



Extent of Use of Cloud Computing Services by Non-Science Undergraduate Students in Universities in Anambra State

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Abstract

The study investigated the 'usage of cloud computing services by non-science undergraduate students in universities in Anambra State'. Two research questions and two hypotheses guided the study. The research design was a descriptive survey. A sample size of 360 students was drawn using the Taro Yamane model and multistage sampling procedure. UCCSQ used for data collection was validated by five experts. Its reliability was determined using Cronbach alpha method which yielded a value of .985. Mean was used to answer the research questions while the hypotheses were tested at .05 Alpha level using t-test and ANOVA. The findings of the study showed that the extent of use of cloud computing services by the students is low and it differed significantly based on institution ownership. Based on the findings, it was recommended among others that university management should make "Use of Cloud Computing Services" a separate course as a general study.

Keywords: Cloud computing services, Usage, Universities, Non-science undergraduates

Introduction

Universities in Nigeria require information and communication technology (ICT) to function effectively and efficiently because it is a vital tool that plays a great role in the provision of the right information to the right person and at the right time in any organization. ICT encompasses the use of computers and telecommunication equipment to store, retrieve, transmit and manipulate data (Obiadazie, 2015). It is defined as a diverse set of technological tools and resources that are used to communicate, create, disseminate, store and manage information (Obiadazie & Maduka, 2017). Its main goal is globalization and technological change (Flor, 2012). ICT is very good at creating new approaches to work, human interaction and collaborative learning like discussions, group problem solving and project works. The flexibility ICT creates help students to have real-time access to resource persons, experts and peers all over the world for constructive criticisms and corrections in their various learning tasks. ICT is also a catalyst in promoting changes that equip students with skills they are expected to have on graduation such as the skill of communication (McGorry, 2002).

Universities in this digital era need ICT such as cloud computing services as one of the major ways of providing effective educational delivery to scholars globally. The main aim of establishing the universities is to encourage and promote scholarship as well as to research in all fields of human endeavours: education, economics, medicine. Hence, a university designs its programmes of study and provides the necessary infrastructure to meet the

goals. It is in light of this that ICT is the most significant and integral infrastructure in the university system. The Federal Republic of Nigeria (FRN, 2013) in the National Policy on Education made a promise to provide facilities and necessary infrastructure for the promotion of ICT and e-learning in schools. The Federal Ministry of Education (FME, 2007) in line with this also made a commitment to bridge the digital divide by targeting Nigerian tertiary institutions. Hence, university undergraduates in Anambra State require the use of cloud computing services to be productive learners and globally competitive.

Sivakumar and Singaravelu (2016) defined the 'cloud' as a type of parallel and distributed system consisting of a collection of interconnected and virtualized computing resources that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements established through negotiation between the service provider and consumers. It is a bunch of highly scalable computing resources working together somewhere and giving services to an end-user over the internet. The cloud is a facilitator in storing and accessing information and a provider of a unified web service with reduced local storage capacity (Majhi, Meher & Maharana, 2015). It enables a single program to travel to different sources of information and create virtual services that facilitate distributed computing paradigm (a process of running program or application over many computers on a network) found in cloud computing.

Cloud computing provides all its resources as a service. These services are diverse ranging from

web-based services, social websites, entertainment and video presentation, calendaring services, file sharing and online storage services, online business productivity tools, science and statistical applications, software development platforms, computing infrastructures, etc. Most students that use social networks like Facebook, Twitter, etc. use free cloud computing services such as “storage” without being aware of it. The growing popularity in news channels, social media, Skype, e-mail services, online applications are all as a result of the availability of cloud computing services. However, cloud computing services fall into three broad categories (Iji, Abah & Anyor, 2017): an entire networking or computing infrastructure known as Infrastructure-as-a-Service (IaaS), a computing platform for developing or hosting applications known as Platform-as-a-Service (PaaS) and a method for delivering software applications over the internet, on-demand and on a subscription basis known as Software-as-a-Service (SaaS). Companies offering these cloud computing services are called cloud service providers. They charge for cloud computing services based on usage, similar to how one is billed for water or electricity at home. They are shared over the internet on-demand and on pay-per-use cost structure (Majhi et al, 2015).

Cloud computing services and different cloud deployment models like public, private, hybrid and community cloud deployment models have disrupted the traditional method of providing ICT infrastructure because virtualized hardware and software are provided on-demand and managed by third parties, thus, achieving the required scalability and availability; and reducing upfront costs (Jose, Miguel, Eduardo & Rafael, 2014). They also extend the previous application service provider model in that cloud providers own and manage their hardware and software while clients/users share the computational infrastructure in a multi-tenant architecture. Unlike in the traditional method of providing ICT where documents and software applications installed and updated by teachers and students in their computer network based on their requirements can only be accessed by students who are present in the computer laboratory. Teachers and students can employ cloud computing services both in the classroom teaching and learning and anywhere else, anytime to enhance students’ engagement, resource availability, and simplification of the teaching-learning process.

If universities and their students use cloud computing services, acquisition of hardware will be the main source of savings according to Laisbeng and Zhengxia (2011) because they do not need to owe expensive often underutilized resources, instead,

these are owned by the cloud service provider. Institutions are only charged per use. Government can also reduce high expenditure on hardware, software, and IT maintenance by providing a centralized data center that is accessible to students, teachers, and administrators of various ministries of education. This will move the burden of technology setup and maintenance to the cloud service provider especially when technology setup involves complex new technologies and applications that are invented and hard for IT staff to install, configure, secure and upgrade (Jain & Pandey, 2013). It is therefore an ideal computing model which teachers and students should be aware of and use to acquire the social craft of learning because schools should be places where learners are taught different ways of learning. Introducing this technology in the classroom will help students increase their learning opportunities and develop skills and competencies necessary for global competitiveness. Students can use cloud services to create new applications and services; store, back-up and re-cover data; host websites and blogs; stream audio and video; deliver software on demand; analyze data for patterns and make predictions.

There are five universities in Anambra State, two-government owned (one Federal, one State) and three private owned universities. The major objectives of establishing these universities do not differ from those of their counterparts in the world. These universities engage actively in training professionals in various disciplines. The university community need cloud computing services to streamline operations, improve productivity, engage in conferences and collaboration, enhance the delivery of course materials, personalize education and improve learning outcomes. The researcher being a student in one of the universities in Anambra State has observed that most of the cloud computing services are always used, some are occasionally used while many others are either rarely used or not used at all by the students. The researcher then imagines if the situation is the same in the rest of the universities in the State. It is clearer from the fore going that cloud computing services will provide a solution where the majority of educational services will be hosted in the cloud and institutions no longer need to host their own data centers with their limited fund and computing resources which are sometimes not utilized. It has presented a shift of control from the traditional way of universities having their own infrastructure to resolve on resource sharing, thus cutting down the cost of running education. It has decreased per unit cost of computing services. Universities can benefit from outsourcing IaaS, PaaS and SaaS in terms of both cost reduction and efficiency in simplifying

processes of teaching and learning, evaluation of students, administration and general staff communication.

Achimuga, Oluwagbemi and Oluwaranti (2010) have shown that tertiary institutions in Nigeria lack adequate ICT infrastructure and are found to effectively tap the opportunities offered by cyber space. There is also a lack of computer-aided learning and other specialized software to support some areas of teaching and learning in different institutions. Academic staff in the universities in Nigeria have low access to ICT facilities that would enhance e-learning (Iji et al, 2017; Okai, Uddin, Arshad, Alsaqour & Shah, 2014). Adopting and using cloud computing services could help to manage the limitations of the slow pace of ICT growth. The extent of use of cloud computing services by non-science undergraduate students in universities in Anambra State is not yet established hence the need for the present research.

Statement of the Problem

Research and preliminary observations and interactions of the researcher with some university undergraduates and staff revealed that many of them who have iPhone, smart phone, cell phones, tablets, iPad, laptops, desktop computers and other mobile devices that can access the internet were not using them to access different online productivity tools. Some even claimed that they are not aware they have good support for such diverse networks and protocols. Some students do not use their cell phones to access Microsoft office online and other media services via the internet anytime, anywhere. This implies that the availability of information resources does not automatically translate to their awareness, accessibility and use.

The low use of cloud computing services can be attributed to lack of awareness. To the best of the researchers' knowledge, a lot of research has been done to investigate the role and benefits of cloud computing in education but none has determined empirically, the extent of use of cloud computing services among non-science undergraduate students in federal, state and private universities in Anambra State, Nigeria. The problem of this study is 'To what extent do non-science undergraduate students use cloud computing services in universities in Anambra State?'

Purpose of the Study

The purpose of the study was to ascertain the extent of use of cloud computing services by non-science undergraduate students in Anambra State. The specific objectives are to determine the:

1. Usage of cloud computing services by non-science undergraduate students in federal, state and private universities in Anambra State.
2. Male and female non-science undergraduate students' usage of cloud computing services in Federal, State and Private Universities in Anambra State.

Research Questions

The following research questions guided the study.

1. To what extent do non-science undergraduate students use cloud computing services in Federal, State and Private universities in Anambra State?
2. To what extent do male and female non-science undergraduate students use cloud computing services in universities in Anambra State?

Hypotheses

The following null hypotheses were tested at a 0.05 level of significance:

1. There is no significant difference in the mean ratings of students from Federal, State and Private universities on the extent of use of cloud computing services by non-science undergraduate students' in Anambra State.
2. There is no significant difference between the mean ratings of male and female non-science undergraduate students on the extent of use of cloud computing services in universities in Anambra State.

Method

This study adopted a descriptive survey research design. The study was carried out in Universities in Anambra State. The population was made up of 3,608 non-science undergraduate students from the Faculty of Arts (Federal = 2215, State = 855 and Private = 538) in universities in Anambra State. The sample size was 360 non-science undergraduate students which was randomly selected as Federal = 221; State = 85 and Private = 54. The sample size was statistically determined using the 'Taro Yamane' formula for a finite population since the population of undergraduate students in the Faculty of Arts in each university was known. According to Ifeakor (2018), the Yamane formula is used to determine the sample size where the population is known. Proportionate stratified random sampling was used in selecting the proportion of male and female non-science undergraduate non-science students in the sampled Federal, State and Private universities to ensure the

sample is the same as their proportion in the population. This yielded in these proportions: Federal University, 81 males and 140 females, State University, 31 males and 54 females and Private University: 18 males and 36 females.

The instrument for data collection was a researcher-developed questionnaire termed ‘Usage of cloud computing services Questionnaire (UCCSQ)’. The instrument had two Parts, I and II. Part I sought information on the personal data of the respondent; Part II was used to collect data for the study. Part II had one section which sought information on the usage of cloud computing services among non-science undergraduate male and female students in Anambra State. The response format was: ‘Always Used (AU)’, ‘Occasionally Used (OU)’, ‘Rarely Used (RU)’, and ‘Not Used (NU)’. Their responses were weighted as: AU = 4.00; OU = 3.00; RU = 2.00; and NU = 1.00. The validity of the instrument was established by five experts: one expert in Computer Education, one expert in Science Education, one expert in Adult and Vocational Education, and two experts in Measurement and Evaluation from Nnamdi Azikiwe University, Awka and Chukwuemeka Odumegwu Ojukwu University, Anambra State. The criticisms of the five validates were noted while their suggestions were considered and incorporated in the final draft of the questionnaire. The reliability of the instrument was determined using the Cronbach alpha method to establish the stability of the instrument. In order to do this, the instrument was administered to 20 non-science undergraduate students selected randomly from the Faculty of Arts in Imo State University, Owerri. The respondents’ ratings were used for testing the reliability of the instrument and a reliability coefficient of .985 was obtained.

To collect data for the study, the researchers administered the copies of the questionnaire to the respondents with the help of four other research assistants briefed on the purpose of the study and how to administer and collect back the filled copies of the questionnaire. Two weeks were used for the administration and retrieval of the completed copies of the questionnaire. All the 360 copies of the questionnaire distributed were properly filled,

returned and used for data analysis. Mean and standard deviation were used to analyse the two research questions. The decision rule was that; any mean rating below 2.50 were regarded as low usage/disagree while the mean ratings of 2.50 and above was regarded as high usage/agree. Analysis of variance (ANOVA) was used to test hypothesis one while t-test was used to test hypothesis two at .05 alpha level. In taking the decision, a null hypothesis was rejected if the probability (p) value is less than or equal to a significant value of .05 ($P \leq 0.05$), otherwise, it was not rejected.

Result

Table 1: Respondents’ Mean Ratings on the Extent Non-Science Undergraduate Students Use Cloud Computing Services in Federal, State and Private Universities in Anambra State

University Ownership	N	Mean	SD	Remark
Federal	221	1.90	.59	Low Usage
State	85	1.90	.54	Low Usage
Private	54	1.52	.34	Low Usage
Total	360	1.77	.49	Low Usage

Table 1 shows that the mean scores of the respondents on the extent non-science undergraduate students’ use cloud computing services in Federal, State and Private Universities in Anambra State are 1.90, 1.90 and 1.52 respectively. This indicates that the extent to which non-science undergraduate students use cloud computing services in Federal, State and Private Universities in Anambra State is low since each university ownership had a mean rating below 2.50 which is the acceptable cut-off mean. Again, the total mean of 1.77 also shows a general low usage of cloud computing services by non-science undergraduate students in universities in Anambra state since it is below the acceptable mean of 2.50.

Table 2: Mean Scores of Responses on the Extent Male and Female Undergraduate Non-Science Students’ Use Cloud Computing Services in Universities in Anambra State

University Ownership	Male				Female			
	N	Mean	SD	Remark	N	Mean	SD	Remark
Federal	81	2.15	.51	Low	140	1.76	.58	Low Usage
State	31	2.08	.59	Low	54	1.79	.47	Low Usage
Private	18	1.50	.27	Low	36	1.53	.37	Low Usage
Total	130	1.91	.46	Low	230	1.69	.47	Low Usage

Data on Table 2 show that male non-science undergraduate students in Federal, State and Private Universities had mean ratings scores of 2.15, 2.08 and 1.50 respectively on their extent of use of cloud computing services while their female counterparts have mean of 1.76, 1.79 and 1.53 respectively. Analysis in Table 2 also shows that the general mean ratings on the extent male and female non-science undergraduate students use cloud computing services in Federal, State and Private Universities in Anambra State are 1.91 and 1.69 respectively. Both the general mean and individual mean ratings of the male and female students on the extent of use of cloud computing services in Federal, State and Private Universities are below the acceptable mean of 2.50. This implies therefore, that the extent to which male and female non-science undergraduate students' use cloud computing services in Universities in Anambra state is low.

Table 3: Analysis of Variance on the Respondents' Mean Ratings on the Extent of Use of Cloud Computing Services by Non-Science Undergraduate Students from Federal, State and Private Universities in Anambra State.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.50	2	3.25	11.00	.00
Within Groups	105.49	357	.29		
Total	111.99	359			

Data on Table 3 show that F-ratio (df: 2,357) is 11.00 and the P-value (.00) is less than the stipulated 0.05

Source of variation	N	Mean	SD
Male	130	2.04	.55
Female	230	1.73	.53

The results in Table 5 shows that the mean ratings for male non-science undergraduate students ($M = 2.04$, $SD = .55$) was significantly greater than that of the female ($M = 1.73$, $SD = .53$); $t(358) 5.33$, $p = .000 < 0.05$. The null hypothesis of no significant difference between the two groups on their usage of cloud computing services was therefore rejected. The study concluded that there is a significant difference between the mean ratings of male and female non-science undergraduate students on their usage of cloud computing services in universities in Anambra State in favour of males

level of significance. It was therefore decided that there is a significant difference in the mean ratings of non-science undergraduate students from Federal, State and Private Universities in Anambra State on their extent of use of cloud computing services. Since the ANOVA test is significant, a scheffe Post Hoc test is carried out to identify where the significant difference exists. This is presented in Table 4.

Table 4: Scheffe Post-Hoc Test on the Usage of Cloud Computing Services by Non-Science Undergraduate Students in Federal, State and Private Universities in Anambra.

(I) Ownership	(J) Ownership	Mean Difference (I-J)	P-value
Federal	State	.01	.99
	Private	.37	.00
State	Federal	-.01	.99
	Private	.37*	.00
Private	Federal	-.37	.00
	State	-.37	.00

As indicated by the Post-Hoc test (Scheffe test) in Table 4, there is a significant difference between the mean ratings of non-science undergraduate students from Federal and those from Private universities in favour of Federal.

Table 5: t-Test Analysis of the Difference between Male and Female Undergraduate Non-Science Students' Mean Ratings on the Usage of Cloud Computing Services in Universities in Anambra State

Source of variation	N	Mean	SD	df	t-cal	P-value	Decision
Male	130	2.04	.55	358	5.33	.000	Sig
Female	230	1.73	.53				

Discussion of findings

The extent non-science undergraduate students use cloud computing services in Federal, State and Private Universities in Anambra State is low. Most of the cloud computing services in the check list were rarely used by these students. The findings of this work are not in line with Iji, Abah and Anyor (2017) which revealed a high frequency of usage of cloud computing services with smartphones (49%), tablets (24%), and laptops (16%) being the set of ICT devices readily available among students in Federal Universities. The difference may be because Iji et al studied undergraduate science students of mathematics education in Benue State. The result of



research question one is also not in line with the findings of Oyeleye, Fagbola and Daramola (2014) which revealed that 70% of the students in public universities use SaaS, 20% use PaaS while 10% use IaaS. SaaS in use in these universities such as google documents, MOODLE, google mail, yahoo mail, and NetSuite were universal, free and in high demand by the entire university community resulting in their wide adoption and use. PaaS in use include google sites, education enterprise resource planning (ERP.net), oracle coherence, Microsoft virtual computing laboratory, online databases, Microsoft dynamics online, and integrated development environment while IaaS in use were servers. The difference between the result of this study and that of Oyeleye, Fagbola and Daramola (2014) may be because Oyeleye, Fagbola and Daramola (2014) studied students in public universities in South Western, Nigeria.

The findings further showed that there is a significant difference in the mean ratings of undergraduate non-science students' usage of cloud computing services based on institution ownership. The result of the mean ratings on the usage of cloud computing services by non-science undergraduate students from Federal and Private Universities was significant. This could imply that non-science undergraduate students of 2019/2020 academic session in Federal Universities use cloud computing services more than their counterparts in Private Universities in Anambra State. This could also mean that non-science undergraduate students of 2019/2020 academic session in Federal Universities are more informed about cloud computing services than those in Private Universities. It could also mean that the management of Federal University put in more effort than that of Private in facilitating non-science undergraduate students' use of cloud computing services in curricular activities, orientation and awareness programmes, etc.

The difference in the mean ratings on the usage of cloud computing services by non-science undergraduate students from State and Private Universities was also significant. This could also imply that non-science undergraduate students of 2019/2020 academic session in State Universities are more informed about cloud computing services and also use cloud computing services more than their counterparts in Private Universities in Anambra State. It could also mean that the management of State University put in more effort than that of Private in facilitating non-science undergraduate students' usage of cloud computing services. However, all the Universities did not make good efforts towards non-science undergraduate students' usage of cloud

computing services since the students' extent of use of cloud computing services in universities in Anambra State is low.

The findings are in line with the findings of Ahmed and Kurshid (2016) which revealed a significant difference in the use of ICT among public and private sector University lecturers with those in public Universities having higher use of ICT than others in the private sector. The findings of Mayank (2013) revealed that librarians in Indian Public Universities use various cloud computing services such as cloud-based office applications, mailing, storage services, video and presentation services, file sharing, calendaring and social networking services, cloud-based forums and operating systems. Again, the findings of Vasileios (2017) revealed that 55.60% of students of Greek teachers training program EPPAIK, Greece which is a public university were familiar with the use of cloud computing services, 22.20% were not familiar while the remaining 22.20% had never heard of cloud computing services. However, 97.2% of the students use cloud-based services such as email, drop-box, google applications, MOODLE and e-class.

The result of this study is different from the findings of Yasmeen, Alan, Mushlaq and Bukhari (2015) which indicated no significant difference in the usage of ICT among the students of public and private Universities. Yasmeen et al found that teachers of both public and private universities are not trained in the skill of ICT. The result is also different from the findings of Malero, Ismail and Manyilizu (2015) which revealed a relationship between the type of school and readiness to adopt the use of ICT in teaching with the private schools being forward. Malero, Ismail and Manyilizu (2015) revealed that private schools are better off than public schools in readiness to use ICT in teaching.

The findings also revealed that the extent male and female non-science undergraduate students' use cloud computing services in Federal, State and Private Universities in Anambra State is low. This is in line with the findings of Ajegbelen (2016) which revealed a gap between university teachers and students, and ICT usage in the classroom. Ajegbelen revealed that many teachers and students in universities go to commercial cyber café in town to use the computer system and access internet services due to a lot of challenges facing the use of ICT in the universities such as the unavailability of ICT facilities, lack of reliable power supply, etc. The result is also in line with the findings of Yasmeen et al (2015) which found no significant difference among students of public and private universities on the usage of ICT. Yasmeen et al indicated that



teachers of both public and private universities are not trained on the skill of ICT, although teachers in private universities are well aware of computer technology compared to teachers of public universities. The findings from the results further showed that the mean ratings for male non-science undergraduate students was significantly higher than that of the female students. This could imply that male non-science undergraduate students of 2019/2020 academic session in Universities in Anambra state are more informed on ICT skills and the use of cloud computing technology. It could also mean that parents and lecturers put in more effort in facilitating male non-science undergraduate students' usage of ICT than they put in females.

Conclusion

Based on the analysis, interpretations and discussions of findings of this study, it was concluded that the extent of use of cloud computing services by non-science undergraduate students in Federal, State, and Private Universities in Anambra State is low. The extent to which male and female non-science undergraduate students use cloud computing services in Universities in Anambra State is low.

Recommendations

The following recommendations are made based on the findings and conclusions of this study:

1. The management of universities should include "Use of Cloud Computing Services" in the curricular activities of non-science undergraduate students in the universities. This will improve their ICT skill needed for use in their various disciplines.
2. University management should allow every newly admitted students to embark on familiarization tour to the University ICT Unit. This will help them to be aware and also see for themselves the cloud computing services available for use in the school.
3. Students should endeavour to use cloud computing services in communication, resource sharing, assignments, projects and in extending learning out of the institution.
4. Teachers should avail themselves for in-service training and learn how to use cloud computing services such as PaaS and IaaS in creating flexible learning environment.
5. Students should also avail themselves for professional development programmes in ICT career. This will help them learn various ICT skills that will help them in the use of cloud based services.

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