

A Survey on Expediency of Cloud Computing Integration into African Universities

Michael Olubunmi Odewumi¹, Oluwatosin O. Bamigboye² and Adelabu A. Olusesan^{3*}

¹*Department of Educational Technology, University of Ilorin, Ilorin, Nigeria*

²*Department of Computer Science, University of Fort Hare, South Africa*

^{3*}*Faculty of Science and Agriculture, University of Fort Hare, South Africa*

E-mail: ¹<agbegilerebunmi@yahoo.com>, ²<201614053@ufh.ac.za>, ^{3*}<aolusesan@ufh.ac.za>

KEYWORDS Integration. Cloud Computing. Web Application. Communication Technology

ABSTRACT Cloud computing is an emerging technology being used in diverse ways which has brought about undeniable development to teaching and learning globally. The study investigated a survey on usefulness of cloud computing integration into African Universities using University of Ilorin, Nigeria as a case study. Survey research method was adopted for this study. Purposively sampling was drawn for total number of one hundred and twenty lecturers of sixty males and sixty females. The research instrument questionnaire titled survey on usefulness of cloud computing integration into African Universities' case study of University of Ilorin, Nigeria (*SUOCCIIAU*) was used to collect data. The validation of research instrument was done by an expert. Two research questions and hypotheses were raised and tested at 0.05 level of alpha using ANOVA and t-test respectively. The finding indicated that there is no significance in University of Ilorin lecturers on the expediency of cloud computing into learning.

INTRODUCTION

Fast development of Information and Communication Technology has transformed society from the information technology age to the knowledge age, which finally results in emerging technologies in diverse forms. This plays a vital role for educational instructions, information sharing and accompanied different tasks. Several protocols and technologies have been deployed by IT professionals in the design and development of cloud computing. Cloud network has been switched to, due to the fact that cloud data centers have been found to be cost effective (Rittinghouse and Ransome 2016). Technology has changed the way teachers interact in their classes. The influence of Information Communication and Technology on mankind is becoming enormous, vital and has inheritable aspects (Chai et al. 2010; Hong and Songan 2011). In a nutshell, ICT has revolutionized human educational, social and economic systems, it has potential to enrich and engage students in learning, as the universe has changed into a global village. As technology keeps advancing and has become an inseparable part of the world, it is therefore required of educational institutions to ensure that every student is equipped with the understanding of this greatly necessitated tech-

nology. Cloud computing has been described as a disruptive technology with profound implications for the delivery of internet services as well as for the IT sector at large (Botta et al. 2016).

Therefore, the major benefit of technology nowadays is the ability to process a large amount of data at lightning speeds, which also requires a larger capacity for data storage (Cloud Computing). The speedy technology changing has adversely resulted in a shift from higher education towards training (Burtch 2005). While trying to keep up with the new technology, more focus may be on learning theoretical principles of face-to-face classroom methods with computing-mediated activities (Strauss 2012). This can be used to combine technology with pedagogical principle for the benefit of students' learning (Hoic-Bozic et al. 2009). Information Communication and Technology has made the delivery of instruction more convenient via the use of various media, and the ubiquity of these changes has manifested itself through the extra-ordinary expansion of the Internet and World Wide Web. This revolution has ushered in the development of Web 2.0, other tools and applications (Caruso 2008; Adebayo 2012; Falade 2013). Cloud computing is a kind of computing service that can provide cost advantage, scal-

ability, flexibility, access of the shared resources automatic updates and upgrades to the organization (Gangwar et al. 2015).

However, cloud computing has attracted much attention in academic settings, and a relatively new trend of Information Technology. It is another name for computer networking, accessible medium to internet anywhere, anytime and distributing information. It is also a movement of technology from local computing to an external cloud provider (Alshwaier et al. 2012; Badger et al. 2012; Ibrahim 2014). Cloud computing is an internet attachment by any mobile devices. It is also a medium that replaces people's view, idea, studies and work from ancient practice, a power hardware and software for internet solutions online, and also, collection of computing programmes and services access via the Internet. Lastly, it is a powerful change that has robbed information technology, of its traditional obligations and empowered the users (Stroh et al. 2009; Hirsch and Ng 2011; Singh and Hemalatha 2012; Kurelovic et al. 2013; Mayank Yuvaraj 2013).

Literature Review

The relevance of cloud computing in university education is numerous, it proffers solution for universities Information Technology (IT) financial problems and provides significant flexibility and agility for internet services. Cloud computing improves web applications and it also provides multiple services, innovative and rapidly developing element of technology for the students and lecturers. It helps in evaluating, reducing the risk and making decisions on educational facilities. It provides easier platform to prepare their teaching portfolio presentations, lessons, conferences, and articles among the teachers (Nicholson et al. 2009). Also, reported some concern and challenges are associated with the adoption of cloud computing such as security, service availability, performance, higher costs (when compared to on premise implementation) associated with the subscription model, lack of interoperability standards, difficult integration with on premise applications and limited customization facilities (Géczy et al. 2012).

The empirical studies on lecturers usefulness of cloud computing, revealed that cloud computing allows the lecturers getting their work

done in their web rather than storing and carrying it on hard drive. It is an avenue to assessing important information with different mobile devices from anywhere and contributing to decisions online. Cloud computing provides innovative and collaborative interactions and personalized constructive learning, hence it has become a platform of bringing together both lecturers and learners technologically in the world for academic purposes. It promotes opportunity to course management systems through other technology devices. Cloud computing is imperative in terms of its usefulness and integration into African Universities (Lease et al. 2005).

Al-Fahad (2009) researched into students' perceptions towards the effectiveness of cloud computing in Saudi Arabia, among undergraduate female students at King Saud University. The findings clearly indicated that cloud computing and mobile learning improves teaching and learning processes among the female students who are enrolled in the open and distance learning. Lamont (2009), studied cloud computing applications in Indian Central University libraries.

The empirical studies on lecturers' perceived usefulness of cloud computing revealed that lecturers get their teaching task done in their web browsers instead of storing and carrying on the hard drive. It assists lecturers to create perfect and safe embedded interactive teaching and learning across various contexts to students wherever they might be (Elumalai and Ramachandran 2011). It enables lecturers to utilize web applications for teaching and learning purposes. It identifies, manages works and executes other educational functions online, assessing critical information with different device from anywhere and contributing to decisions (Lease 2005; Herrick 2009; Mrdalj 2011; Katz et al. 2010; Looi 2010).

Provision of teaching and instructional portfolio, lessons, conferences, and articles, cloud computing education provides direct access to a wide range of different academic resources, educational tools and research applications (Mîrcea and Andreescu 2011; Bora and Ahmed 2013). Sharing ideas more rapidly and getting work done more adequately, with efficient communication and sharing tools for instructional purposes, it also enhances the innovation and collaborative interactions and personalized constructive learning (Kiran 2014). Furthermore, it has been reported to have ability of connecting lecturers

and learners technologically worldwide (Sultan 2010; Blankenship 2011; Chen and Bryer 2012; Al Lily 2013) with the capability of breaking the limitation of course management systems. Through cell phones, smartphones, tablet computers and laptops, learners are technologically linked and socially connected than ever before (Friedrich et al. 2011).

Problem Statement

If there will be true innovation in higher education, lecturers' perceived usefulness to technology is a crucial factor that will facilitate against the success of such a transformation. Increased access to higher education through digital technologies has been perceived as a threat by lecturers who prefer the traditional mode of course delivery. Learning and management systems by lecturers technologically are still on primary stage (Green 2010). Lecturers inculcating new technologies of cloud-based technologies in the higher education are ready for implementation, but fears, preferences, teaching styles and passions constitute a setback (Diaz 2011). Hence, studies that determine the expediency in the context of the lectures are also currently lacking.

It is against these backdrops that this study will examine a survey on usefulness of cloud computing integration into African Universities using University of Ilorin, Nigeria as a case study.

Purpose of the Study

The study seeks to examine a survey on usefulness of cloud computing integration into African Universities case study of University of Ilorin, Nigeria.

Research Questions

The study seeks to answer this research question:

1. What is the difference in the University of Ilorin Lecturers usefulness of cloud computing integration?
2. What is the difference in the male and female University of Ilorin Lecturers usefulness of cloud computing integration?

Research Hypothesis

The research hypothesis in the study was tested at 0.05 significant level.

H_{0_1} : There is no significant difference between the lecturers in the six college / faculties of University of Ilorin usefulness of cloud computing integration.

H_{0_2} : There is no significant difference between the male and female lecturers of University of Ilorin usefulness of Cloud Computing integration.

METHODOLOGY

Research Design

This study used a part of the Technology Acceptance Model that is the perceived usefulness, which is defined as the users' using an application of a technology that will increase his or her job task. The Technology Acceptance Model (TAM) developed by Davis was projected and addressed in 1986 (Lee et al. 2003). The model was derived from the Theory of Reasoned Action, developed by Fishbein and Ajzen (1975). TAM was a huge success for modeling user's acceptance of information systems; it is considered prominent and usually adopted theory for describing an individual's acceptance of information systems. Therefore, the Technology Acceptance Model (TAM) was used as baseline to predict perceived usefulness of cloud computing (Saad and Alharbi 2012).

The theoretical framework for this study is on TAM (Technology Acceptance Model) and Cognitive Theory of Multimedia Learning Theory. Theoretical models have been developed to explore and describe factors that influence users' acceptance, rejection or continuing use of new technology (Venkatesh and Davis 2000; Venkates et al. 2003). Theory of Reasoned Action (TRA) has origin from Ajzen and Fishbein's model. Davis (1989) introduced and developed the Technology Acceptance Model (TAM) and provided a theoretical context that explained the relationship of attitude-intention-behavior. Based on the TAM, perceived usefulness and perceived ease of use are hypothesized to be fundamental determinants of user's acceptance.

The study adopted a descriptive research type utilizing survey method, using questionnaire to obtain necessary information from the

respondents. The target population of this study was the Lecturers in the faculties at University of Ilorin. The sample for the study was drawn from purposively sampling of 120 lecturers of 60 females and 60 males. The instrument used in generating data for the study was the questionnaire named 'a survey' on usefulness of Cloud computing integration into African Universities' case study of University of Ilorin, Nigeria. (SUOCCIUAU). The items in the questionnaire were selected based upon their relevance to usefulness, to use cloud computing.

The items in the questionnaire were selected based upon their relevance to usefulness, to use cloud computing. The questionnaire consists of two sections A and B. Section A elicited information on biographical data of the respondents such as gender and specialization. Section B collected response on usefulness in integrating cloud computing into learning. Items numbered 1 - 10 were patterned after the five point-like type rating scale format of Strongly Agree (SA) - 5 points, Agree (A) - 4 points, Disagree (D) - 3 points Strongly Disagree (SD) - 2 points and Undecided (UD) - 1 point. The instrument was validated to obtain useful suggestion; modifications in term of language clarity, content coverage in terms of adequacies and inadequacies, comments on the relevance to the stated objectives and constructive criticisms on the instrument.

Therefore, the research instrument was tested and validated by two lecturers, one from the Department of Educational Technology and Library Studies, and the other from Information Communication and Technology Department, Obafemi Awolowo University Ile Ife, Nigeria. The instrument was further subjected to pilot testing and reliability before using the research instrument. The reliability of the instrument was administered from the lecturers on University of Ibadan, Oyo State, Nigeria, using Cronbach's alpha. The value obtained for the reliability was 0.81 which was quite satisfactory for this study.

The level of the significance adopted for the analysis was $P \leq 0.05$. This level of significance formed the basis for accepting or rejecting the hypothesis. The researcher administered the instrument to the targeted sample. Due to the type of the instrument, it was possible for the students to attempt the questionnaire within a period of five to ten (5-10) minutes.

Therefore, the researchers waited to collect the completed questionnaire from the respondents immediately.

RESULTS

Hypothesis 1

H₀₁: *There is no significant difference between the lecturers in the six colleges / faculties of University of Ilorin usefulness of cloud computing integration.*

To test this hypothesis, the Analysis of Variance statistics was used to compare the means of the lecturers in the six Colleges or Faculties of University of Ilorin usefulness of cloud computing integration.

Table 1 indicates that the calculated F value of 12.237 is not significant because the significant value of .000 is lesser than 0.05 alpha levels. The result implies that there is significant difference in mean scores of the Lecturers of the six colleges/faculties on usefulness of cloud computing integration to learning. Therefore, the null hypothesis is not accepted.

Hypothesis 2

H₀₂: *There is no significant difference between the male and female lecturers of University of Ilorin usefulness of Cloud Computing integration.*

To test this hypothesis, the t-test statics was used to compare the male and female lecturers

Table 1: Analysis of variance statistics result on the means of six faculties of university of Ilorin usefulness of cloud computing integration

Sources	Type III sum of square	Df	Mean square	F	Sig
Corrected model	6204.742	5	1240848	12.237	.000
Intercept	155448.008	1	155448.008	1532.932	.000
Factor	6204.742	5	1240.948	12.237	.000
Error	11560.250	114	101.406		
Total	173213.000	120			
Corrected	17764.992	119			

Table 2: t-test results on the means of the male and female lecturers' of University of Ilorin on usefulness of cloud computing integration

Variables	No	Mean	SD	df	T	Sig (2-tailed)
Male	60	38.83	11.53	118	2.609	.010
Female	60	33.15	12.31			

of University of Ilorin on usefulness of Cloud Computing integration.

Table 2 indicates that the calculated F value of 2.609 is significant because the significant value of .010 is bigger than 0.05 alpha levels. The result implies that there is significant difference in mean scores of the male and female lecturers on perceived usefulness of cloud computing integration to learning. Therefore, the null hypothesis is accepted. The result shows that male and female lecturers did use cloud computers differently.

DISCUSSION

The present results of the analyses related to the Hypothesis 1 indicated no significant difference in the performances of lecturers of the six faculties on perceived usefulness of cloud computing integration to learning. The finding is in line with Al-khatib (2006) whose study reviewed the awareness of faculty member at the Jordanian University towards the concept of E-learning and their Actual Usage of E-learning in Instruction and also, Behrend et al. (2011) whose research confirmed the usefulness of cloud computing adoption and usage in public colleges. Also, Mircea and Andreescu (2011) who studied on cloud computing in Higher Education and Katz et al. (2010) whose study reviewed the cloud computing in Higher Education.

On the Hypothesis 2, the male and female lecturers in University of Ilorin, cloud computing integration is significantly different. The finding is in line with Changchit (2014) and Alharbi (2012) that there is a significant difference on the perceived usefulness of students, lecturers and employees perceived usefulness of integration of cloud computing, Singh and Hemalatha (2012) whose study pronounced Cloud Computing for Academic Environment, Tuncay (2010) whose study reviewed the effective use of cloud computing in educational institutions and Yadav (2014) whose study presented the role of cloud computing in education.

CONCLUSION

It can be concluded that the usefulness of cloud computing integration indicated significant difference in mean scores. The study revealed that usefulness plays an important role in lecturers accepted cloud computing and that usefulness is very clear from the result that if lecturers perceive cloud computing as a technology that will be beneficial to teaching and learning, it will be generally accepted for use. The integration of cloud computing should not be left out in teaching and learning in the university. Nowadays, technology tends to live with an idea that learning should occur at anytime. The idea can be utilized to close up the learners anywhere and anytime by the lecturers with the use of cloud computing.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are made; the university authority should improve on the services provided on cloud computing for the lecturers. Moreover, lecturers should have access to cloud computing anywhere and anytime to enable them to be skillful in their various disciplines.

REFERENCES

- Adebayo SS 2012. *The Impact of Application of Information and Communications Technology (ICT) in the Administration of Polytechnics in Ogun State, Nigeria*. MEd Thesis, Unpublished. Abeokuta: National Open University of Nigeria.
- Al Lily A 2013. Social change and educational technologies: By invitation or invasion. *Journal of Organisational Transformation and Social Change*, 10(1): 42-63.
- Al-khatib N 2006. *The Awareness of Faculty Member at the Jordanian University towards the Concept of E-learning and their Actual Usage of E-learning in Instruction*. PhD Thesis, Unpublished. Amman-Jordan: University of Jordan.
- Alshwaier F, Alshuwaier A, Areshey A 2012. Applications of Cloud Computing in Education. *IEEE 8th International Conference on Computing and Networking Technology (ICCNT)*, 27-29 August, Gyeongju, Korea. US: IEEE, pp. 26-33.

- Badger L, Grance T, Patt-Corner T, Voas J 2012. Draft Cloud Computing Synopsis and Recommendations. Gaithersburg: National Institute of Standards and Technology, Computer Security Division. *Draft Special Publication*, 800-146.
- Behrend T, Wiebe EN, London J, Johnson E 2011. Cloud computing adoption and usage in community colleges. *Behavior and Information Technology*, 30(2): 231-240.
- Blankenship M 2011. How social media can and should impact higher education. *Education Digest: Essential Readings Condensed For Quick Review*, 76(7): 39-42.
- Botta A, De Donato W, Persico V, Pescapé A 2016. Integration of cloud computing and internet of things: a survey. *Future Generation Computer Systems*, 56: 684-700.
- Bora UJ, Ahmed M 2013. E-Learning using cloud computing. *International Journal of Science and Modern Engineering (IJISME)*, 1(2): 9-13.
- Campbell S 2009. TimeSharing 2.0. HPC Wire. From <http://www.hpcwire.com/hpcwire/2009-11-03/timesharing_2_0.html> (Retrieved on 26 October 2016).
- Caruso JB 2008. *The ECAR Study of Undergraduate Students and Information Technology*. Boulder and Washington: Educause Centre for Applied Research.
- Chai CS, Koh JHL, Tsai CC 2010. Facilitating pre-service teachers' development of technological, pedagogical, and content knowledge (TPACK). *Educational Technology and Society*, 13(4): 63-73.
- Chen B, Bryer T 2012. Investigating Instructional Strategies for Using Social Media in Formal and Informal Learning. The International Review of Research in Open and Distance Education. From <<http://www.irrodl.org/index.php/irrodl/article/view/1027>> (Retrieved on 16 October 2016).
- Davis FD 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3): 319-340.
- Davis FD, Bagozzi RP, Warshaw PR 1989. User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35: 982-1003.
- Diaz V 2011. Cloud-based technologies: Faculty development, support, and implementation. *Journal of Asynchronous Learning Networks*, 15(1): 95-102.
- Elumalai R, Ramachandran V 2011. A cloud model for educational e-content sharing, European. *Journal of Scientific Research*, 59(2): 200-207.
- Faculty Survey of Student Engagement 2009. Bloomington, IN: Indiana University, Center for Post-secondary Research. From <<http://fsse.iub.edu/>> (Retrieved on 24 November 2016).
- Falade AA 2013. *Stakeholders' Perception of Integration of Information Technology and Communication Technology (ICT) in Open and Distance Learning in Nigeria*. PhD Thesis, Unpublished. Nigeria: Department of Educational Technology, Faculty of Education, University of Ilorin.
- Friedrich R, Peterson M, Koster A 2011. The rise of Generation C: How to prepare for the connected generation's transformation of the consumer and business landscape. In: *Strategy and Business*, Issue 62.
- 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.
- Green KC 2010. Campus Computing 2010: The 21st National Survey of Computing and Information Technology in American Higher Education. Encino, CA: Campus Computing Project. From <<http://download.1105media.com/EDU/ct11/CampusComputing2011.pdf>> (Retrieved on 26 October 2016).
- Grimes M, Jaeger TJ, Lin J 2009. Weathering the Storm: The Policy Implications of Cloud Computing. From <<http://hdl.handle.net/2142/15340>> (Retrieved on 26 October 2016).
- Herrick DR 2009. Google This! Using Google Apps for Collaboration and Productivity. *Proceedings of the 37th Annual ACM SIGUCCS Fall Conference: Communication and Collaboration*, 11-14 October, St. Louis, MO, USA. New York: ACM, pp. 55-64.
- Hirsch B, Ng JW 2011. Education Beyond the Cloud: Anytime-anywhere Learning in a Smart Campus Environment. *IEEE International Conference Internet Technology and Secured Transactions (IC-ITST)*, 11-14 Dec, Abu Dhabi, UAE. USA: IEEE, pp. 718-723.
- Hong KS, Songan P 2011. ICT in the changing landscape of higher education in Southeast Asia. In: KS Hong, KW Lai (Eds.): *ICT for accessible, effective and efficient higher education: Experiences of Southeast Asia*. *Australasian Journal of Educational Technology*, 27(8): 1276-1290.
- Jibril SI 2014. *Adoption of Cloud Computing in Higher Education Institutions in Nigeria*. Master of Science Degree Thesis Submitted To School of Business, Unpublished. Malaysia: University Utara Malaysia Management.
- Katz R, Goldstein P, Yanosky R 2010. Cloud computing in higher education. Educause. [Online] 2010. From <http://net.educause.edu/section_params/conf/CCW10/highered.pdf> (Retrieved on 24 October 2014).
- Kureloviæ KE, Rako S, Tomljanovia J 2013. Cloud computing in education and student's needs. *MIPRO 2013/CE*, 856-861.
- Lease D 2005. Factors Influencing the Adoption of Biometric Security Technologies by Decision Making Information Technology and Security Managers. Capella University. From <http://drdavidlease.com/uploads/DavidLease_UMI_Dissertation.pdf> (Retrieved on 24 October 2014).
- Lee Y, Kozar KA, Larsen KRT 2003. The technology acceptance model: Past, present, and future. *Communications of the Association for Information Systems*, 12: 752-780.
- Lei L, Finley J, Pitts J, Rong G 2010. Which is a better choice for student-faculty interaction: Synchronous or asynchronous communication? *Journal of Technology Research*, 21-12.
- Looi C 2010. Levering mobile technology for sustainable seamless learning: A research agenda. *British Journal of Educational Technology*, 41(2): 154-169.
- Mayank Y 2013. Cloud Computing Applications in Indian Central University Libraries: A Study of Librarians Use. Library Philosophy and Practice (e-journal). Paper 992. From <<http://digitalcommons>

- .unl.edu/libphilprac/992> (Retrieved on 24 October 2014).
- Milis K, Wessa P, Poelmans S 2008. The Impact of Gender on the Acceptance of Virtual Learning Environments. *Proceedings of the International Conference of Education, Research and Innovation*, 17-19 November Madrid, Spain.
- Mircea M, Andreescu A 2011. Using cloud computing in higher education: A strategy to improve agility in the current financial crisis. *Communications of the IBIMA*, 1-15.
- Moran M, Seaman J, Tinti-Kane H 2012. *Teaching, Learning, and Sharing: How Today's Higher Education Faculty Use Social Media*. Boston, MA: Pearson Learning Solutions and Babson Survey Research Group.
- Mrdalj S 2011. Would cloud computing revolutionize teaching business intelligence course. *Informing Science and Information Technology*, 8: 209-217.
- Nicholson J 2009. Cloud Computing Top Issues for Higher Education. University Business. From <<http://www.universitybusiness.com/article/cloud-computings-top-issues-higher-education>> (Retrieved on 24 October 2014).
- Rittinghouse JW, Ransome JF 2016. *Cloud Computing: Implementation, Management, and Security*. USA: CRC Press.
- Saad T, Alharbi 2012. Users' Acceptance of cloud computing in Saudi Arabia: An extension of technology acceptance model. *International Journal of Cloud Applications and Computing*, 2(2): 1-11.
- Singh A, Hemalatha M 2012. Cloud computing for academic environment. *International Journal of Information and Communication and Technological Research*, 2: 97-101.
- Stroh S, Acke RO, Kumar A 2009. The Cloud is Ready for You, Are You Ready For Cloud? From <www.booz.com/media/file/Cloud_Is_Ready_for_You.pdf> (Retrieved on 24 October 2014).
- Sultan N 2010. Cloud computing for education: A new dawn? *International Journal of Information Management*, 30(112): 109-116.
- Venkatesh V, Davis FD 2000. A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2): 186-204.
- Venkatesh V, Morris MG, Davis GB, Davis FD 2003. User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27: 425-478.
- Yadav K 2014. Role of cloud computing in education. *International Journal of Innovative Research in Computer and Communication Engineering*, 2(2): 3108-3112.

Paper received for publication on July 2016
Paper accepted for publication on December 2016