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Utilization of Cloud Computing Technologies by Final Year Students of the Federal University of Technology, Owerri: Implications on Academic Performance.

BY

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Abstract

The paper examined utilization of cloud computing and its relationship on the academic performance of final year students of the Federal University of Technology, Owerri. A 4-point Lickert scale of Strongly Agree; Agree; Disagree; Strongly Disagree was used to obtain responses from the 285 sample respondents. The result shows that majority of 206(72%) out of 285 utilizes cloud computing for e-mail and other social media platform. Following in descending order, 96(33.6%) for University portal; 95(33.3%) for e-learning; 88(30.9%) for digital archiving; 88(30.9%) for research application; 87(30.5%) use it to search online database; 85(29.8%) for online file storage. This therefore resulted to a pooled mean value of 2.17 which is below the accepted 2.5 value for a 4-point lickert scale; thus requiring higher utilization. However, the null hypotheses was rejected hence there is a strong relationship between knowledge/utilization of cloud computing and academic performance. As shown in the table, f-ratio calculated value is 31.844 with an alpha value of 0.011 which is higher than f- tabulated value at 0.05 and df=1 and 284 is 3.89.

Key word: Cloud computing, Information Technology, Cloud utilization by students, Academic performance, Final year students.

INTRODUCTION

Today, the term “cloud computing” is a significant term in the field of information technology (IT). Cloud computing is a type of computing that is highly accessible and uses virtualised resources that can be shared by clients (Siegle 2010). It is the delivery of various hardware and software services over the internet, through a network of remote servers. These remote servers are busy storing, managing, and processing data that enables the delivery of on-demand computing services -- from applications to storage and processing, typically over the internet and on a pay-as-you-go basis. A student using cloud computing can communicate with a

lot of servers simultaneously and these servers exchange information between themselves (Sasikala and Prema 2010).

One popular and simple definition describes it as clusters of distributed computers (hugely vast data centres and server farms) that provide on-demand resources and services (e.g., networks, servers, storage, applications and services) over a network medium (usually the Internet) (Lin, Fu, Zhu and Dasmalchi, 2010). Clouds can be deployed internally in an institution, or be provided as a service by third party. The essence is to have access to better infrastructure and expertise of advanced countries and vendors which may be lacking locally, hence providing opportunity to manage institutions' database which staff and students can leverage on to further research and collaborative learning.

In the recent years, many academic institutions attempt to redesign their IT operations to support their concerns in the light of different technology trends so they can achieve their objectives. Academic institutions are always needed to upgrade their software and hardware in order to attract students/instructors and keep up with the rapid developments in IT technologies (Ismail, 2011). Rising education demands are forcing information technology users to think about new ways to support academic institutions' priorities. Within the present economic context, cloud computing is one of the most important solutions on the education scene (Ajith and Hemalatha, 2012). Corroborating, Fagbola (2016) asserted that the adoption of cloud computing, a service-oriented alternative to ICT provisioning and deployment, with the potential to yield low cost, improved efficiency and availability becomes imperative in Universities.

Mehmet and Serhat (2011) identified some of the benefits offered by cloud computing in education to include on-demand access to online database repositories, e-learning platforms, digital archive, portals, research applications and tools, file storages, e-mails and other educational resources anywhere for faculty, administrators, staff, students and other users in university. He opined that cloud computing is now one of the new technology trends, that can bring new value to an education system, as it represents a real chance to reconsideration and re-crafts services for an institution.

The capability and efficiency of using cloud computing in academic institutions has been recognized by a lot of universities, such as Washington State University and the University of California in the US and higher education institutions in the UK (Ajith and Hemalatha, 2012). A survey conducted by cloud vendor "Gooroo" revealed that UK universities employs cloud

computing in order to reduce costs during the slowing economy. Similarly, Fagbola (2016) in his investigation on the trends, benefits and challenges of adoption of cloud computing in public Universities in Nigeria revealed that 54 were aware while 45 adopted the use of cloud computing. This shows that cloud computing is equally gaining popularity in Nigeria's higher institutions.

Bhisikar, 2011, identified four types of cloud computing models depending on what resources are shared and delivered to the users: (1) Private cloud - which is a cloud infrastructure used by a single organization so everyone in the organization can access data, services and applications but others out of the organization cannot. The infrastructure may be managed by the organization itself, or by a third-party provider. Examples: Eucalyptus, VMware, vCloud and OpenStack; (2) Community cloud - A cloud infrastructure shared by several organizations in a community with shared interests and concerns; (3) Public cloud - A cloud infrastructure available to the general public through a third-party service provider. Examples: Google App Engine, Rackspace Cloud Servers; (4) Hybrid cloud - A cloud infrastructure that consists of two or more cloud infrastructures (private, community or public). The infrastructures are connected by interfaces that enable sharing or utilizing each other's data, application or computational resources.

Information technology has brought radical changes to many aspects of current life and the education sector in general, and to academic institutions in particular. Cloud computing has been proven to be attractive to academic institutions due to the benefits that it offers. Cloud computing offers academic institutions the opportunity to concentrate more on teaching and research activities rather than on complicated IT arrangements and software systems (Khazaei and Misi, 2010). According to (Youngheon, 2013), IT complexity can be reduced by cloud computing. In addition, cloud solutions can be employed to support cooperative learning and socially oriented theories of learning, making the collaboration within and between the research groups, instructors, students and staff more effective and efficient.

Further more, the IT industry in order to minimize cost is broken it into three categories to help better define use cases: (a) **Software as a Service (SaaS)** – software is owned, delivered and managed remotely by one or more providers. To start, Software-as-a-Service, or SaaS, is a popular way of accessing and paying for software. Instead of installing software on your own servers, SaaS companies enable you to rent software that is hosted. This is typically the case for

a monthly or yearly subscription fee. More and more CRM, marketing, and finance related tools use [SaaS business intelligence](#) and technology, and even Adobe's Creative Suite has adopted the model. **(b) Infrastructure as a Service (IaaS)** – compute resources, complemented by storage and networking capabilities are owned and hosted by providers and available to customers on-demand. **(c) Platform as a Service (PaaS)** – the broad collection of application infrastructure (middleware) services. These services include application platform, integration, business process management and database services.

The cloud computing concept and its characteristics can help education institutions improve productivity, maintain education institutions' own data centres and enhance hardware and software resources management, which are needed to provide educational quality, scientific and research activities and students' projects (Doelitzscher, Sulistio and Reich, 2011). Cloud computing permits effective usage of existing resources and provides a new view of the reliability of educational services for academic institutions.

Cloud computing is an excellent alternative for educational institutions, which are under budgetary constraints in order to operate their information systems effectively without spending more money on computers and network machines. Cloud computing makes IT operations less expensive (by reducing the need for licensing and software updating) and offers stronger functional capabilities. Furthermore, cloud computing also enables academic institutions to become more competitive due to adaptable computing platforms, providing scalability and high-performance resources and highly reliable and available applications and data (Ahmed, 2012).

Cloud computing is said to be gaining popularity across tertiary institutions in Nigeria in line with global trend. However, the questions to investigate are how individual universities are utilizing cloud computing to improving academic performance. This work attempts to find out the final year students' utilization of cloud computing technologies and its relationship on their academic performance at the Federal University of Technology, Owerri, Imo State, Nigeria. To investigate this, the following objectives were raised:

- To determine the relationship between final year students' knowledge of cloud computing technologies and their academic output.
- To determine the relationship between final year students' utilisation of cloud computing technologies and their academic output.

This study is significant in that it is advancement in technology which offers new opportunities in enhancing teaching and learning. It will also enable students to personalize the environment in which they learn a range of tools to meet their interests and needs.

The theoretical framework that guided the study is Actor Network Theory (1991), Actor network theory (ANT) is a theoretical and methodological approach to social theory where everything in the social and natural worlds exists in constantly shifting networks of relationships. It posits that nothing exists outside those relationships. All the factors involved in a social situation are on the same level, and thus there are no external social forces beyond what and how the network participants interact at present. Thus, objects, ideas, processes, and any other relevant factors are seen as just as important in creating social situations as humans. ANT holds that social forces do not exist in themselves, and therefore cannot be used to explain social phenomena. Instead, strictly empirical analysis should be undertaken to "describe" rather than "explain" social activity. Only after this can one introduce the concept of social forces, and only as an abstract theoretical concept, not something which genuinely exists in the world. This theory is relevant to this study in that it will help the institution under study and other related institutions to know how to clearly put in place the necessary framework needed to bring about this giant stride in our institutions as it concerns cloud computing technologies.

METHODOLOGY

The survey research design was adopted for this study. Survey research involves the collection of data to accurately and objectively describe existing phenomena. Survey research is also directed towards determining the nature of a situation, as it exists at the time of investigation. It is a type of research that studies large and small population to determine the relative incidence of the variables investigated. To further investigate the study, the following research questions were raised:

- What is the relationship between final year students' knowledge of cloud computing technologies and their academic output?
- What is the relationship between final year students' utilisation of cloud computing technologies and their academic output?

The hypotheses that guided the study are:

- There is no significant relationship between final year students' knowledge of cloud computing technologies and their academic output.
- There is no significant relationship between final year students' utilisation of cloud computing technologies and their academic performance.

The population for this study comprised all the 2848 final year students of the Federal University of Technology, Owerri in the 2018/2019 academic year (FUTO News, 2019). The choice for this level of students is because, it is believed that these students have spent at least five years as student and are believed to have acquired the relevant skills needed for in-depth academic activities/research. The sample size of 285 (representing 10%) was purposively and randomly selected to ensure that final year students from the 9 schools were covered in the analysis.

The area of this study is the Federal University of Technology, Owerri. The University is a specialized technological institution created in 1981 by the Federal Government of Nigeria to address the high level technological manpower need of the country. Presently the University has 9 under graduate schools/faculty and 51 departments made up of the following schools:

- i. School of Agriculture and Agricultural Technology (SEET)
- ii. School of Basic Medical Sciences (SBMS)
- iii. School of Biological Sciences (SOBS)
- iv. School of Engineering and Engineering Technology (SEET)
- v. School of Environmental Sciences (SOES)
- vi. School of Health Technology (SOHT)
- vii. School of Information and Communication Technology (SICT)
- viii. School of Management Technology (SMAT)
- ix. School of Physical Sciences (SOPS)

The research instrument used for data collection was a researcher made instrument titled "Cloud Computing Technologies and Academic Performance of Students" (CCTAPS). The instrument was used to get respondents' opinion and obtain information on the variables under investigation. The research instrument "Cloud Computing Technologies and Academic Performance of Students" (CCTAPS) was subjected to face validation in order to ensure its appropriateness, and ensure that the items measured what they were designed to measure. The

instrument was tried-tested on 30 students who were not part of the sample for the main study. The split half method was used and the scores from the test were subjected to analysis which yielded a reliability coefficient of 0.89 which was considered a high reliability and showed that the instrument would measure consistently what it was intended to measure. The instrument was administered on the 285 sampled final year students of the Federal University of Technology, Owerri. This was done by the researcher and one research assistant before the second semester examination of 2018/2019 final year students..

RESULTS/DISCUSSION OF FINDINGS

Research Question 1: students' utilisation of cloud computing technologies

	Items	Strongly Agreed	%	Agreed	%	Disagree	%	strongly Disagree	%	SD±	Mean
	You most often make use of Online data base repositories	33	11.6	54	18.9	78	27.4	120	42.1	59.45	2.00
	You most often make use of e-learning platforms	41	14.4	54	18.9	75	26.3	115	40.4	61.35	2.07
	You most often make use of digital archive	39	13.7	49	17.2	72	25.3	125	43.9	58.81	2.01
	You most often make use of University portal	43	15.1	53	18.6	71	24.9	118	41.4	61.35	2.07

You most often make use of cloud computing for Research application	34	11.9	54	18.9	77	27.0	120	42.1	59.45	2.01
You most often make use of online File/Data storages	33	11.6	52	18.2	74	26.0	126	44.2	58.10	1.97
You most often make use of e-mails and other social media services	127	44.6	79	27.7	46	16.1	39	13.7	150.46	3.07
Pooled Mean										2.17

Table 1 shows the level of utilization of cloud computing by final year students. The table reveals that very few of the respondents make use of online database repositories 30%(87), e-learning platforms 33.3%(95), digital archive 30.9%(88), university portal 33.7%(96), research application 30.9%(88) and online file data storages 29.8%(85). However majority indicated that they most often make use of email and other social media services 72%(206). This gave a pooled mean value of 2.17 which is below average accepted value for a 4-point likert scale which is 2.5

Research Question 2

REASONS FOR USE OF CLOUD COMPUTING

Items	Strongly Agreed	Agreed	Disagree	Strongly	SD±	Mean
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								Disagree			
1	You most often make use of cloud computing for Delivery of document	127	44.6	79	27.7	46	18.9	39	13.7	150.25	3.07
2	You most often make use of cloud computing for Security of document	125	43.9	74	26.0	54	18.9	32	11.2	146.83	3.02
3	You most often make use of cloud computing for Information/Document storage	122	42.8	72	25.3	52	18.9	39	13.7	142.79	2.97
4	You most often make use of cloud computing because of its Collaborative efficiency	120	42.1	71	24.9	63	18.9	37	13.0	139.90	3.00
5	You most often make use of cloud computing for Access to automotive update	127	44.6	85	29.8	57	18.9	36	12.6	150.76	3.20
											3.06

Table 2 shows the reasons the respondents gave for their usage of cloud computing services. Majority of the respondents indicated that they use cloud computing services for delivery of document 72.3%(206), security of document 69.8%(199), information/document storage 68.1(194), collaborative efficiency 67.0%(191) and access to automotive update 74.4%(212).

This gave a pooled mean value of 3.06 which is above 2.5 average accepted value for a 4-point likert scale.

Research Question 3

ADVANTAGES OF CLOUD COMPUTING

	Items	Strongly Agreed		Agreed		Disagree		Strongly Disagree		SD±	Mean
1	Easy access to data base	119	41.8	78	27.4	60	18.9	28	9.8	140.8 2	3.01
2	Cloud Computing affords the Opportunity to learn independently	117	41.1	75	26.3	52	18.9	41	14.4	137.6 0	2.94
3	Cloud Computing Supports learning generally	127	44.6	79	27.7	46	18.9	39	13.7	150.2 5	3.07
4	Cloud Computing affords necessary in keeps	125	43.9	74	26.0	54	18.9	32	11.2	146.8 3	3.02
5	Flexibility of use	122	42.8	72	25.3	52	18.9	39	13.7	142.7 9	2.97
											3.00

Table 3 shows the respondents level of perception on the advantages of cloud computing. Majority of the respondents are of the affirmation that cloud computing helps for easy access to database 72.3%(206), opportunity to learn independently 67.4%(192), helps support for learning generally 69.1% (197), affords necessary in keeps 69.8%(199) and flexibility of use 68.1(194).

This gave a pooled mean value of 3.06 which is above 2.5 average accepted value for a 4-point likert scale.

Hypothesis One

Ho: There is no significant relationship between final year students' knowledge of cloud computing technologies and their academic output.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.756 ^a	.571	.557	.09063	.571	31.844	1	284	.011

a. Predictors: (Constant), KnwCloudComp

b. Dependent: AcadPerform

The table above depicts a strong relationship between Cloud Computing and Academic Performance. It shows that 75.6% level of coefficient exist between Knowledge of Cloud Computing and Academic Performance. The coefficient of multiple determination denoted by R-Square is therefore strong thus indicating that the data does fit well in the statistical model (57.1%) since it is near to 100%, therefore a reasonable amount of Academic Performance is been determined by the Knowledge of Cloud Computing, this therefore appears to be useful for making predictions since the value of *R-Square* is close to 1.

Also when the R-Square was adjusted for possible error in fitness an Adjusted error of 55.7% was observed, this normally do serve as an indication that some other explanatory variable(s) by which without them the dependent variable (Academic Performance) cannot be fully measured. Therefore other predictor variables are needed to be sourced out in order to fully measure the dependent variable (Academic Performance).

An F-test was also performed to determine if the model is useful for prediction at 5% level of significance. The F-ratio was calculated of the predictor variable to be 31.844 with an alpha value of 0.011 which was found to be higher than f-tabulated value at 0.05 and df= 1 and 284 is 3.89. This therefore shows that the model is useful for predicting Academic Performance based on the Knowledge of Cloud Computing.

On these bases we therefore reject the null hypotheses that say “There is no significant relationship between final year students’ knowledge of cloud computing technologies and their academic output.” and accept the Alternate Hypothesis.

Hypothesis Two

Ho: There is no significant relationship final year students’ utilisation of cloud computing technologies and their academic performance.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.723 ^a	.523	.487	.04836	.571	11.234	1	284	.001

c. Predictors: (Constant), UtiCloudComp

d. Dependent: AcadPerform

The table above depicts a strong relationship between students’ utilisation of cloud computing and Academic Performance. It shows that 72.3% level of coefficient exist between students’ utilisation of cloud computing and Academic Performance. The coefficient of multiple determination denoted by R-Square is therefore strong thus indicating that the data does fit well in the statistical model (52.3%) since it is near to 100%, therefore a reasonable amount of Academic Performance is been determined by the students’ utilisation of cloud computing, this therefore appears to be useful for making predictions since the value of *R-Square* is close to 1. Also when the R-Square was adjusted for possible error in fitness an Adjusted error of 48.7% was observed, this normally do serve as an indication that some other explanatory variable(s) by which without them the dependent variable (Academic Performance) cannot be fully measured. Therefore other predictor variables are needed to be sourced out in order to fully measure the dependent variable (Academic Performance).

An F-test was also performed to determine if the model is useful for prediction at 5% level of significance.

The F-ratio was calculated of the predictor variable to be 11.234 with an alpha value of 0.001 which was found to be higher than f-tabulated value at 0.05 and df= 1 and 284 is 3.89. This therefore shows that the model is useful for predicting Academic Performance based on the students’ utilisation of cloud computing.

On these bases we therefore reject the null hypothesis that says “There is no significant relationship between final year students’ utilisation of cloud computing technologies and their academic performance.” and accept the Alternate Hypothesis.

CONCLUSION

Final year students of the Federal University of Technology, Owerri are aware of Cloud computing technology, but majority only use it for e-mailing, document delivery, assessing database and other social media platform. In the same vein, there is a strong positive relationship between utilization of cloud computing and enhancement of academic output, hence its utilization should be highly encouraged by students for effective study and improvement in their academic activities.

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