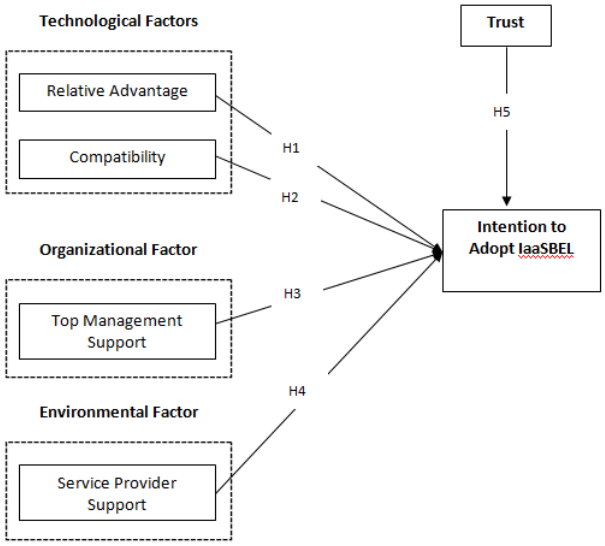

Figure 1: The Research Model

1. Methodology and Results

This study used a survey questionnaire and a disproportionate stratified random sampling technique(Creswell & Creswell, 2018). The questionnaires were distributed face to face to the ICT directorates top managers which include; IT directors, deputy IT-directors, unit head, assistant unit head and deans from both Federal and State universities across the Northern region of Nigeria. The reason behind selecting the ICT top managers is due to their expertise as well as their responsibility in managing and maintaining systems in the Nigerian HEIs. The department also shouldered with the responsibility of software installation, website maintenance, and networks, etc. Hence, the respondents are knowledgeable in CC and e-learning respectively. The reason for focusing this study in the Northern region of Nigeria is due to insecurity challenges, as well as a high percentage of out of school children, time and cost of administering the questionnaires. Systematic random of all respondents was carried.

Furthermore, Krejcie and Morgan (1970) sampling technique were used and a total of 227 respondents was used as the main respondent in this study. The 227 will be multiplied by 2 to increase the response rate, which is consistent with research in Nigeria (Mahmoud, Ahmad, & Poespowidjojo, 2018) as well as reduces sampling error, response error and non response issues (Blythe, 2005; Hair, Wolfinbarger, Ortinau, & Bush, 2009). A 7-point Likert scale was used to measure items starting from 1; Strongly disagree, 2; Disagree somewhat, 3; Disagree Slightly, 4; Undecided, 5; Agree Slightly, 6; Agree Somewhat, 7; Strongly Agree. In the data cleaning process, SPSS (v. 25) is utilized.

SEM Analysis – Measurement Model Assessment

SmartPLS (v. 3.2.8) was utilized to run the model as depicted in Figure 1. The instrument reliability was examined using the composite reliability and the average

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variance extracted derived from the SmartPLS analysis. Hair, Black, Babin, Anderson, and Tatham (2014)suggested a threshold value for composite reliability (0.70), outer loadings (0.70), and average variance extracted (0.50) respectively. For discriminant validity (Fornell-Larcker). Similarly, validity and reliability are measured using the composite reliability (mainly using Heterotrait-Monotrait Ratio) and the average variance extracted as shown in Table 1.

Table 1: Reliability Assessment

Variable/Construct	Composite Reliability	Average Variance Extracted
Relative Advantage (RA)	0.861	0.509
Compatibility (COM)	0.876	0.704
Top Management Support (TMS)	0.914	0.639
Service Provider Support (SPS)	0.872	0.629
Trust (TR)	0.814	0.595
Intention to Adopt IaaSBEL	0.878	0.705

Fornell-Larcker criterion and Heterptrait-Monotrait Ratio (HTMT) is used to measure the discriminant validity as shown in Table 2 and 3. Fornell-Larcker Criterion

Table 2: Fornell-Larcker

	COM	INT	RA	SPS	TMS	TR
COM	0.839					
INT	0.464	0.84				
RA	0.436	0.441	0.713			
SPS	0.597	0.561	0.477	0.793		
TMS	0.524	0.429	0.396	0.466	0.799	
TR	-0.557	-0.382	-0.332	-0.455	-0.455	0.771

Table 3: Heterptrait-Monotrait Ratio (HTMT)

	COM	INT	RA	SPS	TMS	TR
COM						
INT	0.582					
RA	0.536	0.501				
SPS	0.751	0.693	0.547			
TMS	0.626	0.499	0.417	0.537		
TR	0.751	0.466	0.386	0.573	0.577	

SEM Analysis – Evaluation of the Structural Model

The structural model was assessed based on the coefficient of determination (R^2) for the endogenous latent construct. Thus, to generate the significance of the hypotheses, a bootstrapping with 5,000 sub-samples were utilized to get the significant relationship between the exogenous and endogenous latent constructs. Also, *t*-statistics, *p*-value, *β*value of the endogenous and exogenous latent constructs Are shown in Table 1.3. Thus, the exogenous constructs account for 38.5% of variance explained for IaaSBEL intention to adopt by the top management in the Nigerian Higher Education Institutions.Table 4 presents the findings of the study.

Table 4: Path Coefficient, β, t, and R^2 value

Hypothesis	Relationships	β-value	t-value	p-value	Support
H1	Relative Advantage (RA) → INT	0.170	2.536	0.006***	Yes
H2	Compatibility (COM) → INT	0.081	1.040	0.149	No

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H3	Top Management Support (TMS) → INT	0.130	1.417	0.079	No
H4	Service Provider Support (SPS) → INT	0.341	4.212	0.000***	Yes
H5	Trust (TR) → INT	-0.067	0.954	0.170	No

Table 4. Presents the relationship between the independent and dependent variables. The findings show that H1 and H4 were supported while; H2, H3, and H5 are not supported. Figure 1. Illustrates the structural model with a standardized path coefficient between the independent and dependent variables.

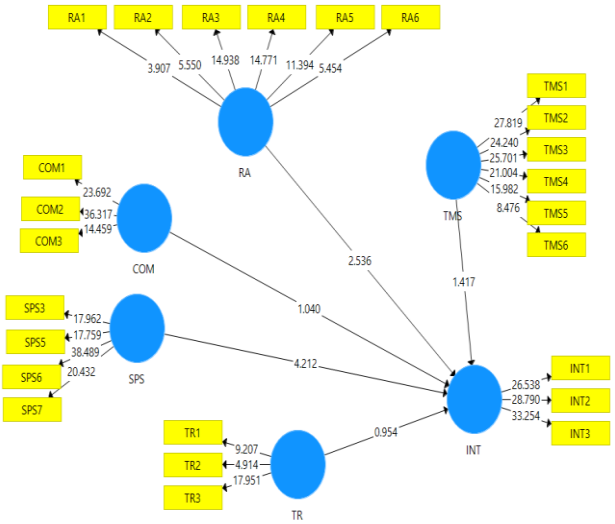

Figure 2: The Structural Model with Standardized Path Coefficients

2. Discussion

This study examined the inclination of the ICT directorates' top manager's intention to adopt IaaSBEL in the Nigerian HEIs. An adoption model was presented using variables from the DOI and TOE theory and Trust as an external variable. The aim of examining these factors is an essential point in addressing the issues of poor and limited ICT infrastructure, insufficient funds (budget on education), disaster recovery, and skills. Expectedly, almost 100% of the respondent have experience in some form of cloud-based e-learning, this indicated that the diffusion of IaaSBEL in the Nigerian HEIs will be faster and easier. IaaSBEL is an evolving technology that if effectively utilized in emerging nations in general and Nigeria in specific will aid in meeting the growing demands of students seeking entrance into the Nigerian HEIs without the constraint of location-independent and access to e-learning contents. The primary aim of this research is to address the existing problems of e-learning, lack of funds as well as access to learning content. Although, the CC is mainly used in the form of SaaS. However, our study focus on the IaaS aspect and its adoption to aid in teaching, learning, and collaborative research amongst students, and institutions at large.

It was apparent from the outcome of the study that technological factors; relative advantage has a significant influence on the respondent's intention to adopt IaaSBEL with (β=0.170, t=2.536, p=0.006). This finding proves the significance of relative advantage in the diffusion of IaaSBEL in the institutions as rightly stated in the DOI theory (Rogers, 2003). The findings are consistent with preceding studies that found the relative advantage to be significant in CC adoption decisions (Alzougool & Kurnia, 2010; Tashkandi & Al-Jabri, 2015). Compatibility, on the other hand, was not statistically significant on the intention to adopt IaaSBEL. This outcome contrasts from some past research (Gangwar, Date, & Ramaswamy, 2015) and agrees with others (Sabi, Uzoka, & Mlay, 2018; Tashkandi & Al-Jabri, 2015). This mixed result may be ascribed to that HEIs have not yet seen major contrasts among CC for e-learning and in-house computing services. This result may also show that IaaSBEL is still in its infancy stage of adoption in Nigerian HEIs.

The technological perspective findings show that top management support has no significant role in the intention to adopt IaaSBEL by the Nigerian HEIs. A similar outcome was attained by Tashkandi and Al-Jabri (2015). This could probably suggest that the top manager's perception of IaaSBEL is still sketchy and are skeptical about allocating resources for the easier transition of IaaSBEL in their institutions.

Similarly, the environmental factor, service provider support was found to play a significant influence on the top manager's intention to adopt IaaSBEL with (β=0.341, t=4.212, p=0.000). Although CC has not been widely adopted in the Nigerian HEIs. The respondents are positive about the support that they will likely get when they implement CC in their institutions. Evidence shows that Service provider support has a strong influence on IaaSBEL adoption in the institutions.

Trust was found to be a non-significant determinant on the intention to adopt IaaSBEL. The findings were consistent with the study of Almazroi, Shen, and Mohammed (2019) but were inconsistent with some preceding research(Almazroi et al., 2016). Perhaps as more data are stored in the cloud data centers, the HEIs may be worried about privacy, especially related to projects, and students' grades, etc. The reason for the indirect effect probably due to trust been one of the crucial concerns of adopting CC by organizations. This is also true for the Nigerian HEIs.

Conclusion and Future Work

In this study, we examined the inclination of IaaSBEL adoption by ICT directorates top management in Nigeria and the factors that influence their intention to adopt it.

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The models used in this study were proposed by Rogers (2003) DOI, and Tornatzky and Fleischer (1990)TOE theory, with the addition of trust as an external variable. Using SPSS and SmartPLS, data collected from 454 respondents were analyzed. The results (see Table 4) indicated that relative advantage and service provider support show a significant impact on the ICT directorates' top manager's intention to adopt IaaSBEL. This study also found trust to be a non-significant determinant of IaaSBEL adoption. The study shows the variance explained for ICT directorates' top manager's intention to adopt IaaSBEL was 38.5%. These findings suggest that other factors should be considered by future researchers using either quantitative, mixed-method, or qualitative methodology in the Nigerian HEIs.

The study further presented some crucial insights into the factors that will influence the Nigerian HEIs decision-makers to adopt IaaSBEL. The study, therefore, contributes by appraising the HEIs decision-makers of the appropriate factors that should be considered when considering the intention to adopt IaaSBEL. One of the limitations of this study was the incapacity of the authors to cover colleges of education, polytechnics, Monotechnics and private universities in Nigeria. This was somewhat due to monetary imperatives and the spreading of the institutions across all the six geopolitical zones in Nigeria could be not be accessed. Further study can use qualitative techniques to have more insight into the factors that will influence the intention to adopt IaaSBEL in Nigerian HEIs.

Reference

[1] Al Isma'ili, S., Li, M., Shen, J., & He, Q. (2016). Cloud computing adoption determinants: an analysis of Australian SMEs. Faculty of Engineering and Information Sciences - Papers: Part A. Retrieved from http://ro.uow.edu.au/eispapers/5826

[2] Alavi, M., & Leidner, D. E. (2001). Research Commentary: Technology-Mediated Learning - A Call for Greater Depth and Breadth of Research. Information Systems Research, 12(1), 1–10. https://doi.org/10.1287/isre.12.1.1.9720

[3] Alhammadi, A., Stanier, C., & Eardley, A. (2015). The Determinants of Cloud Computing Adoption in Saudi Arabia. Computer Science & Information Technology (CS & IT), Almazroi, A. A., Shen, H., & Mohammed, F. (2019). The Impact of Trust on the Adoption of Cloud Computing Services by University Students. International Conference of Reliable Information and Communication Technology, 902–911. Springer.

[4] Almazroi, A. A., Shen, H., Teoh, K.-K., & Babar, M. A. (2016). Cloud for e-Learning: Determinants of Its Adoption by University Students in a Developing Country. 2016 IEEE 13th International Conference on E-Business Engineering (ICEBE), 71–78. https://doi.org/10.1109/ICEBE.2016.022

[5] Alshamaila, Y., Papagiannidis, S., & Li, F. (2013). Cloud computing adoption by SMEs in the north east of England. Journal of Enterprise Information Management, 26(3), 250–275. https://doi.org/10.1108/17410391311325225

[6] Alzougool, B., & Kurnia, S. (2010). Towards a better understanding of SMEs' perception of electronic commerce technology adoption. Interdisciplinary Journal of Contemporary Research in Business, 2(3), 9.

[7] Baker, J. (2012). The Technology–Organization–Environment Framework. In Information System Theory (pp. 231–245). https://doi.org/10.1007/978-1-4419-6108-2_12

[8] Blythe, J. (2005). Essentials of Marketing (Third Edit). Prince Hall.

[9] Chrysikos, A., McDowell, J., & Ward, R. (2016). Cloud Services in UK Higher Education: A Feasibility Study for Providing IaaS in the Computing and Library Services of a UK University. In Handbook of Research on Cloud-Based STEM Education for Improved Learning Outcomes (pp. 377–402). https://doi.org/DOI: 10.4018/978-1-4666-9924-3.ch023

[10] Creswell, J. W., & Creswell, J. D. (2018). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (Fifth Edit).

[11] Flavián, C., & Guinalíu, M. (2006). Consumer trust, perceived security and privacy policy. Industrial Management & Data Systems, 106(5), 601–620. https://doi.org/10.1108/02635570610666403

[12] Gangwar, H., & Date, H. (2016). Understanding cloud computing adoption: A model comparison approach. Human Systems Management, 35(2), 93–114. https://doi.org/10.3233/HSM-150857

[13] [14] Gangwar, H., Date, H., & Ramaswamy, R. (2015). Understanding determinants of cloud computing adoption using an integrated TAM-TOE model. Journal of Enterprise Information Management, 28(1), 107–130. https://doi.org/10.1108/JEIM-08-2013-0065

[14] Ghobakhloo, M., Arias-Aranda, D., & Benitez-Amado, J. (2011). Adoption of e-commerce applications in SMEs. Industrial Management & Data Systems, 111(8), 1238–1269. https://doi.org/10.1108/02635571111170785

[15] Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2014). Multivariate Data Analysis (7th edition). Retrieved from www.pearsoned.co.uk

[16] Hair, J. J. F., Wolfinbarger, M. F., Ortinau, D. J., & Bush, R. P. (2009). Essentials of Marketing Research. McGraw-Hill Irwin.

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ISSN: 0193-4120 Page No. 5904 - 5912

[17] Hair, Joseph F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2017). A primer on partial least squares structural equation modeling (PLS-SEM) (SECOND EDI). Retrieved from https://uk.sagepub.com/en-gb/asi/a-primer-on-partial-least-squares-structural-equation-modeling-pls-sem/book244583

[18] Ifinedo, P. (2011). An Empirical Analysis of Factors Influencing Internet/E-Business Technologies Adoption By SMEs In Canada. International Journal of Information Technology & Decision Making, 10(04), 731–766. https://doi.org/10.1142/S0219622011004543

[19] Jarvenpaa, S. L., Tractinsky, N., & Vitale, M. (2000). Consumer trust in an Internet store. Information Technology and Management, 1(1/2), 45–71. https://doi.org/10.1023/A:1019104520776

[20] Jeyaraj, A., Rottman, J. W., & Lacity, M. C. (2006). A review of the predictors, linkages, and biases in IT innovation adoption research. Journal of Information Technology, 21(1), 1–23. https://doi.org/10.1057/palgrave.jit.2000056

[21] Kendall, J. D., Tung, L. L., Chua, K. H., Ng, C. H. D., & Tan, S. M. (2001). Receptivity of Singapore's SMEs to electronic commerce adoption. Journal of Strategic Information Systems, 10(3), 223–242. https://doi.org/10.1016/S0963-8687(01)00048-8

[22] Klug, W., & Bai, X. (2014). The Determinants of Cloud Computing Adoption by Colleges and Universities (Northcentral University). Retrieved from https://search.proquest.com/docview/1527001253/previewPDF/D59DD1BB97F2419APQ/1?accountid=42599

[23] Krejcie, R. V., & Morgan, D. W. (1970). Determining Sample Size for Research Activities. Educational and Psychological Measurement, 30(3), 607–610. https://doi.org/10.1177/001316447003000308

[24] Lai, H.-M., Lin, I.-C., & Tseng, L.-T. (2014). High-Level Managers' Considerations for RFID Adoption in Hospitals: An Empirical Study in Taiwan. Journal of Medical Systems, 38(2), 3. https://doi.org/10.1007/s10916-013-0003-z

[25] Low, C., Chen, Y., & Wu, M. (2011). Understanding the determinants of cloud computing adoption. Industrial Management & Data Systems, 111(7), 1006–1023. https://doi.org/10.1108/02635571111161262

[26] Mahmoud, A. M., Ahmad, S. Bin, & Poespowidjojo, A. L. D. (2018). The Relationship between Entrepreneurial Behavior, Psychological Factors and Individual Performance of Middle Managers in Nigerian Medium Enterprises: A Pilot Study. International Journal of Organization & Business Execellence, 3(1), 1–17. Retrieved from http://www.ijobe.uum.edu.my/images/Full_Text/vol.3_issue.2_2018/IJOBE-31-proofread.pdf

[27] Mohammed, F., Alzahrani, A. I., Alfarraj, O., & Ibrahim, O. (2018). Cloud Computing Fitness for E-Government Implementation: Importance-Performance Analysis. IEEE Access, 6, 1236–1248. https://doi.org/10.1109/ACCESS.2017.2778093

[28] Molla, A., & Licker, P. S. (2005). eCommerce adoption in developing countries: a model and instrument. Information & Management, 42(6), 877–899. https://doi.org/10.1016/J.IM.2004.09.002

[29] Moore, G. C., & Benbasat, I. (1991). Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation. Information Systems Research, 2(3), 192–222. https://doi.org/10.1287/isre.2.3.192

[30] Oliveira, T., & Martins, M. F. (2010). Understanding e-business adoption across industries in European countries. Industrial Management & Data Systems, 110(9), 1337–1354. https://doi.org/10.1108/02635571011087428

[31] Oliveira, T., Thomas, M., & Espadanal, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. Information & Management, 51(5), 497–510. https://doi.org/10.1016/j.im.2014.03.006

[32] Pavlou, P. A. (2003). Consumer Acceptance of Electronic Commerce: Integrating Trust and Risk with the Technology Acceptance Model. International Journal of Electronic Commerce, 7(3), 101–134. Retrieved from https://dl.acm.org/citation.cfm?id=1288221

[33] Premkumar, G., & Roberts, M. (1999). Adoption of new information technologies in rural small businesses. Omega, 27(4), 467–484. https://doi.org/10.1016/S0305-0483(98)00071-1

[34] Punchng. (2019). 2019 budget: Education gets N620.5bn, against UNESCO's advice – Punch Newspapers. Retrieved July 6, 2019, from https://punchng.com/2019-budget-education-gets-n620-5bn-against-unescos-advice/

[35] Robinson, L. (2009). A summary of Diffusion of Innovations. Retrieved from https://www.enablingchange.com.au/Summary_Diffusion_Theory.pdf

[36] Rogers, E. M. (1995). Diffusion of Innovations Third Edition (Third). Retrieved from https://teddykw2.files.wordpress.com/2012/07/everett-m-rogers-diffusion-of-innovations.pdf

[37] Rogers, E. M. (2003). Diffusion of innovations (5th ed., Vol. 1).

[38] Sabi, H. M., Uzoka, F.-M. E., Langmia, K., Njeh, F. N., & Tsuma, C. K. (2017). A cross-

country model of contextual factors impacting cloud computing adoption at universities in sub-Saharan Africa. Information Systems Frontiers, 1–24. https://doi.org/10.1007/s10796-017-9739-1

[39] Sabi, H. M., Uzoka, F.-M. E., & Mlay, S. V. (2018). Staff perception towards cloud computing adoption at universities in a developing country. Education and Information Technologies, 23(5), 1825–1848.

[40] Sallehudin, H., Razak, R. C., & Ismail, M. (2015). Factors Influencing Cloud Computing Adoption in the Public Sector: An Empirical Analysis. Journal of Entrepreneurship and Business, 3(1), 30–45. https://doi.org/DOI: 10.17687/JEB.0301.03

[41] Tarhini, A., Masa'deh, R., Al-Badi, A., Almajali, M., & Alrabayaah, S. H. (2017). Factors Influencing Employees' Intention to Use Cloud Computing. Journal of Management and Strategy, 8(2), 47. https://doi.org/10.5430/jms.v8n2p47

[42] Tashkandi, A., & Al-Jabri, I. (2015). Cloud Computing Adoption by Higher Education Institutions in Saudi Arabia: Analysis Based on TOE. 2015 International Conference on Cloud Computing (ICCC), 1–8. https://doi.org/10.1109/CLOUDCOMP.2015.7149634

[43] Tashkandi, A. N., & Al-Jabri, I. M. (2015). Cloud computing adoption by higher education institutions in Saudi Arabia: an exploratory study. Cluster Computing, 18(4), 1527–1537. https://doi.org/10.1007/s10586-015-0490-4

[44] Thong, J. Y. L., Yap, C.-S., & Raman, K. S. (1996). Top Management Support, External Expertise and Information Systems Implementation in Small Businesses. Information Systems Research, 7(2), 248–267. https://doi.org/10.1287/isre.7.2.248

[45] Tornatzky, L. G., & Fleischer, M. (1990). The processes of technological innovation. The Journal of Technology Transfer, 16(1), 45–46. https://doi.org/10.1007/BF02371446

[46] Tweel, A. (2012). Examining the Relationship between Technological, Organizational, and Environmental Factors and Cloud Computing Adoption (Northcentral University (USA)). Retrieved from https://search.proquest.com/docview/1101947090/abstract/EC45851E744B4920PQ/1?accountid=42599

[47] Universities UK. (2011). Efficiency and effectiveness in higher education: A report by the Universities UK Efficiency and Modernisation Task Group. Retrieved from https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2011/report-by-efficiency-and-modernisation-task-group.pdf

[48] Wu, W.-W. (2011). Mining significant factors affecting the adoption of SaaS using the rough set approach. Journal of Systems and Software, 84(3), 435–441. https://doi.org/10.1016/j.jss.2010.11.890